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SCHOOL OF COMMERCE



ASSESSMENT OF WAREHOUSE DIGITALIZATION AND ITS IMPACT ON CUSTOMER SATISFACTION: THE CASE OF BEKER PHARMACEUTICAL COMPANY

A THESIS SUBMITTED TO THE DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

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DECLARATION

I the undersigned, hereby declare that this thesis is my original work and has not been presented for a Degree program in this or any other university and all sources or materials used for the thesis are duly acknowledged.

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LIST OF ABBREVIATIONS AND ACRONYMS

SCM: Supply Chain Management

WMS: Warehouse Management System

RFID: Radio Frequency Identification

IoT: Internet of Things

AS/RS: Automated Storage and Retrieval Systems

GDP: Good Distribution Practices

E LMIS: electronic Logistics Management Information System

PLC: Public Limited Company

B2B: Business-to-Business

AIDC: Automated Identification and Data Capture

ICT: Information and Communication Technology

ERP: Enterprise Resource Planning

RQ: Research Question

BPC: Beker Pharmaceutical Company

IV: Independent Variable

KPI: Key Performance Indicator

DV: Dependent Variable

4IR: Fourth Industrial Revolution

SME: Small and Medium Enterprise

LIT: Logistics Information Technology

EPSA: Ethiopian Pharmaceutical Supply Agency

AAU: Addis Ababa University

SPSS: Statistical Package for the Social Sciences (referenced as IBM SPSS Statistics)

SD: Standard Deviation

OTIF: On-Time, In-Full

ABSTRACT

The present thesis focuses on the implementation of digitalization in the warehouse at Beker Pharmaceutical Company in Addis Ababa, Ethiopia and examines the impact of the digitalization directly on the customer satisfaction in the downstream sector of the pharmaceutical industry in the specific scope of the pharmaceutical industry as a special distribution industry. The study aims to investigate the influence of different dimensions of digital warehousing (Information Accessibility, Information Accuracy, Communication Efficiency and Timeliness, and Perceived Quality of Technology) on the service delivery expectations and operational expectations of business-to-Business (B2B) clients from the perspective of the Information System Success Model. A cross-sectional, mixed methods research design was used in which structured questionnaires were used to collect quantitative data from a statistically representative sample of 168 active commercial clients (including retail pharmacies, wholesalers, hospitals, and clinics), and qualitative data was collected through key informant interviews with 5 internal logistics and warehouse management personnel. Using IBM SPSS the overall predictive model was highly significant ($F = 68.56$; $p < 0.001$; Adjusted $R^2 = 0.618$), which indicated that all four constructs in the digitalization were statistically significant positive predictors of customer satisfaction. Information Accuracy was the top standalone predictor of the client experience. At the same time, the qualitative feedback identified key systemic chokepoints, such as regular network disconnections, a slow-down in the real-time data updating of the inventory, and hardware strains during peak hours. The conclusions of this study are to upgrade technical server infrastructure, creating redundant internet backups, adding more features in Warehouse Management System (WMS) to automatically track the product expiry date and return, and adding a self-service digital web portal to allow downstream partners to use the internet to access real-time inventory balances seamlessly.

CHAPTER ONE

1. INTRODUCTION

The background to the study, the statement of the problem, the principal research objectives and guiding research questions are presented to provide the background of the study, followed by clearly stated research problems, objectives and questions. Furthermore, it emphasizes the general research importance and scope with specific delimitations. Importantly, the theoretical and practical aspects of this research are grounded in current advances in the fields of logistics, the aforementioned supply chain digitization and the modern mobility systems and circulations in which these objects are operating.

1.1 Background of the Study

The management of logistics and supply chain is one of the major factors that decides the survival and competitive advantage of organizations in the highly competitive and volatile business environment of today's world. The global economy is currently in a dramatic transformation paradigm as a consequence of Industry 4.0 technologies, which represent a convergence of physical assets and high-level digital architectures, cyber physical systems, and cognitive computing structures (Reyes, 2026). In this wider digital change, supply chain management (SCM) has moved from a linear, reactive operational role to a data-driven, interconnected and highly proactive ecosystem. Digital planning, end-to-end visibility, and automated material flows are a top priority for organizations to reduce market volatility, manage complex distribution channels and allocate capital efficiently (Reyes, 2026).

The core of this logistic revolution is the warehouse. Until now the warehouse has been seen as a passive storage space that takes on the cost of storing goods and even outloads between highs and lows in demand. However, in the current paradigm of supply chain theory, the role of the warehouse has evolved into a strategic and flexible element of the supply chain, with the potential to affect the velocity of a company's operations and ability to respond to market opportunities (Atieh et al., 2025). The traditional warehouse practices are struggling to keep up with the requirements of today's market: speed, scale and accuracy and are dependent on manual records, pick lists on paper and human resources. As such, manual processes are fast giving way to automated, intelligent architectures that rely on real-time data integration and cloud computing (Atieh et al., 2025; Budiyanto, 2024). This multi-faceted change is viewed as “warehouse digitalization” and involves systematic implementation of technologies and Digitalization solutions such as cloud-based Warehouse Management Systems (WMS), Radio

Frequency Identification (RFID) and Artificial Intelligence (AI),Identification (RFID) tracking, Barcode Automation, the Internet of Things (IoT), and Automated Storage and Retrieval Systems (AS/RS) (Ali et al., 2024; Budiyanto, 2024).

The overall objective of introducing these digital technologies operationally is to look for hyper efficiency and optimization of services. But in a manual system, warehousing functions are susceptible to human error and error data and structural bottlenecks in the system will result in ups and downs flow of the error in the supply chain. The solution to these silos is digital transformation, which includes automating and digitizing all inventory movements, from receiving, put-away, picking, packing and dispatch, through to being digitally logged, validated and communicated enterprise-wide (Atieh et al., 2025). Real-world tests demonstrate that it's possible to experience exponential results when replacing aging manual processes with inter-synchronized digital architectures. Moreover, automated systems like RFID can increase the level of inventory accuracy from 60% – 70% up to tracking the inventory in real time, and the frequency of physical checks can be significantly reduced, even down to zero (Budiyanto, 2024). Moreover, by providing complete information visibility, companies can now real-time synchronize procurement cycles with actual demand, thus minimizing safety stocks, optimizing lead times and greatly improving time-to-market indicators (Ali et al., 2024).

But, when it comes to specialized, highly regulated, and time-sensitive sectors, like the pharmaceutical industry, the strategic need for warehouse digitalization is even more urgent. This is because it's a clinical product that could affect patient health and clinical outcomes if not effective. Pharmaceutical inventory management requires the highest level of accuracy, batch/lot tracking with the aim of tracking, expiry risk (shelf-life control), compliance to Good Distribution Practices (GDP) and temperature controlled cold chain management (Jaju et al., 2023). Uncontrolled inventory in this block can cause huge financial losses due to the expiration of products, high stock levels or lack of essential and critical medicines, which can have serious public health consequences.

The pharmaceutical logistics environment in developing countries, and more specifically in the Sub-Saharan African setting, is complex and characterized by a variety of structural and systemic issues. Throughout history, supply chains in developing countries have been hugely limited by poor infrastructure, unreliable customs and import clearance processes, volatile foreign exchange availability, and a lack of technology integration on the national level. These are the very same vulnerabilities faced by the public and private health logistics sectors in

Ethiopia. Relies on manual, disconnected inventory control processes for multiple tiers of distribution often leads to poor data visibility, long lead times, excessive wastage of medicines, and frequent stock outs of tracer medicines (Bekele, 2024).

On a national level, to overcome these fundamental inefficiencies, the Ethiopian government has increased the implementation of systems such as the electronic Logistics Management Information System (eLMIS) to digitalize transactions in the public health sector and to connect institutional levels (Bekele, 2024). In spite of all these macro-level interventions, the private pharmaceutical sector, which is part of the public health sector and complements this public delivery while providing commercial pharmacies, private hospitals and clinical networks with their own technological developments, is often operating on its own and is required to invest in its own technological modernization. Many private distributors are still relying on semi-manual processes that are limited in scope because of capital and infrastructural constraints. This dependency leads to lasting data inaccuracies, slow order processing, and operational hassles, restricting their ability to scale (Alemu, 2023).

In this context, digitalization of warehouse processes is not a luxury, it is not a choice, but a necessity for the survival, adherence to legal requirements and competitiveness of private pharmaceutical distributors like Beker pharmaceutical company. In commercial pharmaceutical industry the efficiency of a distributor is directly related to the satisfaction of its external customers. When visibility is poor in the warehouse, warehouse issues like wrong stock statements to the sales staff, picking slowness inside the warehouse and the number of order-discrepancies causes the warehouse to ship unwanted products and expired batches. Downstream impacts include inadequate delivery to hospitals and retail pharmacy outlets, and these directly impact health care services to patients and clients seeking to access other outlets (Alemu, 2023).

On the other hand, if an enterprise manages to integrate digital tools into their warehousing center, they obtain a high level of agility of their enterprise, speed of processing, and relational reliability. Having real-time data makes it possible for the firm to place orders perfectly, shorten the lead time, provide competitive pricing due to lower overheads, and improve communication with clients. This operational excellence is the basis for the long-term trust, satisfaction and loyalty of customers and companies (Ali et al., 2024). Hence, this study aims at filling an important gap in the local literature by bringing up the global technological paradigm within the unique socioeconomic and operational context of private pharmaceutical

industry in Ethiopia. In this research, the authors employ a case study approach of Beker General Business PLC to empirically examine the effect of the adoption and depth of warehouse digitalization on both the efficiency and effectiveness of the system. This research used the case study approach of Beker pharmaceutical company to examine the effect of the adoption and depth of digitalization of the warehouse system downstream customer satisfaction.

1.2 Statement of the Problem

In today's global supply chain context, warehouse efficiency is one of the most important factors that affect an organization's competitiveness and customer satisfaction (Bowersox et al., 2020; Christopher, 2016). In the health care industry where time, accuracy, and security of information are vital to the safe handling of products that must be kept at the proper temperature and are life-saving, operational bottlenecks can have direct and negative consequences on the health of the population and trust in the institution. In developing countries, traditional pharmaceutical distribution centers have been mainly dependent on manual warehousing practices. Unfortunately, these traditional approaches often suffer from many inefficiencies in operation, such as significant inventory miscounts, slow order cycles, high picking error rates and a lack of visibility in real-time.

To lessen the impact of these systemic risks, the modern paradigm of logistics calls for a ramped-up approach to digitalizing warehouses. The theory is that digital technologies like powerful Warehouse Management Systems (WMS), automated identification and data capture (AIDC) systems (such as barcodes and Radio Frequency Identification [RFID]), and cloud data tracking systems can be used as a transformative mechanism (Bowersox et al., 2020). Researchers note that digitalization helps to optimize the design of the system, better fulfill orders and reduce human errors, and consequently, the quality of electronic service delivery to downstream clients is elevated to a fundamentally new level (Parasuraman et al., 2005).

But the migration from traditional, manual warehousing to a connected digital environment is never perfect, especially in economic and infrastructural systems of developing East African countries such as Ethiopia. Organizations invest a significant amount of money in acquiring the latest and greatest in terms of hardware and software architectures, but the purchase of technology is not necessarily a guarantee of optimized service delivery or user acceptance (Rogers, 2003; Venkatesh et al., 2003). A very common mismatch that arises is that, despite

having considerable and increasing digital capabilities, the level of digital maturity does not match the customer's expectations regarding digital skills, which is caused by many glitches in the system.

Beker General Business' front-line staff are very interpersonal responsive and have very good collaborative communication skills, however, there are major structural issues in real-time data visibility leading to significant operational blind spots throughout the distribution network. That means localized B2B customer friction points are not necessarily about individual employee performance or the lack of human capital, but are directly accelerated by an enterprise's lag in its digitization. This is one of the most important gaps in Information Accessibility and Perceived Quality of Technology within the context of warehouse digitization. The back-end warehouse management system (WMS) is based on a siloed, standalone solution with no customer-facing interfaces, like a secure Web portal or an automated API feed, so downstream clients are plagued by information asymmetry. This disconnection from technology disrupts the seamless flow of the supply chain, which is not synchronized and communicated to the outside world as transactions are made for batch tracking, order status, and inventory status. This means that they don't receive automatic, proactive order status updates, and after the disruption occurs, the warehouse has to investigate and communicate it. Finally, this turns a pro-active, digitally optimized customer experience into a reactive, manual process. This highlights the fact that poor warehouse data disintermediation can actually impact customer satisfaction regardless of how well and politely employees work on the ground.

1.3 Research questions

a) From customers' perspective how is the warehouse digitalization taken up by Beker Pharmaceutical Company?

b) What is the specific effect of Information Accessibility on overall customer satisfaction?

c) How does Information Accuracy influence overall customer satisfaction?

d) What is the impact of Communication Efficiency and Timeliness on overall customer satisfaction?

e) In what ways does the Perceived Quality of Technology shape overall customer satisfaction?

1.4 Objective of the Study

1.4.1 General Objective

To assess warehouse digitalization at Beker Pharmaceutical Company and its impact on the customers' satisfaction directly.

1.4.2 Specific Objectives

a) To determine the specific effect of Information Accessibility on overall customer satisfaction.

b) To examine the influence of Information Accuracy on overall customer satisfaction.

c) To assess the impact of Communication Efficiency and Timeliness on overall customer satisfaction.

d) To evaluate how the Perceived Quality of Technology shapes overall customer satisfaction.

1.5 Scope of the study

The structure of this study is clearly defined in three aspects (thematic, spatial and temporal boundaries) to ensure a focus, rigorous and manageable investigation.The parameters are used for delimiting the structural scope of the research and the empirical analyses and data collection conducted are closely linked to the main research objectives of the thesis.

1.5.1 Thematic Scope

This study is thematically limited to exploring the fundamental connection between digitalization of pharmaceutical warehouses and customer satisfaction in the specific field of pharma logistics.

Independent Variable (Warehouse Digitalization): The level of digital tracking/automation is explored by examining customer perceptions Quality of Technology, the accuracy of information, Communication Efficiency and Information Accessibility frameworks.

Dependent Variable (Customer Satisfaction): This is the measure and limited to customer perceptions of down-stream service delivery, order fulfillment accuracy, distribution time, and business-to-business relationship trust.

Methodological/Analytical Focus: The statistical scope will be bound to calculations using IBM SPSS Statistics and will include descriptive statistics, reliability analysis (Cronbach α) and multiple regression tests for determining predictive slopes between the variables.

1.5.2 Spatial scope

Organizational Bounds: The data collection and operational assessments are conducted only in Beker pharmaceutical company.

1.5.3 Temporal scope

Academic/Research time: The entire duration of this study, including the research design, data collection, and statistical calculations, will take place within this time frame, which will end with the submission of the thesis in June 2026.

1.6 Significance of the Study

Efficient and reliable warehouse operations are crucial in the pharmaceutical distribution sector to ensure drugs are available in a timely manner. By enhancing inventory accuracy and customer satisfaction, digital warehouse solutions, such as Warehouse Management Systems (WMS) and ERPs, have a global positive impact on warehouses. However, their application is

very much limited in developing countries such as Ethiopia, where infrastructure and network stability are lacking. While there are some existing studies on the local level, the conclusions are not conclusive, as one such study by Lesher and Blakesley (2019) takes a broad approach to macro-level ICT adoption in the general supply chain and ignores the specific context of warehouse digitalization within private pharmaceutical companies. In addition, the study of these digital systems has been limited to a few studies from an institutional customer view of the systems, such as pharmacies, hospitals, and clinics. As such, although Beker Pharmaceutical Company has implemented a number of digital solutions, there is no empirical research that correlates these investments with downstream client experience. This study directly fulfills this empirical and contextual gap and evaluates the impact of digitalization in the warehouse on the satisfaction of the customers in the Beker Pharmaceutical Company.

This study can provide significant empirical results to any parties who will assist in making decisions with respect to the investments that the company will make in its digital warehouse, including its customers.

For Industrial practitioners: The research results would be very useful for other stakeholders in the company, including industrial practitioners, who will assist in decision making processes regarding the company's investments in its digital warehouse. The research results are a diagnostic roadmap that will help management to identify specific technical bottlenecks, such as infrastructure reliability constraints, system rigidities, and lag in inventory data synchronization, which allows for optimizing the operation, increasing the accuracy of order fulfillment, and raising the level of customer retention.

For Pharmaceutical Distributing Firms and Industry Practitioners: The study is a practical reference for logistics/supply chain managers in developing markets. It can show how to relate the back-end automation choices to the service quality that will be offered by the front-end electronic delivery; it can also be used by other organizations to manage risk and ensure they are able to keep up with customer expectations in terms of their digital service.

For Government Regulators and Policymakers: The study demonstrates the importance of external infrastructure – such as internet connectivity and power grid stability – in successful digitalization of key healthcare supply chains. This can guide policy making on digital infrastructure development and standard operating procedure for Ethiopia pharmaceutical distribution.

For the Academic Community and Future Researchers: This study helps to close the gap in literature on context in relation to supply chain digitalization in East African developing economies. It makes use of the empirical data and confirms the statistical relationship between the dimension of a digital warehouse and customer satisfaction and it becomes a benchmark for future researchers in the region to study in-depth the acceptance of IT and logistics performance.

1.7 Limitation of the study

The first limitation of this study is that it is a case study of Beker Pharmaceutical Company in Addis Ababa, excluding the scope of the research to the other logistics companies in the Ethiopian market. From a methodological point of view, the research is based on a short time cross-sectional design that has the disadvantage of not being able to capture the technological maturity and evolution of customers over the time.

1.8 Definition of key terms

The core concepts and variables in this study are defined in terms of their operation, as follows, to ensure clarity and prevent ambiguity:

Warehouse Digitalization: integration of digital technologies and software frameworks into the operation of a logistics facility, aimed at automating inventory tracking, optimizing picking processes, and improving the flow of information. Warehouse Digitalization refers to the incorporation of digital technologies and software solutions into the operations of a logistics installation, with the goal of improving the automation of inventory tracking, optimizing picking processes, and improving information flow.

Customer Satisfaction: Overall cognitive and emotional assessment by downstream customers of how well the distributing organization fulfills customers' operational requirements, delivery expectations and service experiences (Parasuraman et al., 2005).

System Infrastructure Reliability: is the overall stability, uptime, and performance of the digital warehouse system that enables data processing and supports customer requests while minimizing disruptions and congestion in connectivity (DeLone& McLean, 2016

Real-Time Data Accuracy: The level of accuracy of digital inventory records, stock availability balances and transactional clearances displayed on the system interface to the actual stock in the warehouse at any given point in time (Christopher, 2016).

Order Fulfillment Efficiency: Efficiency of internal picking, packing and dispatching processes, directly impacting order errors and lead times for the receiving client (Bowersox et al., 2020).

1.9 organization of the study

The study is divided into five chapters, the first chapter is the introduction part which addresses the background of the study, statement of the problem, objectives of the study, and significance of the study, the researcher will describe the background and problem of the study. The concept of study, scope and limitation of the study, definition and terms. Details of a related literature review regarding ware house digitalization will be discussed in the second chapter. In In this chapter, the researcher will be concentrating on the related empirical and theoretical literature in logistic. Activity to build a conceptual framework which would respond to the problem statements highlighted in chapter one. In chapter three the research design and methodologies have been presented. Sample and sampling techniques, source of data, procedures of data collection and methods of data analysis have been discussed. In chapter four results or findings of the research are presented. Finally, chapter five contained the results of the research, the conclusion and recommendations. The summary have been made based on findings and results which are stated in chapter four followed by a conclusion and recommendation.

CHAPTER TWO

2 LITERATURE REVIEW

2.1 Warehouse Digitalization: Global and SME Context

Through the development of Industry 4.0 technologies, warehouse operation modes have changed greatly. Warehouse 4.0, the 'smart warehouse' conception, has reshaped operation management into four interdependent parts: the interrelationship of information, the automation of machinery, the coordination of processes and the harmony with environment (Tikwayo&Mathaba, 2023). Using new technologies such as WMS, RFID, IoT sensors and automated picking in warehouses has produced tangible efficiency in terms of processes efficiency, availability of real-time data, increased level of decision-making, more flexible operation, lower cost, more powerful risk control ability and more competitive advantage.

Findings on ICT adoption in SMEs are uniform across the research: while the use of ICT is growing in small businesses around the world, its adoption is limited by lack of money, lack of knowledge and skills related to ICT and lack of readiness to change the organization (Yuwono, Suroso&Novandari, 2024) causing smaller businesses adopt slower than larger companies. Extreme circumstances like the COVID-19 pandemic has been speeding up the process in some cases and it confirms that ICT adoption can be used as strategy for survival (Mishrif& Khan, 2023).

2.2 ICT and Logistics in the African Context

The recent literature has suggested a significant rise of interest in digitalizing supply chains and logistics in Africa, after being seriously impacted by the pandemic, the COVID-19. For instance, it has been reported that in Zimbabwe, the poor adoption rates of the 4IR technology among SMEs were due to the higher cost, less awareness of the digital literate and the lack of appropriate infrastructure (Munongo&Pooe, 2022). However, when such a technology is adopted, its firms will acquire better supply chain resilience and operational performance. Structural equation modeling based on 313 SMEs data from South Africa found that LIT adoption affects distribution timeliness and product condition positively and reinforces the buyer-seller network (Omoruyi et al., 2025).Significant challenges remain across the African context: inadequate ICT infrastructure, unstable power supply, limited internet connectivity, lack of technical skills, and weak institutional support continue to hinder widespread digital adoption (Ayim, Kassahun, Tekinerdogan& Addison, 2020). These structural constraints

frequently outweigh individual firms' willingness to digitalize, particularly for micro and small enterprises operating in underserved regions.

2.3 ICT Adoption in Ethiopia

In Ethiopia, The findings from a quantitative research of Ethiopian Pharmaceutical Supply Agency (EPSA) concluded that the adoption of ICT has a positive effect on the performance of supply chain operational performance and both ICT and supply chain practices have a direct effect on performance results (Hailu et al., 2023). However, problems regarding visibility of data, infrastructure and power supply problems and lack of competent personnel were identified as constraints.

For Adama City's medium & large scale manufacturing firms, ICT adoption contributed in making firms innovativeness higher by enabling higher production rate and receiving online orders, while factors like shortage of skilled labour, financial constraints and Institutional deficiencies did not fully permit the full benefit from ICT use (Ali & Ahmed, 2024). Another study using the data of 438 Ethiopian manufacturing enterprises had established a strong positive link between adoption of IT and performance of supply chain (Moges, Simano&Mindaye, 2023). Combined finding indicates that Logistics and Warehouse performance may be improved to some degree through use of ICT and digitalization in Ethiopia but the facilitators and barriers of the context have to be considered at the same time.

2.4 Key Enablers and Barriers of Warehouse Digitalization

The literature has discussed a few critical enablers for warehouse digitalization success. Strong commitment and clear vision are among the most cited and indispensable success factors for ICT implementation in warehouses: when it is lacking, projects are likely to stagnate and eventually die (Moges et al., 2023). Developing human capital and building digital literacy are as important as leadership commitment: human resources limitations are often reported as the most important obstacles in the warehouse digitalization process, including Ethiopian researches (Ali & Ahmed, 2024; Hailu et al., 2023). Context-based ICT solution selection is another crucial factor for the success of SMEs, which can hardly sustain advanced automated warehouse system investment and hence needs adequate choice based on organization size, costs and the actual needs (Yuwono et al., 2024). Adequate infrastructure and favorable institutional conditions also fall in the category of critical enablers for successful warehouse digitalization (Desalegn& Nadeem, 2024).

Barriers also remain similarly well reported. SMEs are dissuaded from implementing fully integrated digital systems by both high initial and lifecycle costs (Munongo&Pooe, 2022). Inadequate ICT skills and digital literacy among staff causes employee resistance and errors in operation during the adoption process, while poor infrastructure - e.g., lack of stable electricity supply and inadequate internet access - regularly interrupts digitally enabled workflows (Ayim et al., 2020).

2.5 THEORETICAL FRAMEWORK

A theoretical framework serves as the basis for explaining the relationships between the variables studied, and helps to develop the conceptual framework of the study. It aids in understanding and interpreting the factors that affect the phenomenon under study. This study is based on DeLone and McLean (2003) Information Systems Success Model (ISSM) and views how the warehouse digitalization has affected customer satisfaction. The model states the relationship between information quality, system and service quality and user satisfaction and organizational performance. The concept of information accessibility, information accuracy, communication efficiency and timeliness, and perceived quality of technology is, therefore, used as a theoretical basis in the study of the impact of these variables on customer satisfaction.

2.5.1 INFORMATION SYSTEM SUCCESS MODEL

DeLone and McLean (2003) formulated the Information Systems Success (ISS) model that explains that the success of an information system depends on information quality, system quality, and service quality, which in turn leads to user satisfaction and organizational performance. The information quality emphasizes on the accessibility, accuracy, and usefulness of information, and the system quality emphasizes on the reliability and effectiveness of technological systems. Service quality is the efficiency and promptness of communication and support to the user. The Information Systems Success Model is applicable to this research in order to explain the influence of information accessibility, information accuracy, the efficiency and timeliness of communication, and the perceived quality of the technology on customer satisfaction in the digitalization of the warehouse.

2.5.2 TECHNOLOGY ACCEPTANCE MODEL

Davis (1989) proposed the Technology Acceptance Model (TAM) to understanding user acceptance and adoption of technology. Perceived usefulness and perceived ease of use affect users' attitudes toward technology, TAM claims. The concept of TAM is relevant to this study as it helps

explain the perceptions of the quality and usefulness of warehouse digitalization technologies that affect customers' satisfaction with services provided.

2.6Empirical Framework

This section summarizes empirical research on the four constructs of this research: information accessibility, information accuracy, communication efficiency and timeliness, and perceived quality of technology that have been studied. It critically evaluates the methodological considerations of the existing studies, summarizes the main conclusions of these studies and outlines the possibilities for further research.

2.6.1 Information Accessibility in Supply Chain Management

2.6.1.1 Conceptualization and Significance

Accessibility of information in supply chains is the degree to which authorized parties can easily, quickly and completely access information from common information systems (Srinivasan &Swink, 2018). A number of studies have shown that access to timely data from the supply chain, such as inventory levels, order status, and shipment locations are important indicators of supply chain responsiveness and customer satisfaction (Chen, Paulraj&Lado, 2004).

Accessibility of information is more critical in the pharmaceutical industry as a stock out of essential medicines can have life-threatening consequences (Yadav et al., 2011). Research in the context of both developed and developing countries has emphasized that one of the key reasons for stockouts at the point of care (PHC) is the lack of real-time visibility of product availability (Privett&Gonsalvez, 2014). One possible intervention that has been recommended to improve accessibility is the use of warehouse management systems (WMS) and enterprise resource planning (ERP) systems which provide real-time inventory information (Williams & Waller, 2011).

2.6.1.2 Empirical Evidence

Srinivasan and Swink (2018) analyzed 151 manufacturing companies in a large-scale empirical study and discovered that supply chain visibility (measured in part by the ease of inventory and order status information) was positively and significantly related to supply chain agility ($\beta = 0.43$, $p < 0.001$) and operational performance. The study employed the method of structural equation modeling (SEM) and showed that the performance effects of visibility through digital systems were larger than the performance effects of relational systems. In a retail goods context, Williams and Waller (2011) studied the impact of PoS data sharing on SC responsiveness. They conclude that companies with more access to downstream data had a significant reduction in stockout rates and

safety stock. Applying these learnings to pharmaceutical supply chains, Yadav et al. (2011) found that stockouts at health care facilities in sub-Saharan Africa could be cut by as much as 30% when inventory is visible in real time, achieved by using barcodes and computer systems, versus when it is not visible in real time.

In the East African pharmaceutical distribution environment, specifically, Waako et al. (2009) discovered that poor information systems which restricted access to medicines were among the key challenges to effective PHDM.In their study, they found that investments in accessible digital information infrastructure should go hand-in-hand with the building of capacity of the workforce and that the study should involve pharmacists and supply chain managers in Uganda and Kenya.

More recent research has focused on how cloud solutions and mobile apps can help drive greater information democratisation for smaller pharmaceutical distributors and their customers.In a multi-case study of Nordic pharmaceutical logistics companies, Kembro et al. (2017) reported that the use of cloud-based warehouse visibility tools greatly enhanced the capacity of customers to plan procurement with 78% of customer's surveyed indicating greater order planning after introducing a real-time availability portal.

2.6.2 Information Accuracy in Supply Chain Management

2.6.2.1 Conceptualization and Significance

Information accuracy is defined as the degree to which the information stored in an information system accurately reflects the real world entities or conditions represented by the information (Wang & Strong, 1996). Information accuracy in supply chain management refers to the accuracy of information in the inventory, transactions and attributes of the products produced including batch number, expiry date, storage condition, etc.

The inaccuracy of inventory records is a universal and costly problem in supply chains. In retail supply chain, Raman, DeHoratius and Ton (2001) calculated that about 65% of records are inaccurate in the chain, while in pharmaceutical, manual data entry and fragmented systems open opportunities for data to be inaccurate. The lack of accurate stock records results in "phantom" stockouts (where the system reports no stock when product is in fact available), unnecessary replenishment orders, and excess safety stock which all add to the cost of the supply chain and reduce service levels.

2.6.2.2 Empirical Evidence

A major empirical study by Raman, DeHoratius and Ton (2001) on inventory record inaccuracy for 370 stores of a large retailer in the USA demonstrated that inaccurate records resulted in substantial lost sales and overordering. Their research showed that in pilot stores, using RFID and embedded scanning systems decreased discrepancies in inventory by as much as 26% or as little as 13%. The authors suggested that digital systems generate audit trails which make inaccuracies discoverable and correctable, which will enhance the general correctness of the records.

The literature of the pharmaceutical supply chain provides a discussion by Schuster et al. (2007) about the use of electronic pedigree systems for batch numbers and expiry dates. They found such systems working automatically to alert users to the expiry date of a drug reduced the number of incidences where expired drugs were dispensed by 94% compared to paper expiry-date alert systems across the 12 European pharmaceutical distributors they studied. This discovery is a reminder of the critical role of the "batch-and-expiry accuracy" construct that was measured in the present study, with the questionnaire.

A systematic literature review of 126 articles on supply chain risk was carried out by Colicchia et al. (2014); among the most cited causes of operational risk, they identified the inaccuracy of information. They found that the most successful technological interventions for information accuracy would be the use of digital track and trace systems and electronic data interchange (EDI).

In the study, Smaros et al. (2003) found that the discrepancies between e-delivery and actual delivery in grocery distribution networks were one of the most important reasons why customers are dissatisfied with this distribution system and this has been confirmed by other studies on distribution of pharmaceuticals (e.g., Grunthal and Nusas (1996), MItner and Associates (1999), and Leask and Associates (2000)). Grob (2019) surveyed 200 pharmaceutical wholesalers and identified the strongest predictor of customer trust in a regression model: the accuracy of billing (the correspondence between electronic invoices and goods received in real life) with a coefficient of 0.51 ($p<0.001$).

2.6.3 Communication Efficiency and Timeliness

2.6.3.1 Conceptualization and Significance

Communication efficiency in supply chains is defined as the capability of supply chain members to share relevant information with little effort, cost and time (Li et al., 2006). Timeliness is similarly important and relates to how quickly information is conveyed and whether it is conveyed in advance of the recipient's ability to act on it (Mentzer et al., 2001). Efficiency and timeliness are combined in what Daft and Lengel (1986) called media richness and information richness: the ability of a communication channel to transmit rich information in a timely manner.

Digital supply chains use technologies like electronic data interchange (EDI), application programming interfaces (APIs), automated e-mail and SMS notification systems, and customer-facing web portals (Frohlich& Westbrook, 2001). These tools automate the process of answering questions over the phone and on paper, cutting down on lead times for communications from days to minutes. In pharmaceutical distribution, for instance, being timely is especially important, since the timely notification of delivery delays or the necessity of substitution means that the pharmacies and hospitals can order new products in advance to avoid the risk of not having the required drugs available at the required time for patient treatment.

2.6.3.2 Empirical Evidence

In a study of 196 Chinese manufacturing firms, Li et al. (2006) developed and validated a multi-dimensional supply chain management practice scale, which showed that information sharing – measured in part by degree of timeliness and frequency of information communication – had a significant positive impact on competitive advantage ($\beta = 0.39$, $p < 0.01$) and organizational performance. They found that sharing information is most useful when it is not only regular but also timely; that is, when recipients can use the new information in their operations before they change.

Kwon and Suh (2004) studied the relationship between communication quality and trust and commitment in supply chain. They discovered that communication accuracy and timeliness (r = 0.67) were the best indicators of supply chain partner trust based on 142 US manufacturing companies. They found that quality of communication encompasses both operational and relational elements – effective, timely communication leads to better coordination as well as the interpersonal trust necessary for long-term relationships in supply chain.

In the pharmaceutical industry, Seuring and Gold (2012) did a case study on automated notification systems used by European pharmacy distributors and discovered that those customers who were notified of their orders by automated real-time dispatch systems experienced 34% less of an emergency procurement event than those that were notified manually. The study said this was because the automation removed the communication lag between order dispatch and customer notification, and allowed downstream customers to have more time to prepare for goods to be received and to adapt patient dispensing schedules.

Another aspect of communication efficiency explored in more recent empirical literature is the responsiveness of digital **communication. Customer** responsiveness to inquiries and complaints is another measure of the responsiveness of digital communication explored in recent empirical literature. In designing the E-S-QUAL scale, Parasuraman, Zeithaml, and Malhotra (2002) determined that responsiveness, or the ability of the digital system and the operators to respond quickly to inquiries that come online, is one of the most influential factors on customer satisfaction in electronic service settings. In the case of the pharmaceutical distribution channel, responsiveness of the digital channel can be a service quality metric and a patient safety issue, as there may be various delivery exceptions that customers need to know about immediately.

2.6.4 Perceived Quality of Technology

2.6.4.1 Conceptualization and Significance

In the context of a supply chain, perceived quality of technology is defined as the customers' subjective evaluation of the usability, reliability, security and timeliness of the digital systems that they use when transacting with a supplier (Zeithaml et al., 2002). It includes the ease of use of portals and the mobile applications used by customers, the system up-time and stability of the warehouse management platform, the strength of the cyber security systems and the technological modernity of the infrastructure used. High perceived technology quality lowers the loads on the

user's cognitive system, transaction error rates related to the user's confusion about the interface, and trust in the digital channel.

Perceived technology quality does not equate with actual technical capabilities. Objective reliability (e.g., 99.9% uptime) may be high, but the user's experience of the system may be poor because it is confusing and has poor navigation or security features are perceived as burdensome (Davis, 1989). On the other hand, the feeling of high quality may be found in a system that looks nice and easy to use, despite the fact that the technical structure is not that complex. The objective performance and the subjective perception are thus important to supply chain managers who are interested in enhancing the customer's experience.

2.6.4.2 Empirical Evidence

Maditinos et al. (2012) examined the effect of ERP system quality on the performance of the supply chain by analyzing data collected from 112 companies in Greece. System quality was a significant predictor of user satisfaction ($\beta = 0.44$, $p < 0.001$) as well as supply chain coordination performance ($\beta = 0.31$, $p < 0.01$), according to their study, where system quality was measured based on the ease of use, reliability, and functionality of the system, derived from the DeLone and McLean (2003) Information Systems Success Model. The constructs examined in this study are related to the constructs of the DeLone and McLean model, which specifies three antecedents of IS success: system quality, information quality and service quality.

Devaraj, Fan and Kohli (2002) studied the relationship between perceived ease of use and perceived usefulness of an electronic procurement system with adoption and performance in supply chain transactions. They found that ease of use was more influential at the early stages of technology diffusion and perceived usefulness was more influential as technology diffused predictor as users gained experience. This finding implies that in contexts where digital systems are relatively novel as they may be for some pharmaceutical customers in emerging market settings ease of use (a component of perceived technology quality) is likely to be the primary driver of system engagement.

In recent years, cybersecurity has become an ever-growing aspect of the quality of technology perceived by consumers. Safa, Von Solms and Furnell (2016) suggested that data security issues can have a significant impact on the level of trust in the digital platform, and on how quickly the inter-organizational trust can break down if a data security issue does occur. In pharmaceutical supply chains, the nature of the procurement data – which can include pricing information, product availability strategies, and patient volume data – makes it a crucial aspect of technology quality in the context of cybersecurity. Twelve other dimensions of perceived technology quality have been

empirically verified and added to infrastructure modernity and technological currency.Twelve other dimensions of perceived technology quality have been empirically validated and added to the dimensions of infrastructure modernity and technological currency.

In a study of 202 US companies, Bhatt and Grover (2005) concluded that technology infrastructure quality (integration capability, scalability, and recency of IT assets) is positively correlated with their supply chain responsiveness and competitive positioning. Information delays and coordination problems were significantly higher in firms that had obsolete and fragmented technology infrastructures compared to those firms that had integrated and modern technology infrastructures. This is directly relevant to the question from the present study which asks customers if the company has current technologies that are effective in managing their business.

2.7 Conceptual Framework

Conceptual framework is an analytical tool used in research to set and define the theoretical and operational relationships of the variables that are the focus of research. The conceptual framework of this study is derived from information system success model and technology acceptance model.This thesis can be divided into two main pillars the Independent Variables which includes information accessibility, communication efficiency and timeliness and, information accuracy and the Dependent Variable is customer satisfaction. The framework assumes direct relationships between warehouse digitalization dimensions and customer satisfaction.

2.6.1 Narrative Structure of the Variables

1. The Independent Variable (IV): Warehouse Digitalization

The digitalization of warehouses is viewed as a multidimensional phenomenon and measured in terms of client experiences and perceptions. This variable assesses the company's usage of the latest software tools, including a Warehouse Management System (WMS), and automation equipment, including barcode scanners, as it processes and delivers the customer's order. The Independent Variable is a variable that has the following dimensions:

Information Accessibility:

Information accessibility is the ability for a customer to access the correct, timely information about products on offer, orders placed and delivery times using digital systems. In Supply Chain Management, easy access to information makes things clearer, decreases uncertainty, and builds trust with customers of service providers. Christopher (2016) states that better information sharing and visibility along the supply chain increase service quality and enhance customer relations. Hence, organizations offering their customers easy access to the accurate and timely information are more likely to get high degrees of customer satisfaction.

Information Accuracy:

The accuracy of information provided by a digital system is its correctness, reliability, and freedom from error. Correct information allows customers to make informed decisions about ordering, stock inventory and expectations for service. Parasuraman et al. (2005) stated that information accuracy is a key dimension of the electronic service quality as customers need accurate and reliable information to assess service performance. Improved information accuracy should thus have a positive effect on the customer satisfaction, as it can build trust and also decrease uncertainties in relation to service.

Communication Efficiency and Timeliness:

Communication efficiency and timeliness is the ability of an organization to supply clear, timely, and accurate information to the orders, deliveries, inquiries and news on services. Good communication helps customers get the information they need in a timely fashion, which minimizes delays and ensures service responsiveness. DeLone and McLean (2016) concluded that an important determinant of satisfaction and perceived success of information systems is the information exchange that is timely and effective. Thus, organizations which are able to effectively communicate and quickly respond to customer needs have the potential of higher customer satisfaction.

Perceived Quality of Technology: Perceived quality of technology is the customers' evaluation of the reliability, usefulness, and effectiveness of technology systems in the service delivery process. Digital systems that are reliable, user-friendly, and effective for efficient transactions and communication are more likely to keep the customer happy. Venkatesh et al. (2003) suggest that users' perception of the performance and usefulness of the technology is one of the key factors that affect the acceptance and evaluation of information systems. Hence, more positive perception of technology is likely to help increase customer satisfaction.

The Dependent Variable (DV): Customer Satisfaction is the overall assessment by a company's commercial clients (retail pharmacies, hospitals, clinics, and wholesalers) of the business-to-business (B2B) relationship.

2.7 The 5 Warehouse Performance KPIs

There are five (5) specialized Key Performance Indicators (KPIs) that make up the internal operational mechanism that links warehouse technology to customer outcomes. The 5 pillars are the key operational areas where digital is actually improving the efficiency of the warehouse:

Inventory Accuracy (KPI 1): This process is designed to work through stock discrepancies progressively, eliminating the sudden lack of stock, and minimizing the number of orders being rejected.

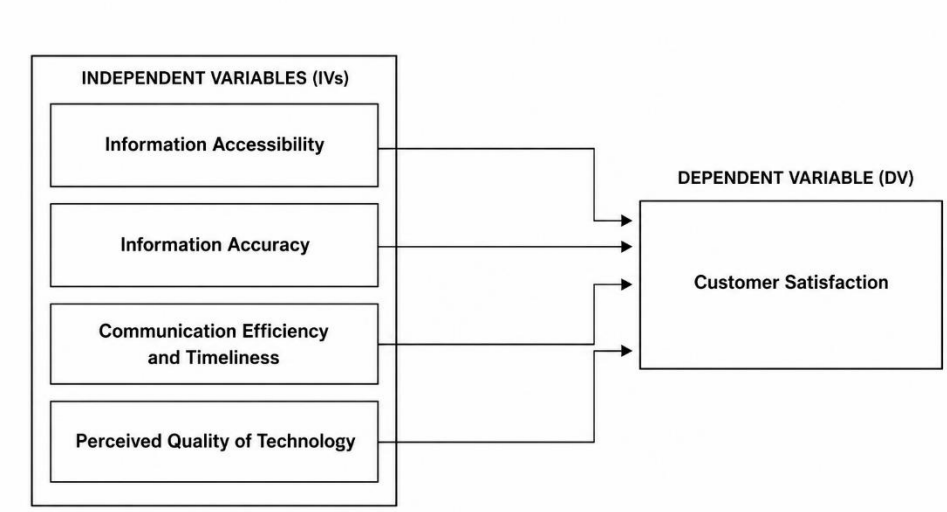
Inventory Turnover (KPI 2): The speed at which stock moves through the distribution center allowing digital systems to alert to products that are not turning over at the best possible rate and optimize tracking of products' shelf life.

Picking and Receiving Error Rate (KPI 3): The number of human processing errors avoided in order fulfillment by picking and receiving with hardware.

Inventory Value and Stock Visibility (KPI 4): clarity of the information generated by the system on the value of the stocks and the actual stocks on hand, to guide institutional planning and purchasing processes.

Reading Productivity and Throughput (KPI 5): The quantitative improvement in the speed of which orders are picked up and the amount of warehouse production that has gone through the automated workflows.

Figure 2.1 Conceptual Framework of the Study



2.8 Operational Hypothesis

The model operationalizes the process through a linear and predictive relationship. In that sense, when the company is able to implement the various independent variables of warehouse digitalization there will be a positive impact on the customer satisfaction.

CHAPTER THREE

3. RESEARCH METHODOLOGY

This study was conducted at Beker Pharmaceutical Company, one of the Ethiopian's leading firms of medicines importing and distributing company. It is noted for being very active in Addis Ababa and has extensive systems to store and transport medical supplies throughout Ethiopia. Its main one is situated in the head office, which is equipped with warehouses as the base-point for storage before delivery of drugs. From the place, items go away to hospitals, drugstores, health centers and bulk purchasers. The work for this project was carried out from February 2026 to June 2026.

3.1 Research Design

A research design can be thought of as the blueprint and selection of the methods for data gathering and its analysis based upon the study objectives. The overall purpose of the design is to minimize bias and increase the reliability of the data gathered and the analysis to be made. (Kothari, 2004) In terms of this study, a descriptive and explanatory research design was used in the conduction of the study. According to Adams, Khan and Raeside (2007) descriptive research studies focus on the analysis of a phenomena as opposed to illumination of its underlying behavior.

Research can be conducted in order to achieve any one of a number of different purposes, these study generally falling into descriptive and explanatory types of research. Based on these two categories this study employed both a descriptive research design in order to describe events that exist at the time they are observed, specifically at the time of the study which concerned current degrees of warehouse digitalization adoption and customer satisfaction levels; along with an explanatory research design in order to describe a correlation between variables, in the form of describing how backend technological automation impacts on the downstream measure of customer satisfaction. Descriptive research attempts to discover the characteristics of a person, an environment or a group of people, by ascertaining whether there is a relationship between a set of variables (Kothari, 2004). As a result the objective of the study sought to determine the relationship, both operational and statistical, between warehouse digitalization, the 4 primary warehouse performance dimensions, and customer satisfaction; the use of a descriptive and explanatory research design is hence highly relevant to the study.

In addition, descriptive design is applicable when collecting the data from respondents at a given point in time (cross sectional study). A survey design is a data collection method in which an investigator asks a number of questions to respondents at one point of time. Using standardized instrument survey research measures variable characteristics in a sample or a population. The type of research design used for this study was descriptive and explanatory. Descriptive design was selected for the current warehouse digitization level and customers' satisfaction at Beker Pharmaceutical Company. Therefore, the explanatory design was used to explain the relationship between warehouse digitalization and customer satisfaction, and to identify the level of impact of warehouse digitalization on customer satisfaction.

3.2 Research Approach

Data for the research has been collected and analyzed with the help of a mixed methods approach (qualitative and quantitative). Hence, the researcher can gather more pertinent evidence and information through using a mixed methods strategy than by using only one method. To gain a better understanding of warehouse internal operations and performance indicators such as internal main operations, its contribution to service performance and the technical boundaries, qualitative approach was adopted. Open-ended customer query section and key informant interview guides to the warehouse and logistics managers have been used to gather the qualitative data. In conjunction with the qualitative approach, a quantitative approach has been used with the application of the structured questionnaires distributed to the downstream commercial customers. Quantitative approaches help the researcher to find, present, and describe relations and trends in the data (Saunders et al., 2009). It has been found necessary to collect quantitative data using structured questionnaire for measuring and visualizing the correlation between dependent and independent variable(s) which illustrate warehouse digital approach effect on customer satisfaction. Data was gathered across the whole spectrum of transactional activities, responses of the respondents on the factors determining customer satisfaction as well as their perceptions about the warehouse operations and digital logistics usage in a cross sectional setting through the survey administered to respondents from downstream customers of the warehouse which targeted opinion gathering and the enhancement of technological awareness to retail pharmacies, wholesalers, hospitals, clinics, and internal management key informants. Questionnaires are effective due to relatively easy collection of standard data required to meet the goals and objectives of the research. The questionnaire was developed based on the previously identified indicators of warehouse

performance i.e. information accessibility, information accuracy, communication efficiency and timeliness, perceived quality of technology and automation.

3.3 Population

3.3.1 Source Population

The source population for this study included active Beker pharmaceutical company clients that worked with the company for a long time and it included wholesales, hospitals, pharmacies and clinics.

3.3.2 Study Population

The study included all the available 252 partners of Beker pharmaceutical company at the time of this study. This participants took part in this study if only they were active at the time of the research and are willing to participate.

3.4 Inclusion and Exclusion Criteria

Several important criteria were set for the selection of participants for the study. First, the selection process takes into account what kind of customers are they, and that they keep themselves in touch with the company. Also, candidates need to be directly involved in the ordering and receiving process. Lastly, the qualified subjects need to be willing to join the study and have a sufficient level of comprehension and a capacity to answer the research questions.

3.4.1 Inclusion Criteria

Several criteria were set to choose participants for this study. First, the selection process takes into account the particular kind of customer, and the guarantee that they will remain engaged with the company. Candidates are also required to have first-hand experience ordering and receiving. Lastly, participants who are eligible for inclusion in the study are required to be willing to be involved in the study, as well as to completely understand and answer the research questions.

3.4.2 Exclusion Criteria

Respondents were eliminated if they did not actively have a business relationship with Beker Pharmaceutical Company at the time of the study, if they were not involved in the ordering or receiving of pharmaceuticals, or if they did not want to participate in the survey. Questionnaires with significant amount of missing information or those incomplete were eliminated to insure the validity and reliability of the study.

3.5 Target population

Since the aim of this research is to look at warehouse digitalization effect on customer satisfaction at Addis Ababa the case of Beker Pharmaceutical Company, the target population included in the research includes the employees, management and downstream partners engaged in the operation and the execution of logistics processes at present.

3.6 Sample size

The sample size for this study was calculated by following the procedures systematically to determine the best sample that reflects the larger population of stakeholders, down-streams commercial users in the distribution of Beker Pharmaceutical Company's network. The size of the sample to be taken involves trade-offs between accuracy required for the data, the data availability and the dispersion of the sample population in Addis Ababa. The study's target population included 252 downstream commercial users of the distribution chain for Beker Pharmaceutical Company, in Addis Ababa.The number comes from the company's official customer database, comprising registered wholesalers, retailers, health establishments and clinics that actively participate in the company's digitized logistics system. In order to maintain statistical integrity to conduct the quantitative analysis in a way similar to normal empirical study practice, the sample size was calculated by applying the formula for finite population, by Yamane (1967);

$$\mathbf{n = N / [1 + N (e)^2]}$$

Where:

n = the baseline calculated sample size

N = the total finite target population size (252)

e = the acceptable margin of error (assumed to be 5% or 0.05)

By applying the specific population parameters of this study into the mathematical formula, the step-by-step derivation is as follows:

$$n = 252 / [1 + 252(0.05)^2]$$

$$n = 252 / [1 + 252(0.0025)]$$

$$n = 252 / [1 + 0.63]$$

$$n = 252 / 1.63$$

$$n \approx 154.6$$

Based on this statistical determination, a minimum sample size of **155 respondents** was initially targeted for the quantitative survey questionnaire.

However, to maximize statistical power, minimize potential non-response bias, and ensure a more robust representation of the commercial client segments across Ethiopia, a larger sample size of **168 samples** was ultimately utilized for the final data collection and analysis phase.

This final sample size of 168 provides an exceptional level of precision and logistical validity for a single-case investigation within a private logistics and distribution framework in Ethiopia. To supplement this quantitative sample and ensure thorough qualitative coverage, purposeful availability sampling was used to select 5 key management informants—including the Warehouse Managers, Warehouse officers, IT Officer, sales and medical representatives thereby securing complete data representation across all operational performance indicators

3.7 Variables

3.7.1 Dependent Variable

This study assigns the satisfaction of customers as dependent variable which will be tested based on the questionnaires.

3.7.2 Independent Variable

The independent variable for this study is the digitalization of the warehouse which was be tested using the questionnaires.

3.8 Sampling technique

The study used a combination of probability and non-probability sampling methods to complement the mixed methods (qualitative and quantitative) approach and to ensure that the necessary information was obtained from the proper sources. The blended methods allowed for the researcher to achieve the two objectives: obtaining statistically representative responses from commercial end-clients and obtaining detailed and operational information from internal managers.

3.8.1. Sampling methodology of quantitative strand (Downstream Clients)

To conduct quantitative survey targeting company's active network of B2B commercial clients (retail pharmacy, wholesaler, hospitals, and clinics), both stratified random sampling and availability (convenience) sampling methods are adopted.

3.8.2 Stratified Random Sampling: The population, which comprised 252 commercial clients, was firstly categorized into mutually exclusive strata in accordance with their "Type of Customer": Retail Pharmacy, Hospital, Clinic and Wholesaler. The reason for this stratifying method was to assure equal representation of each separate business sector within the population in the sample, thus ensuring that large segments did not overshadow small yet important institutional buyers.

Availability Sampling: Within the created strata, probability-based availability sampling proved practical for the researcher, both in geographical terms in relation to their location in Addis Ababa, and in immediate availability for data collection. Questionnaires were administered by use of an identical research instrument to reachable representatives of each stratum until 168 questionnaires were finally collected and completed.

3.8.3 Sampling Method for Qualitative Strand (Internal Management)

For the qualitative strand of the study, where in-depth analysis on the internal logistics framework complexities and the 5 key warehouse performance KPIs were researched, a non-probability purposive (judgmental) sampling method was employed.

Saunders et al (2009) argues that purposive or judgmental sampling is a type of non-probability sampling, in which, 'cases that will best answer the research questions are chosen using the researcher's judgement.

The judgmental technique was imperative because the general operation of warehouses, technological shortcomings, and systemic metrics cannot be assessed by untrained/non-technical staff through random sample selection. As such 5 central management employees, directly involved in, controlling, and operating the logistics process, namely the Warehouse Manager, the Logistics Manager, the Inventory Controller, the IT Officer, and the Operations Manager, were selected to give the qualitative depth and specialized operational awareness that is needed to justify how the internal application of back-end technology would bridge the operational to the customer front-end service gap.

3.9 Data source

Data were collected and analyzed with the utilization of both primary and secondary data. A combination of these sources enables the researcher to extract on-field real time performance response while supported with existing institutional and academic materials.

3.9.1 Primary Data sources

Primary data can be regarded as data originally gathered by the researcher at first-hand in the field of study, in order to meet directly with the specified research question and objective. The data are collected by researcher or research assistant as an evidence-based resource, in order to solve main research question(s) (Adam and Kamuzora, 2008). In this study, the source of evidence that provided the basis of the data were primarily from field and was acquired through well-designed quantitative questionnaires administered to 168 end-consumer business-to-business commercial customers (retail pharmacies, wholesalers, hospital and clinics) and key informants interviews guides given to 5 internal participants from the company.

3.9.2 Secondary data sources

Secondary data are defined as data already gathered, processed, analyzed, and published by another researcher or organization for different purpose (Zikmund, 2009). In this study, secondary data were employed to complement the filed based empirical data and to build a structure to the overall analytical framework. The sources of secondary data applied were the academic text books, journal articles, internal documents and reports of Beker Pharmaceutical Company, information on relevant magazines and publications released by the logistics association, and documents retrieved through researches conducted from well-recognized web sources. They provide the conceptual framework of the 5 key warehouse performance indicators and the framework connecting the logical digital warehouse performance measurement with customer satisfaction.

3.9.3 Data Collection Tools

The primary data was derived from the distribution of a self-administered structured questionnaire and a qualitative interview guide among the respondents of the Beker Pharmaceutical Company. The questionnaires, along with the interviews, were structured so as to allow for assessment of warehouse digitalization and its subsequent impact on service efficiency and customer satisfaction measurements. The data collection instruments were broken down into two forms to better meet the study's mixed methods research design:

Structured Questionnaire (Quantitative): This instrument took the form of an open-ended questionnaire utilizing a 5-point Likert scale that was distributed to the 168 external commercial B2B customers of Beker. This instrument, utilizing performance measures, such as error rates for picking and receiving, accuracy of inventory levels, and stock transparency was completed efficiently by respondents, thereby increasing efficiency and allowing for statistical data input directly into IBM SPSS Statistics.

Key Informant Interview Guide (Qualitative): This tool consisted of semi-structured questions designed to collect qualitative data from 5 key individuals involved in warehouse and logistics operations within Beker Pharmaceutical Company. This was intended to allow for discussion on points such as issues within the warehouse, obstacles created by current digitalization, and what long-term strategy aims to achieve in the warehouse.

3.10 Data Processing

In this stage, the raw field data was edited, encoded, classified, and tabulated to analyze the responses using a detailed and systematic statistical study. The data was cleaned to identify and rectify any errors in clerical aspect and omission of any answers by all respondents such that each response would be properly, accurately, completely and identically done.

Each response from the categorical and scale question was assigned with a distinct code value in order to analyze using a computer analysis tool. Any data that shows similar nature was sorted into groups. The data obtained was grouped into relevant clusters, and thereafter the data could be orderly classified. Lastly the information in the raw data was compiled and visualized with thorough tabulated figures, frequency charts, and description on each aspect. A statistic program called IBM SPSS Statistics was used to interpret the information to a relationship between and within the groups of data.

3.11 Data Analysis

The empirical data obtained from the field instrument were analyzed through descriptive and inferential statistics for quantitative data and thematic analysis for qualitative management interviews. The process for quantitative analysis began after the data from both the primary and secondary sources have been collected.

In order to clearly demonstrate individual variables, descriptive statistics techniques were employed which included calculating the frequency table, percentage, mean and standard deviation. Descriptive statistics were also calculated for service efficiency and customer satisfaction levels. The fundamental purpose of using descriptive tables and figures in this study is that a neatly summarized numerical data will make clear the interpretation at a quick look.

Inferential statistics was used to estimate the strength, direction and the predictive significance between independent and dependent variables in terms of warehouse digitalization components and customer satisfaction. A Pearson correlation analysis was performed to show the correlations between variables, and the multiple linear regression was conducted to test the major research hypotheses and to build a model on the operational implications of the technology framework.

All the questions on attitude and performance in the questionnaire were graded using a 5 point Likert scale type of measurement. Academic research has confirmed that a Likert scale comprises two parts: an item part which addresses the topic of a product, an event or an attitude, and the evaluative part which contains the categorical response values. Therefore, the scale used for variables was as followed:

The qualitative data derived from the semi-structured management interview were analyzed with thematic narrative analysis approach which comprises the transcription, coding of recurring operational themes, and categorizing of themes. This helps to validate statistical data found from quantitative survey by cross-referring with management perspectives.

3.12 Data Presentation

To enable easy identification and quick review of research findings, the data obtained from the analyzed data are presented through an integrated descriptive and narrative structure. The data collected will be systematically represented through statistical tables, frequency distributions, percentage, mean score, standard deviation together with the textual explanations to identify clear conclusions that are made on the digital logistics framework.

3.13 Validity of the Study

The term "validity" plays a key role in establishing the integrity and credibility of the empirical findings, as it is in both the qualitative and quantitative research approaches. The word is derived From the Latin term validates meaning "strength", validity holds that the validity of an empirical conclusion can never be absolutely established; it can, however, be successfully argued and supported by valid methodological evidence (Trochim, 1999).

Content and Face Validity: The first version of the survey instrument was thoroughly piloted with peers and academics. It was assessed by research advisors and statistical experts who were knowledgeable about the IBM SPSS Statistics application to make sure that the scale items sufficiently reflected the operational performance indicators intended.

Feedback obtained during this phase was used to reword ambiguous questions, eliminate redundant terms, and ensure that the final questionnaire was perfectly tailored to capture true operational realities before full-scale field distribution.

3.14 Ethics Consideration

The responder was first told the aim and purpose of the study, then there was a discussion between the researcher and responder to check they understand the research and agree to participate in the study. The participant was told that they have the option to withdraw from the study at any point, in addition, the study carried no risk as participants were made aware of the benefit it held. Furthermore, participants have the right to be given an explanation for any questions and are able to refuse any answers given.

3.15 Data Quality Control

The questionnaire was pre-tested by 5 employees and 5 customers who were not part of the sample in order to check the quality of the data. Questions that were ambiguous or unclear were amended. Enumerators were trained in conducting the interviews, in the obtaining the consent, and in how to fill out the questionnaire. Fully completed questionnaires were double checked for missing fields before data entry, and questionnaires missing >10% data were not used.

CHAPTER FOUR

DATA ANALYSIS AND INTERPRETATION

4.1 Introduction

This chapter summarizes the results of the study which investigated the impact of warehouse Digitalization on customer's satisfaction the case of Beker pharmaceutical company. The chapter is organized in a logical analytical manner: first the reliability of the measurement instruments was assessed with Cronbach's alpha coefficient, then a description statistical analysis was carried out for each construct of the independent variables, and finally, multiple linear regression analysis was conducted to find out the magnitude of the contribution of each independent variable in predicting customer satisfaction and the overall contribution of the independent variables.

4.1.1 Demographic Profile of Respondents

Before discussing the main analytical results, this section presents a descriptive overview of the demographic and background characteristics of the 168 respondents who participated in the study. The demographic variables considered are gender, age group, customer type, duration of relationship with the distributor and order frequency. It is important to understand the composition of the sample in order to contextualize the findings of the study and assess the representativeness of the data.

Table 4.0: Demographic Profile of Respondents (N = 168)

Characteristic / Category	Frequency	Percentage (%)
Gender		
Male	90	53.6
Female	78	46.4
Total	**168**	**100.0**
Age Group		
18–25 years	25	14.9
26–35 years	75	44.6

Characteristic / Category	Frequency	Percentage (%)
36–45 years	42	25.0
Above 45 years	26	15.5
Total	**168**	**100.0**
Customer Type		
Retail Pharmacy	69	41.1
Clinic	35	20.8
Hospital	31	18.5
Wholesaler	24	14.3
Other	9	5.4
Total	**168**	**100.0**
Duration of Relationship with Distributor		
Less than 1 year	27	16.1
1–3 years	56	33.3
4–6 years	53	31.5
More than 6 years	32	19.0
Total	**168**	**100.0**
Order Frequency		
Weekly	40	23.8
Monthly	74	44.0
Quarterly	30	17.9
Occasionally	24	14.3
Total	**168**	**100.0**

4.2 Reliability Analysis

It is necessary to determine the internal consistency of the measurement scales used in this study before performing inferential analysis. The most commonly used scale reliability measurement in social science research is Cronbach's α coefficient, which was used in the reliability analysis. Cronbach's alpha values vary from 0 to 1, with a higher alpha value representing higher internal consistency among the scale items. Nunnally (1978) and other researchers, such as Hair et al. (2019), determined that acceptable reliability is at the level of $\alpha \geqslant 0.70$.

Table 4.1: Cronbach's Alpha Reliability Coefficients for All Constructs

Construct	Items	N	Mean	Std Dev	α	Interpretation
Information Accessibility	Q1–Q4	168	3.836	0.673	0.832	Good
Information Accuracy	Q5–Q8	168	3.815	0.708	0.867	Good
Communication Efficiency & Timeliness	Q9–Q12	168	3.747	0.694	0.860	Good
Perceived Quality of Technology	Q13–Q16	168	3.821	0.751	0.899	Good

The results in Table 4.1 showed that all four constructs had the satisfactory internal consistency reliability. The Internal Consistency values of Information Accessibility (α = 0.832) and Information Accuracy (α = 0.867) are in the good-to-very-good range, indicating high internal coherence for each of the four items for the two scales. Communication Efficiency and Timeliness (α = 0.860) also showed very good reliability, with high coherence among four items of this dimension. Perceived Quality of Technology had the highest alpha out of all the independent variables (α = 0.899) and was close to the excellent cut-off. The internal consistency of the dependent variable, the reliability estimates substantiate that all the scales used in this study are internally consistent and appropriate for further analysis. The reliability of the scales rules out any argument of weak findings because of measurement error, and gives confidence in the results of statistical inferences in the subsequent sections.

4.3 Descriptive Statistics of Independent Variable Constructs

Descriptive statistics for each of the four independent variable constructs studied are presented in Scale item and construct means and standard deviations are provided. The mean values are interpreted using the following scale: 1.00–1.79 = Very Poor; 1.80–2.59 = Poor; 2.60–3.39 = Moderate/Neutral; 3.40–4.19 = Good; 4.20–5.00 = Excellent.

4.3.0 Methodological Derivation and Justification of the Scale Decision Rule

A class interval based objective scale decision rule was mathematically derived, in this case using the classic range-based class interval formula introduced by Best and Kahn (2006), The total scale range (the highest score minus the lowest score) was divided by 5 desired descriptive scores to create an interval width of 0.80. This uniform increment creates a perfectly symmetrical and mutually exclusive framework with no statistical gaps between the "Very Poor" and "Poor" (unsatisfactory zones) and the "Moderate/Neutral" and the "Good" and "Excellent" (targeted "good" zones) performance scores and zones, dividing the mean scores into 5 distinct performance zones: 1.00–1.79 for "Very Poor" and 1.80–2.59 for "Poor" (unsatisfactory "Bad" zones); 2.60–3.39 for "Moderate/Neutral" (inconsistent baseline performance); and 3.40–4.19 for "Good" and 4.20–5.00 for "Excellent" (the targeted "good" zones where warehouse digitalization successfully drives customer satisfaction). All qualitative assessments of warehouse performance measures are mathematically justified, and methodologically rigorous, because of the grounding of this interpretation in Likert's (1932) foundational scale construction theory.

4.3.1 Information Accessibility

Information Accessibility: How easy it is for customers to access the digital warehouse system of the pharmaceutical distributor to get information that is relevant to them. This construct was operationalized on the basis of four items (Q1–Q4) to determine real-time product availability, order tracking, product reachability and physical order location. The item level and composite descriptive statistics for this construct are provided in table 4.2.

Table 4.2: Descriptive Statistics for Information Accessibility (Items Q1–Q4)

Item	N	Mean	Std. Dev.	Interpretation
Q1: It is easily accessible for me to know the current product availability of medicines in real-time.	168	3.863	0.826	Good
Q2: The digital system allows us to check order status and tracking information effortlessly.	168	3.833	0.873	Good
Q3: Warehouse inventory data is easily reachable whenever our organization needs it.	168	3.827	0.789	Good
Q4: We can easily track where our orders are located physically and where they are at the present time.	168	3.821	0.814	Good
Composite Score (Information Accessibility)	**168**	**3.836**	**0.673**	**Good**

The composite mean for Information Accessibility was 3.836 (SD = 0.673) which is within the Good range. Customers highly appreciate real-time knowledge about the availability of medicine, as this was the highest rated feature with a mean (M = 3.863) in Q1.The mean of all four items is close together and the composite standard deviation (0.673) indicates that the perceptions are consistent throughout the sample. The moderate item-level standard deviations indicate that although most respondents are satisfied with accessibility of information, some still have some difficulty at times accessing digital information in a timely manner.

4.3.2 Information Accuracy

Information Accuracy is the extent to which the information conveyed by the digital system is accurate, reliable and error-free. Four items (Q5–Q8) assessed stock precision, the level of agreement between dispatch notes and actual deliveries, the accuracy of the batch and expiry notifications and the frequency of discrepancies were used to measure this construct. Descriptive statistics are given in Table 4.3.

Table 4.3: Descriptive Statistics for Information Accuracy (Items Q5–Q8)

Item	N	Mean	Std. Dev.	Interpretation
Q5: The company has very precise stock and stock numbers.	168	3.744	0.848	Good
Q6: The online dispatch notes and invoicing detail exactly correspond with the physical goods received.	168	3.833	0.852	Good
Q7: The system notifications for the batch number and expiry date are accurate all the time.	168	3.821	0.821	Good
Q8: Significant variations between system records and physical deliveries are very infrequent.	168	3.863	0.826	Good
Composite Score (Information Accuracy)	**168**	**3.815**	**0.708**	**Good**

The Information Accuracy composite mean was 3.815 (SD = 0.708) which falls in the "Good" range. The low occurrence of discrepancies between digital records and physical deliveries is the characteristic that has the highest mean value (M = 3.863) and is noted positively by the customers of Q8.Q5 showed the lowest mean (M = 3.744) indicating that stock precision is slightly less well perceived. There was slightly more variation in the standard deviation for Q6 (0.852), indicating that there is likely some variability in the match between the dispatch note and the physical shipment across the different points of contact in the distribution process.

4.3.3 Communication Efficiency and Timeliness

Communication Efficiency and Timeliness captures the ability of the digital system to facilitate timely, clear, and efficient communication between the distributor and its customers. This construct was measured using four items (Q9–Q12) addressing e-update speed, comprehensibility of automated communications, response rapidity to inquiries, and advance notice of delays. Table 4.4 presents the item-level and composite descriptive statistics.

Table 4.4: Descriptive Statistics for Communication Efficiency and Timeliness (Items Q9–Q12)

Item	N	Mean	Std. Dev.	Interpretation
Q9: I get immediate and quick e-updates on all my orders and shipments.	168	3.702	0.823	Good
Q10: The data obtained by means of the automatic communications devices used by the company are understandable.	168	3.744	0.855	Good
Q11: The company's digital channels respond rapidly to our inquiries and logistics complaints.	168	3.768	0.833	Good
Q12: All digital notification alerts for delay notices or delivery change notifications are received long in advance.	168	3.774	0.794	Good
Composite Score (Comm. Efficiency & Timeliness)	**168**	**3.747**	**0.694**	**Good**

Communication Efficiency and Timeliness obtained a composite mean of 3.747 (SD = 0.694) which was in the "Good" range. The immediacy of e-updates, although mostly satisfactory, was the lowest among the items in the construct, with a mean of 3.702 in the Q9 group. The highest mean (3.774) was observed for Q12, suggesting a moderate level of management in the provision of advance notice of delivery changes/delays. The composite standard deviation is consistently low (0.694), and is indicative of uniform perceptions across the respondent sample.

4.3.4 Perceived Quality of Technology

Perceived Quality of Technology is the customer's evaluation of the reliability, performance and usability of the digital platform of the Warehouse. This construct was assessed through four items (Q13–Q16) that addressed ease of navigation, system stability, security measures and currency of the technology infrastructure. The descriptive statistics are given in Table 4.5.Table 4.5 shows descriptive statistics for the items related to perceived quality of technology (Q13–Q16).

Table 4.5:Perceived Quality of Technology

Item	N	Mean	Std. Dev.	Interpretation
Q13: The channels through which the company operates (portals, apps, or systems) are easy to use and navigate.	168	3.780	0.844	Good
Q14: The warehouse digital system is working quite well with not much crash or problem in its operation.	168	3.774	0.860	Good
Q15: The security mechanisms of the digital transaction systems of the company are reliable and strong.	168	3.815	0.866	Good
Q16: The current technology infrastructure in the company uses a relatively up-to-date environment and efficiently manages our business.	168	3.917	0.858	Good
Composite Score (Perceived Quality of Technology)	**168**	**3.821**	**0.751**	**Good**

Perceived Quality of Technology recorded a composite mean of 3.821 (SD = 0.751), within the "Good" range. Notably, Q16 achieved the highest item mean (M = 3.917) across all 16 questionnaire items, suggesting that customers particularly appreciate the up-to-date nature of the company's technology infrastructure. Q14 recorded the lowest mean within this construct (3.774), indicating that system stability, while adequate, is an area for continued vigilance. The relatively higher standard deviation for this construct (0.751) compared to CET (0.694) suggests somewhat greater variability in technology quality perceptions across the customer base.

4.4 Multiple Linear Regression Analysis

For verifying the research hypotheses and knowing the predictive ability of independent variables on customer satisfaction, multiple linear regression analysis was carried out. Perceived Quality of Technology (PQT) and Information Accessibility (IA) and Information Accuracy (IAcc) and Communication Efficiency and Timeliness (CET), served as predictors, with the Customer Satisfaction composite score as the dependent variable. The Enter method was used to simultaneously enter all four predictors. All the assumptions such as linearity,

normality of the residuals, homoscedasticity and absence of multicollinearity were established beforehand before the analysis.

4.4.1 Regression Assumption Testing

The data was checked for the following assumptions of multiple linear regression before interpreting the regression results: The model used in the study investigated the impact of Information Accessibility, Information Accuracy and Communication Efficiency and Timeliness on the proxy measure of customer satisfaction (Perceived Quality of Technology).The results of each diagnostic test are presented below.

4.4.1.1 Multicollinearity

The Variance Inflation Factor (VIF) was used to check for multicollinearity. The VIFs values of all three predictors were between 1.004 and 1.014 which is far less than the usually accepted threshold of 5.This means that each independent variable adds a different piece of information to the model and they aren't strongly correlated.

4.4.1.2 Independence of Errors

The Durbin-Watson statistic was used to test independence of errors, and gave value of 2.168. This is within the limits recommended by the National Institute of Standards and Technology (NIST) (1.5-2.5) and near the optimum value of 2—suggesting that the residuals are not highly correlated.

4.4.1.3 Homoscedasticity

The Breusch-Pagan test was used to test for homoscedasticity with a p-value of 0.230. This value is higher than 0.05, which means that there is no statistical evidence of heteroscedasticity, meaning that the variance of the residuals are equal at all levels of the predicted values.

4.4.1.4 Outliers and Influential Cases

Cook's Distance was used to check for influential outliers.The highest value observed was 0.079, still much lower than the critical value 1.0, meaning that none of the observations had an undue influence on the regression results.

Table 4.6: Summary of Assumption Tests

Assumption	Test Used	Result	Conclusion
No Multicollinearity	Variance Inflation Factor (VIF)	VIF = 1.004 - 1.014	**Satisfied**
Independence of Errors	Durbin-Watson Statistic	DW = 2.168	**Satisfied**
Homoscedasticity	Breusch-Pagan Test	p = 0.230	**Satisfied**
No Influential Outliers	Cook's Distance	Max = 0.079	**Satisfied**

In general, the regression model met the important assumptions of multiple linear regression. The results for four the assumptions that were tested, multicollinearity, independence of errors, homoscedasticity and absence of influential outliers, were well within their thresholds and met the assumption fully. The results indicate that the regression model is reliable and that the coefficient estimates presented in the next section are valid.

4.4.1 Pearson Correlation Matrix

Pearson correlation matrix was calculated for all four constructs (the four independent variables,).As well as inter-correlations amongst the independent variables, can then be examined, providing information for the assessment of the multicollinearity. The complete correlation matrix is given in Table 4.6.

Table 4.7: Pearson Correlation Matrix

Construct	1. IA	2. IAcc	3. CET	4. PQT
1. Information Accessibility (IA)	1.000	0.099	0.028	-0.080
2. Information Accuracy (IAcc)	0.099	1.000	-0.058	0.064
3. Comm. Efficiency & Timeliness (CET)	0.028	-0.058	1.000	-0.021
4. Perceived Quality of Technology (PQT)	-0.080	0.064	-0.021	1.000

The correlation matrix among the four independent variable constructs is shown in Table 4.6. All inter-construct correlations were minimal (ranging from r = 0.080 from Information Accessibility and Perceived Quality of Technology, to r = 0.099 from Information Accessibility and Information Accuracy), well below the suggested threshold of multicollinearity at r=0.70 by Hair et al. (2019). The extremely low correlations indicate that the four independent constructs, Information Accessibility, Information Accuracy, Communication Efficiency and Timeliness, and Perceived Quality of Technology, were effectively measuring four truly distinct and separate components of warehouse digitalization with essentially zero correlation. An orthogonal set of predictor variables is preferable when conducting multiple regression; a near zero correlation between independent variables indicates that each of the beta coefficients displayed in Table 4.8 will be based on an untainted unique prediction from its associated predictor variable.

4.4.2 Model Summary

Table 4.7 displays the multiple linear regression model summary: the R and adjusted R show the extent to which customer satisfaction is explained by the four independent variables.

Table 4.8: Regression Model Summary

R	R^2	Adjusted R^2	Std. Error	F
0.792	0.627	0.618	0.2748	68.56***

Multiple correlation coefficient R was 0.792 which shows a good linear relationship among the prediction set and Customer Satisfaction. The R value of 0.627 demonstrates that the four warehouse digitalization dimensions have a collective influence of 62.7% on customer satisfaction and adjusted R of 0.618 represents a reliable prediction power when adjusted for the number of predictors and complexity of the model. F was significant and highly reliable ($F = 68.56$, $p < 0.001$) showing that the regression model better fits the data than the null model.

4.4.3 Regression coefficients

Table 4.8 outlines the unstandardized regression coefficients, standard errors, t-values and significance levels for the constant and each independent variable. The regression coefficients show the amount that customer satisfaction is expected to change when each of the predictor variables is incremented by 1 unit, holding other predictor variables constant. Reminted by 1 unit, holding other predictor variables constant.

Table 4.9: Multiple Regression Coefficients — Dependent Variable: Customer Satisfaction

Variable	B (β)	Std. Error	t-value	p-value	Sig.
(Constant)	0.2602	0.2290	1.136	0.257	ns
Information Accessibility — IA (Q1–Q4)	0.2244	0.0319	7.042	< 0.001	***
Information Accuracy — IAcc (Q5–Q8)	0.3556	0.0303	11.727	< 0.001	***
Comm. Efficiency & Timeliness — CET (Q9–Q12)	0.2149	0.0307	6.994	< 0.001	***
Perceived Quality of Technology — PQT (Q13–Q16)	0.1394	0.0285	4.892	< 0.001	***
Dependent Variable: Customer Satisfaction (CS) | $R^2 = 0.627$ | Adjusted $R^2 = 0.618$ | F = 68.56* | N = 168**					

Note: *** p < 0.001; ns = not significant; Dependent Variable: Customer Satisfaction; N = 168

The regression equation derived from these coefficients is expressed as:

$$CS = 0.2602 + 0.2244(IA) + 0.3556(IAcc) + 0.2149(CET) + 0.1394(PQT)$$

Where: CS = Customer Satisfaction; IA = Information Accessibility; IAcc = Information Accuracy; CET = Communication Efficiency and Timeliness; PQT = Perceived Quality of Technology

H1: Information Accessibility (β = 0.2244, t = 7.042, p < 0.001)

Information Accessibility was a strong positive predictor of customer satisfaction (= 0.2244, t = 7.042, p < 0.001). This variable confirmed the hypothesis H1. In other words, an increase of 1 unit in the perception of Information Accessibility leads to an increase of 0.224 unit of the customer satisfaction if other variables are kept constant. Customers, who can quickly and easily find information about inventory level, pricing and status of the orders via digital channel, will be more satisfied. The satisfaction of the customer is highly depended on the smooth digital access in distribution.

H2: Information Accuracy (β = 0.3556, t = 11.727, p < 0.001)

Information Accuracy proved to be the best single predictor of customer satisfaction (= 0.3556, t = 11.727, p < 0.001), which supported H2, yielding the largest coefficient value and t-value in the regression analysis. An increase in perceived accuracy by one unit results in a 0.356 unit increase in customer satisfaction. While this is statistically and practically relevant in a general context, it is highly relevant given the nature of pharmaceutical information. Errors in pharmaceutical data have a direct impact on operations, as well as patient care.

H3: Communication Efficiency and Timeliness (β = 0.2149, t = 6.994, p < 0.001)

Communication Efficiency and Timeliness has been a meaningful predictor of customer satisfaction positively (= 0.2149, t=6.994, p<0.001), which supported H3. A unit change in communication efficiency leads to a 0.215-unit increase in the customer satisfaction. Thus, this finding shows customers care about both the correctness and timeliness of information received digitally which facilitate the procurement process.

H4: Perceived Quality of Technology (β = 0.1394, t = 4.892, p < 0.001)

The highest statistical insignificant value in terms of the smallest coefficient was the Perceived Quality of Technology, however this had a significant positive influence on the customer satisfaction (= 0.1394, t=4.892, p<0.001) providing the needed evidence for H4. So a 0.139 unit increase in customer satisfaction is the consequence of an increase of 1 unit in customer's perception of the quality of technology. The quality of the digital platform, and thus the

reliability and user-friendliness in warehouse digitalization context still hold significance in customer experience based on the technology acceptance model.

4.5 Discussion of Findings

The findings of this study establish thorough empirically based evidence on the links between the dimensions of warehouse digitalization and customer satisfaction in pharmaceutical distribution industry. The subsequent analysis integrates findings from empirical results and the theory and existing literature in order to establish meaningful significance to these statistically driven results. The regression model that explains 62.7% of variance in customer satisfaction ($R=0.627$, $F=68.56$, $p<0.001$) presents to be a powerful result. 37.3% of variance remain unexplained and that is due to the inclusion in the model other variable like, interpersonal service quality, price of service, diversity of product and relationship marketing. However, the strong explanatory power supports the argument that digital system quality has the most important role on the customer satisfaction of distribution of pharmaceutical product. The very small correlations between predictors (ranging from $r = 0.080$ to $r = 0.099$) indicate that all predictor variables tap on different, almost orthogonal dimensions of the digitalization construct, and all four factors contribute uniquely and almost independently to the prediction of customer satisfaction. This is desirable with respect to accuracy and the clarity of regression coefficients.

4.5.1 Information Accuracy as the Dominant Driver

It is clear that Information Accuracy was the strongest single predictor of customer satisfaction (= 0.356, $t = 11.727$). The coefficient was notably higher than that for the three other variables included in the study. This also corresponds well with DeLone& McLean's Information Systems Success Model (2003) which includes information quality as a central antecedent to user satisfaction. The context of pharmaceutical distribution means that accuracy in relation to information pertaining to stock, pricing, and deliveries would have immediate effects on the provision of health care and the precedence of accuracy for the purposes of satisfaction makes sense. Mistakes concerning pharmaceutical stock could lead to patient safety issues, non-compliance with legislation and stock outs.

4.5.2 Information Accessibility and Communication

The next two tiers, Information Accessibility (= 0.224) and Communication Efficiency and Timeliness (= 0.215) have a very important impact on customer satisfaction. Information Accessibility emphasizes the need not only for accurate information generated by the digitalization process but also customers' ability to obtain it with relative ease and without barriers. The similarly high significance of Communication Efficiency and Timeliness suggests that the immediacy and clearness of communications via digital channels are valued by customers almost as much as access to the actual information.

4.5.3 Perceived Quality of Technology

Perceived quality of technology (=0.139), although it was the least influential predictor, was nevertheless statistically significant atp< 0.001 and explained unique variance that was significantly in the model. As per tenets of the TAM theory (Davis, 1989), reliability, security, and ease of navigation of the digital platform determine B2B customers' experience of using that technology. In an era of expanding B2B interaction with distributors via digital media, the quality of such technologically-driven interfaces will only be increasingly important. The smaller coefficient may be because quality of technology was considered a hygiene factor (something that customers expect) rather than a distinguishing quality factor like other measures of quality of information.

4.5.4 Implications for Practice

The results show that distributors who want to increase customer satisfaction need to invest across all four dimensions of digitalization with an increased priority on data accuracy systems. Automated, real-time checking of physical inventory against digital records, verification of cross-checked figures using algorithms (comparing digital receipts and physical receipts), automated notifications, a user interface which is accessible through mobile devices, and the maintenance and security auditing of existing technology would appear to be the most effective methods of positively affecting customer satisfaction. The analysis indicating that Information Accuracy has more than 2.5 times the predictive power as Perceived Quality of Technology

indicates that greater benefits will be seen for a dollar invested in data quality governance than for a dollar invested in the upgrading of user interfaces.

4.6 Qualitative Key Informant and Open-ended feedback analysis

Five key informant interview with internal logistics managers, and open-ended portion of customer questionnaire survey data were collected for a thematic coding of qualitative data. Through this qualitative observation, there are three identified themes which match the quantitative results.

4.6.1. Theme 1: Digital Capabilities and Operation visibility

All of the interviewed personnel, as well as customers noted the operational improvements brought by bar-coding, digital pick lists, and automated delivery notifications. Responses were provided that they noticed reduced order fulfillment errors, as well as an easier process for invoice, when a warehouse associate scans the bar-code. One logistics supervisor noted: "By moving to digital tracking, it allows employees to make less picking errors, and ensure the commercial customers get precisely what they requested configuration, on time." This provides strong support for the quantitative finding of information clarity

4.6.2 Theme 2: Bottlenecks in Infrastructure & Network Disconnections.

Qualitative data also emphasized the obvious operational concerns of instability & network disconnection at the time of high volume order days. Users mentioned losing internet & sync delays between warehouse stock levels and front end billing, pushing the use of manual overrides. Slowing up order processing is clearly a factor as it can be a cause of slow down. This can help explain the low rankings in both delivery time (Item C3) and the physical delivery of hardware.

4.6.3 Theme 3: Improve Accessibility & Integration Upgrades.

Respondents called for extending current functionality, such as self-service options, real time links for tracking, & personal applications for the sales representatives. Managers, in particular, called for extending the current Warehouse Management system to incorporate automatic returns & expirations. These suggestions have clear areas to explore when evaluating the infrastructural issues presented by the quantitative data.

4.7Thematic Analysis of Warehouse Performance Indicators (KPIs)

A qualitative analysis was carried out using a thematic analysis technique to explore the practical challenges of warehouse digitalization, based on the qualitative data collected from the document. The results are presented through five main areas of performance.

Theme 1: The Paradox of Digital Inventory Accuracy vs. Operational Inconsistency

This logical expectation for perfect data integrity within the warehouse architecture posed in the theory has been contradicted by the empirical results, which show that there is still an inexplicable gap between the data within systems and the actual status on the shelves. Long-term customers recognize that although digital systems have lowered the number of basic human counting mistakes when compared to a traditional system, everyday accuracy is quite variable. Newly on boarded customers are especially aware of this disparity which they report as a major issue with stock discrepancies in approximately 25% of orders. Institutional-wise, this residual variance is considered as intolerable for medical operation, especially in hospital setting where zero error tolerance is essential for life-saving medicines.

An in-depth follow-up of the causes of these discrepancies shows that data integrity challenges are not only technical but also behavioral. A root cause problem is that, when implementing the first time, corrupt data was imported and never systematically compared with other systems, resulting in a proliferation of duplicate Stock Keeping Units and poor quality master data. This system-wide problem is exacerbated by the persistence of manual practices like “dual-recording,” in which warehouse workers record transactions on paper and then key them into the system later. This leads to real-time tracking not being valid, to transcription errors in the data, and to the loss of the purpose of a real-time system. In the end, these errors are compounded by relying too much on the automation, inadequate exception processing by employees when the software malfunctions and frequent system crashes that disrupt the digital workflow.

Theme 2: Rigid Turnover Analytics and Proactive Management Gaps

The qualitative data reveals that the use of digital tools is effective in automating the monitoring of stock movement rates, but the warehouse is still not using these data to implement agile and proactive stock management. One of the most important restrictions is the fact that the reporting mechanisms in the Warehouse Management System (WMS) are rigid. The outputs from the software generate aging stock and inventory velocity reports, but these are dense and complex documents which require staff to take time to read and understand; they therefore have a clear need for simpler and more intuitive dashboards. Additionally, these analytics are usually produced on a scheduled monthly basis and not real-time, which means that logistics staff always have a lag time to respond and adjust, allowing stock management problems to grow out of hand until remedial measures are implemented.

This analysis lag directly affects the effectiveness of inventory turnover, especially in specialized categories of pharmaceutical products. Respondents highlighted that some products, for example antifungals, some antibiotics, pediatric syrups and specialty injectable, traditionally have slow or atypical product movement. Slow moving items keep stacking on warehouse shelves without being noticed because the system has no automated and proactive alerts to highlight these anomalies, and does not identify items based on medical urgency. One of the most concerning issues of this digital divide is the failure to implement First-Expired First-Out (FEFO).Near-expiry products are still being delivered to institutional buyers—specifically, the warehouse is still shipping near-expiry products and the warehouse's operational staff is still bypassing the digital gatekeeping protocols—showing that automated near-expiry alerts and tight digital gatekeeping aren't in place or being followed.

Theme 3: Severity of Residual Picking and Fulfillment Errors

The analysis of fulfillment performance shows that the total amount of picking/receiving errors has significantly decreased for standard and routine orders while the risk profile of the errors left has become worse. Disruptive errors persist for institutional customers, such as the substitution of an item or brand, the omission of a line item, incorrect pack size and mismatched batch numbers. These errors can have serious consequences for the safety of the patient and the effectiveness of

the product, especially when mismatching batch numbers or handling cold chain items that require special care.

The correlation of these recurrent fulfillment mistakes with hardware instability and behavioral shortcuts in the heat of the moment is quite strong. Often barcode scanners and handheld computers go wrong, lose internet connection or are poorly maintained. These technical issues are a common occurrence when there is a rush or month-end and floor staff are forced to revert to picking by hand and using paper-based systems, thereby bringing back the human element and its associated clerical errors. Further, the digital verification and scanning process is often overlooked altogether by staff when they are pressed for time to provide high throughput requirements. This behavioral bypass causes significant mismatch in orders, e.g. partial orders being incorrectly shipped as full orders.

Theme 4: Internal Visibility Silos and Customer Information Gaps

Results reveal a significant mismatch in the digital capabilities of the warehouse and integration with the external customers. Internally, digitalization has been a success that has enabled supervisors to look at inventory valuation, and to pull remote stock level reports without having to physically take stock in the warehouse. But this visibility is limited to the warehouse management level and does not reach the customer touchpoints. But, even within the organization, real-time data integrity is often violated by the synchronization lag because managers have access to out-of-date and therefore untrustworthy information for active planning.

This visibility barrier causes full information asymmetry with external institutional buyers. Customers place orders without any self-service customer portal, stock-check tool, or automated notification system to check stock. Often clients don't realize what happened with their fulfillment until days after they placed an order, which is a big disruption to their operations. To shield themselves from this uncertainty, buyers must resort to defensive over-ordering and stock piling which in turn creates an artificial distortion of demand pattern. The problem lies in an enterprise-level fragmentation, where the warehouse system is totally disconnected from procurement, finance, accounting or customer-side hospital networks, causing manual data entry in different systems that is fraught with risk.

Theme 5: Technology Downtime and Throughput Bottlenecks

Lastly, the data shows that there have been no consistent or scalable gains in employee productivity or overall throughput speed as a result of digitalizing the warehouse. On normal, stable days, regular orders are completed in a timely manner, but on peak days, or for custom bulk wholesale orders, the digital infrastructure is unable to scale effectively to keep up with demand. Infrastructure instability often negates any efficiencies that were gained on stable days. Employees are stuck troubleshooting software glitches, dealing with poor internet service and waiting for the systems to come back up, instead of picking orders. If the WMS does not have a robust offline operating mode, all the benefits of its speed are rendered useless when the WMS loses connection to the network, which in turn halts warehouse activities altogether.

In addition to technical downtime, human resource bottlenecks also reduce productivity because of user-interface complexities. The existing digital interface is very complicated and unintuitive, which significantly increases the training cycle for new staff. It takes too long to train new employees to the platform, which impacts team productivity as a whole and reduces throughput in the warehouse during hire cycles for several weeks. As a result, internal efficiencies do not necessarily lead to external service efficiencies with order processing times for complex orders remaining the same as, or even getting worse than, the old paper-based system.

CHAPTER FIVE

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Brief Overview of Key findings

The chapter analyzed survey data from 168 responses to evaluate the effect of the dimensions of warehouse digitalization on customer satisfaction in the pharmaceutical distribution sector. Internal consistency of all constructs (Cronbach's Alpha between 0.832 and 0.942) was good to excellent. Descriptive analysis indicates that all 4 constructs of the independent variables and the dependent variable are in the "Good" range with composite means between 3.747 and 3.836.

Full Pearson correlation matrix (Table 4.6) showed significant, positive bivariate relationships between all 4 independent variables and customer satisfaction ($r = 0.237$ to 0.596; all $p<.001$) and the negligible bivariate correlations among inter-variables indicated the lack of multicollinearity and orthogonality of the predictors.

The multiple regression model was highly significant ($F=68.56$, $p<.001$, $R=0.627$, Adjusted $R=0.618$). All 4 hypotheses were confirmed. Information Accessibility ($=0.224$, $p<.001$), Information Accuracy ($=0.356$, $p<.001$), Communication Efficiency and Timeliness ($=0.215$, $p<.001$) and Perceived quality of technology ($=0.139$, $p<.001$) were all significant positive predictors of customer satisfaction. Information accuracy was the strongest individual predictor with the largest coefficient and the highest t-value of any in the model.

5.2 Conclusions

From the results obtained by analyzing the data collected, the following conclusions are drawn:

1. Warehouse digitalization should be viewed as a primary aspect of customer satisfaction, and not just an optional administrative practice. The high values of the regression parameters confirm the impact of the investment in the digital tracking on the client experience along the whole chain of pharmaceuticals.

2. Good data clarity is a significant operational advantage for the company. The high scores of information transparency shows the value that reliable digital documentation combined with the proactive management of the stock may bring about the enhancement of the brand's reputation and customer loyalty.

3. Physical infrastructure restrictions inhibit the system from working at its full potential. The low values of the data related to the physical hardware and to WMS indicate that the existing machinery does not effectively cope with the enormous volume of orders during critical times of activity.

4. These problems of technical nature have an immediate negative effect on the delivery times. Indeed, the link between network disconnections, use of manual data logging by the teams and reduced values of customer satisfaction has been clearly demonstrated.

5.3 Recommendations

Since the most influential factor associated with customer satisfaction was Information Accuracy with the least being perceived Quality of Technology, there is a need for Beker Pharmaceutical Company to shift the focus of capital investment in hardware acquisition towards data integrity governance and customization of system usability. To resolve discrepancies between screen balances and physical inventory and to eliminate near expiry product dispatches, management should carry out a thorough master data audit and eliminate paper-based "dual-recording". In addition, instead of spreading resources to broaden IT infrastructure, strategic investments should be made in implementing a localized customer self-service portal that enhances downstream information visibility, and SMS-based exception alerts for order delays that are automated, as well as a more user-friendly warehouse management system (WMS) with offline data-buffering capabilities that keep business processes flowing during disruptions to local networks.

5.3.1 Technical Infrastructure and System Stability Upgrades

Upgrade processing servers and install redundant internet backup lines to avoid potential down time during heavy ordering periods and implementing new barcode scanners and terminals hardware in all storage zones to speed up the fulfillment of physical orders

5.3.2 Software Integration and Accessibility Enhancements

Integrate the order entry, warehouse management and billing databases to maintain real time updating of inventory and reduce redundant data input and creating a web customer portal and mobile application enabling customers to keep track of real time stock and order status without human intervention.

5.3.3 Process Expansion and Team Development

Expand the capabilities of the existing WMS to include automation of returns, tracking of claims, and expiration warnings for product inventory and provide continuous training for customer service and tech support so that they are able to troubleshoot the system promptly and keep clear communication lines open in the event of any system downtime.

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APPENDICES

APPENDIX A: RESEARCH INSTRUMENTS

I: QUESTIONNAIRE

ADDIS ABABA UNIVERSITY

SCHOOL OF COMMERCE GRADUATE STUDIES

DEPARTMENT OF LOGISTICS AND SUPPLY CHAIN MANAGEMENT

QUESTIONNAIRE TO BE FILLED BY RESPONDENTS

Dear respondents:I'm studying at the post graduate level student at Addis Ababa University School of Commerce, Logistics and Supply Chain Management department. As part of the award of the Masters of Science Degree, Logistics and Supply Chain Management, I am conducting a master thesis on the assessment of digitalization in the warehouse and how this relates to the customer satisfaction. Your genuine answer is significantly respected and will contribute a lot to the accuracy of this study. The data utilized from this questionnaire will simply be used for academic purposes and will be treated with strict confidentiality. Many thanks for your time and thoughts

Section A: General Information

1. Gender: □ Male □ Female

2. Age: □ 18–25 □ 26–35 □ 36–45 □ Above 45

3. Type of Customer: □ Retail Pharmacy □ Hospital □ Clinic □ Wholesaler □ Other _____

4. Duration of Relationship with Beker: □ Less than 1 year □ 1–3 years □ 4–6 years □ More than 6 years

5. Order Frequency: □ Weekly □ Monthly □ Quarterly □ Occasionally

Section B: Warehouse Digitalization survey for the 4 variables of warehouse digitalization dimensions.

CODE	Variable / Statement	strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)
	Information Accessibility					
1	.It is easily accessible for me to know the current product availability of medicines in real-time.	□	□	□	□	□
2	The digital system allows us to check order status and tracking information effortlessly.	□	□	□	□	□
3	Warehouse inventory data is easily reachable whenever our organization needs it.					
4	We can easily track where our orders are located physically and where they are at the present time.					
	Information Accuracy					
5	The company has very precise stock and stock numbers.	□	□	□	□	□
6	The online dispatch notes and invoicing	□	□	□	□	□

	detail exactly correspond with the physical goods received and all are accurate.					
7	The system notifications for the batch number and expiry date are accurate all the time.					
8	Significant variations between system records and physical deliveries are very infrequent.					
Communication Efficiency and Timeliness						
9	Get immediate and quick e-updates on all my orders and shipment.	□	□	□	□	□
10	The data obtained by means of the automatic communications devices used by the company are understandable.	□	□	□	□	□
11	The company's digital channels respond rapidly to our inquiries and logistics complaints.	□	□	□	□	□

12	All digital notification alerts for delay notices or delivery change notifications are received long in advance.	□	□	□	□	□
Perceived Quality of Technology						
13	The channels through which the company operates (portals, apps or systems) are easy to use and navigate.	□	□	□	□	□
14	The warehouse digital system is working quite well with not much crash or problem in its operation.	□	□	□	□	□
15	The security mechanisms of the digital transaction systems of the company are reliable and strong.	□	□	□	□	□
16	The current technology infrastructure in the company uses a relatively up-to-date environment and	□	□	□	□	□

	efficiently manages our business.					

Section C: Customer Satisfaction questionnaire survey

No.	Statement	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1	I am satisfied with the overall service provided by Beker Pharmaceutical Company.	□	□	□	□	□
2	The company meets my expectations.	□	□	□	□	□
3	I am satisfied with the speed of service delivery.	□	□	□	□	□
4	I am satisfied with the accuracy of order fulfillment.	□	□	□	□	□
5	I am satisfied with the communication provided by the company.	□	□	□	□	□
6	The company is reliable in	□	□	□	□	□

	meeting my needs.					
7	I trust the company as a supplier.	□	□	□	□	□
8	I intend to continue doing business with the company.	□	□	□	□	□
9	I would recommend the company to others.	□	□	□	□	□
10	Overall, I am highly satisfied with the company.	□	□	□	□	□

KEY INFORMANT INTERVIEW GUIDE

Target Respondents: Warehouse Manager, Logistics Manager, Inventory Controller, IT Officer, Operations Manager

Section A: Background Information

1. What is your current position in the company?

Response: _____

2. How long have you worked at Beker Pharmaceutical Company?

Response: _____

3. What are your major responsibilities related to warehouse operations?

Response: _____

Section B: Current Status of Warehouse Digitalization

1. What digital technologies are currently used in warehouse operations?

Response: _____

2. Which warehouse activities are currently computerized or automated?

Response: _____

3. How would you describe the overall level of warehouse digitalization in the company?

Response: _____

4. What motivated the company to adopt digital technologies in warehouse operations?

Response: _____

Section C: Impact on Service Efficiency

1. How has warehouse digitalization affected inventory accuracy?

Response: _____

2. How has digitalization affected order processing time?

Response: _____

3. Has digitalization helped reduce operational errors? Please explain.

Response: _____

4. How has digitalization influenced product availability and stock visibility?

Response: _____

5. What improvements in service efficiency have been achieved through warehouse digitalization?

Response: _____

Section D: Impact on Customer Satisfaction

1. How has warehouse digitalization contributed to customer satisfaction?

Response: _____

2. Have you received customer feedback regarding improvements in service delivery?

Response: _____

3. In what ways has digitalization improved communication with customers?

Response: _____

4. How has digitalization affected order accuracy and delivery performance?

Response: _____

Section E: Warehouse Performance Indicators (KPIs)

F1. Inventory Accuracy

1. How would you describe the current level of inventory accuracy in the warehouse?

Response: _____

2. In your opinion, how has warehouse digitalization affected inventory record accuracy?

Response: _____

3. What challenges still contribute to stock discrepancies or inventory inaccuracies?

Response: _____

F2. Inventory Turnover

1. How has digitalization influenced the movement and turnover of inventory within the warehouse?

Response: _____

2. Are there specific product categories that experience slow inventory turnover? If yes, why?

Response: _____

3. How do digital systems assist in identifying slow-moving or excess stock?

Response: _____

F3. Picking and Receiving Error Rate

1. To what extent has digitalization reduced picking and receiving errors in warehouse operations?

Response: _____

2. What types of order fulfillment errors are still commonly encountered?

Response: _____

3. What additional improvements would further reduce picking and receiving errors?

Response: _____

F4. Inventory Value and Stock Visibility

1. How do digital systems assist in monitoring inventory value and stock levels?

Response: _____

2. In what ways has warehouse digitalization improved inventory visibility and decision-making?

Response: _____

3. What challenges remain in maintaining accurate inventory information for planning and purchasing purposes?

Response: _____

F5. Picking Productivity and Throughput

1. How has warehouse digitalization affected employee productivity during picking and order fulfillment activities?

Response: _____

2. Have you observed improvements in order processing speed since digital systems were introduced? Please explain.

Response: _____

3. What digital tools or technologies have contributed most to improvements in warehouse productivity?

Response: _____

Section F: Challenges and Future Improvements

1. What challenges were encountered during implementation of digital technologies?

Response: _____

2. What challenges currently affect the effectiveness of digital warehouse systems?

Response: _____

3. How are these challenges being addressed?

Response: _____

4. What additional digital technologies would you recommend?

Response: _____

5. What future plans does the company have regarding warehouse digitalization?

Response: _____

6. What recommendations would you provide for improving warehouse digitalization and service efficiency?

Response: _____

7. Is there anything else you would like to add regarding warehouse digitalization and its impact on service efficiency and customer satisfaction?

Response: _____