

**CUSTOMS AUTOMATED SYSTEM, TAX AGENCY AGILITY AND
EFFICIENCY OF CROSS BORDER TRADE IN NAIROBI INLAND
CONTAINER DEPOT**

BY

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DECLARATION

Declaration by Candidate

I declare that this research project is my original work and has not been presented to any other college, university or institution.

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DEDICATION

This project is dedicated to God for provision, protection and sufficiency. To my siblings who have been my encouragers throughout my journey of education, and my parents for unending inspiration. To all teachers whom I have had the privilege of being their student and the Kesra fraternity as a whole.

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ABSTRACT

Multicarrier handoffs and border delays have been a challenge in logistics and supply chain, making it tough to track orders and determine liabilities for in-transit goods. Meeting promised delivery timeframes has become a hurdle, impacting the efficiency of cross border trade. Additionally, paperwork, regulations and compliance, where, customs declaration, manifests, product license, packing requirements, export evidences and invoices used in the efficiency of cross border trade has involved significant documentation which varies in the market. The purpose of the study was to establish the moderating effect of Tax Agency Agility on the relationship between Customs Automated Systems and efficiency of cross border trade in Nairobi Inland Container Depot. The specific objectives were to determine the effect of Integrated Customs Management System, Electronic Cargo Tracking System and Scanning System on efficiency of cross border trade in Nairobi Inland Container Depot, and the moderating effect of Tax Agency Agility on each of the direct effect relationship. The study was anchored on three relevant theories which include; Diffusion of Innovation Theory, Technology Acceptance Model and the Dynamic Capabilities Theory. The target population for the study was 950 Customs Officers and licensed Clearing Agents. The study used Taro Yamane formula to arrive at a total of 281 respondents as a sample of the total population drawn from Nairobi Inland Container Depot. The study used explanatory research design and questionnaires were used to collect the primary data. A pilot study was carried out at Jomo Kenyatta International Airport. The data was analyzed using descriptive statistics and Multiple regression analysis to test the hypothesis at 0.05 significance level. The study findings indicated that Integrated Customs Management System execution had significant and positive effects on efficiency of cross border trade ($\beta=0.155$, $p<0.05$). Electronic Cargo Tracking System execution had significant and positive effects on efficiency of cross border trade ($\beta=0.372$, $p<0.05$). and Scanning Systems execution had significant and positive effects on efficiency of cross border trade, ($\beta=0.177$, $p<0.05$). The study also shows that Tax Agency Agility has a moderating effect on the relationship between Integrated Customs Management System execution and efficiency of cross border trade ($\Delta R^2=0.002$, $\beta=0.332$, $p<0.05$). The study also showed that Tax Agency Agility moderates the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade ($\Delta R^2=0.006$, $\beta=0.064$, $p<0.05$). Lastly Tax Agency Agility moderates the relationship between Scanning Systems execution and efficiency of cross border trade ($\Delta R^2=0.005$, $\beta=0.063$, $p<0.05$). The study recommendation is that government should support the continuous development and integration of advanced Integrated Customs Management System technologies. The KRA is recommended to ensure thorough training for staff on the Integrated Customs Management System and regularly update the system to incorporate new features that enhance trade efficiency. The government should invest in infrastructure needed for comprehensive Electronic Cargo Tracking System coverage and reliability. Future studies may be conducted to investigate the influence stake holder sensitization on cross border trade.

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ABBREVIATIONS AND ACRONYMS

ACE	Automated Commercial Environment
ASYCUDA	Automated System for Customs Data
DOI	Diffusion of Innovation Theory
ECT	Electronic Cargo Tracking system
EDI	Electronic Data Interchange system
GPS	Global Positioning System
ICD	Inland Container Depot
ICT	Information and Communication Technology
JKIA	Jomo Kenyatta International Airport
KRA	Kenya Revenue Authority
NCTS	New Computerized Transit System
OECD	Organisation for Economic Cooperation and Development
RECTS	Regional Electronic Cargo Tracking System
RFiD	Radio Frequency iDentity
SARS	South African Revenue Services
SPSS	Statistical Package of Social Sciences
TAM	Technology Acceptance Model
UNCTAD	United Nations Conference on Trade and Development
WCO	World Customs Organization
WTO	World Trade Organization

OPERATIONAL DEFINITION OF TERMS

Customs Automated Systems: These are complex systems automating the customs clearance process for goods entering or leaving the country. The use of digital systems facilitates more efficient customs operations by leveraging technology to automate various tasks, such as document submission and duty calculation (ISA, 2020).

Efficiency of Cross Border Trade: Is the ability to exchange goods and services between buyers and sellers of different countries. It focuses on effective regional trade between border regions where trade tends to be shorter distance and focuses on goods and services that serve local cross border markets, (Hurricane Commerce, 2023).

Electronic Cargo Tracking System: is a web-based solution designed to offer real-time monitoring of transit cargo under customs control. It facilitates tracking of goods under customs control by using GPS and GPSR technology which proves to be an efficient e-solution in terms of cost and time, (TRA, 2019).

Integrated Customs Management System: An advanced system that connects the Kenya Revenue Authority (KRA) with its external stakeholders is central to this digitalization effort. This enhanced system integrates multiple modules

into a single repository, which not only accelerates the clearance process but also minimizes the costs associated with international trade. It improves compliance and facilitates cooperation in customs processing, (KRA, 2019).

Tax Agency Agility: Is the ability to adapt and react quickly to changes made to a business environment, customers' needs and technological advancements. This interconnectedness is crucial for maintaining a smooth flow of goods across borders, reflecting a broader trend toward efficiency in global trade (Parikka, 2021).

Scanning System: is the Non-Intrusive Inspection (NII) system, which uses X-ray imaging to inspect and identify goods without physically opening containers. As highlighted by MRA (2019), this technology significantly reduces the time required for cargo clearance, particularly for imports, by allowing customs officials to quickly assess the contents of shipments.

CHAPTER ONE

INTRODUCTION

1.0 Overview

This chapter presents the background of the study which will discuss global, regional and local perspectives. This will be followed by statement of the problem, objectives of the study, hypotheses, significance of the study and lastly the scope of the study.

1.1 Background of the Study

The implementation of technological system is part of a broader effort to enhance the speed and reliability of cross-border trade, which has expanded rapidly in recent decades due to technological advancements and trade liberalization initiatives (IMF, 2001). The efficiency of cross-border trade, particularly in goods and services, has become a critical metric for economic success. This efficiency is measured by the ability of countries to conduct transactions smoothly and effectively, with minimal barriers to trade. The focus on cross border trade efficiency is especially relevant in regions where neighboring countries engage in frequent trade, often over shorter distances. Such trade is vital for local economies, providing access to goods and services that might otherwise be unavailable. As noted by Hurricane Commerce (2023), the growth of cross-border trade has been fueled by the increasing demand for services exchanged between residents of different countries, including those provided through foreign affiliates.

The potential for advanced technologies to further automate and enhance global supply chains is vast. International organizations, the private sector, and academia have all explored how the latest technological innovations can be applied to improve the efficiency of cross border trade. The World Customs Organization (WCO) and the

World Trade Organization (WTO) have been particularly focused on the role of blockchain, distributed ledger technology, the Internet of Things (IoT), and artificial intelligence in customs operations. These technologies offer new ways to secure and facilitate trade, while also ensuring that customs administrations can meet their objectives of safety, security, and revenue collection (WTO, 2022).

The efficiency of cross border trading can be seen in some of its benefits such as global expansion, increased revenue, sustainability, increased access to end customers, brand awareness and selling of niche products globally. However, efficiency of cross border trade also presents several challenges for e-commerce businesses. These challenges include, customs, export, transport and import regulations, currency conversions and payment processing, logistics and shipping, product compliance, taxation and accounting. To successfully navigate the challenges of international markets, businesses must adopt strategies and solutions that are tailored to their specific needs. This requires a deep understanding of the global trade environment and the ability to adapt quickly to changing conditions (Hurricane, 2023).

The role of customs has evolved significantly over the past few decades, transitioning from a primary focus on revenue collection and societal protection to one of trade facilitation and border security. The "Customs in the 21st Century" blueprint, developed by the WCO in 2002, underscores this shift, emphasizing the importance of integrated policies and procedures that enhance both safety and trade efficiency.

Customs process automation plays a pivotal role in this modernized approach, encompassing a range of technologies that streamline the clearance process. These include electronic document submission, automated duty calculations, and the use of digital systems to facilitate the movement of goods through customs. The goal is to

reduce the time and cost associated with customs clearance while improving accuracy and compliance with regulations. Automation also helps mitigate the risks of smuggling and fraud, making the trade environment more secure.

Customs Automated Systems are complex systems that automate the customs clearance process for goods entering or leaving the country. The automated systems replace the manual processing of customs documents which as a result helps in facilitating cross border trade through the normalization of forms and documents, data standardization, computerization and simplification of customs clearance process to accelerate the clearance of goods. The ongoing reforms and modernization efforts within customs operations are critical to enhancing the efficiency and security of international trade. These initiatives include a broad array of technological advancements, such as electronic document submission, the adoption of electronic payment systems, and improved inter-agency cooperation and coordination. A key aspect of this modernization is the integration of government agency systems involved in the customs clearance process, which allows for more seamless operations. The implementation of One Stop Border Posts (OSBPs), pre-arrival goods processing, and Coordinated Border Management (CBM) are also pivotal components of these reforms. Additionally, electronic tracking of goods and risk-based management practices have been recognized by Revenue and Customs Authorities as essential measures for securing and facilitating trade (Gichuki, 2021).

The effectiveness of these automated systems is significantly enhanced when they are interfaced with the systems of other agencies involved in the clearance process along the supply chain, particularly Cross Border Trade Agencies that have also adopted automation. By ensuring that these systems communicate and cooperate effectively, the

entire clearance process becomes more streamlined, reducing bottlenecks and improving overall efficiency.

The primary goal of customs process automation is to decrease both the time and cost associated with customs clearance while simultaneously increasing the accuracy and efficiency of the process. Automation plays a crucial role in minimizing errors, ensuring better compliance with regulations, and mitigating risks associated with smuggling and fraud. However, despite these advancements, there remain challenges, particularly the persistence of complex procedures and the reluctance to fully transition from paper-based processes to electronic forms. This resistance to change continues to hinder the full potential of automation in many cross-border trade transactions. Therefore, there is a strong push for the adoption of automated systems in service delivery, as they are increasingly seen as a necessary solution for the future of global trade.

In today's unpredictable market environment, competition is causing fluctuations in both demand and supply that are more rapid, widespread, and frequent than ever before (Lee, 2013). Under such volatile conditions, businesses must develop agility—defined as the ability to sense and respond to market changes quickly and efficiently—to maintain their operational performance (Weill & Vitale, 2002). Tax Agency Agility, specifically, refers to an organization's capacity to adapt swiftly to a changing external environment and landscape (Mrugalska, 2021). This agility is essential for companies to thrive and prosper in a rapidly changing and unpredictable environment (Vinodh et al., 2012). The introduction of agility within a company has been shown to directly correlate with improved performance, underscoring its critical importance.

As Volberda (2011) highlights, a flexible organization places a strong emphasis on its ability to adapt and respond to change. Firms face numerous pressures for change,

driven by both external and internal factors, such as emerging markets, new competition, technological advancements, evolving customer needs, and new business opportunities. The implementation and adoption of new technologies to leverage competitive advantages present significant challenges but also offer substantial rewards. Agility is often viewed as an organization's dynamic capability to gain and exploit competitive advantages by adopting and implementing these technologies. It is argued that the agile nature of these technologies allows organizations to achieve significant gains in agility across various domains, including supply chain management, manufacturing, and workforce efficiency (Richter, 2018).

The beneficial impacts of Tax Agency Agility are increasingly recognized, with growing empirical support linking agility to enhanced firm competitiveness. Research by Martinez, Saenz, and Chen (2013) suggests that firms that embrace agility not only improve their operational performance but also gain a competitive edge in the market. This makes agility not just a desirable trait, but a critical factor in the success of modern organizations. Some of these benefits include; Increased productivity and innovation, more customers, improved employee engagement, outlast competitors among other benefits. Failure to adapt to industry and environmental changes may result to decreased efficiency and security, the company may lose a lot of its customers, employee shortages and less revenue. Tax Agency Agility refers to the effective implementation of key responses (such as speed, adaptability, innovation, and quality) through the strategic integration of reconfigurable resources and best practices within a knowledge-rich environment. This approach enables organizations to deliver customer-focused products and services efficiently, even in rapidly changing and unpredictable market conditions (Gunasekaran, 2003).

1.1.1 Global Perspective of Customs Automated Systems

Many countries are actively pursuing a variety of reforms aimed at modernizing their customs operations. These efforts are driven by the need to establish well-organized and efficient customs services that can effectively balance their multiple responsibilities. The goal is to ensure maximum compliance with regulatory requirements while also meeting customs revenue objectives. In addition, these reforms aim to create a legal framework that facilitates the smooth movement of exports, imports, people, and even animals across border points (Ranker, 2003).

The United States, Japan, and several European nations were pioneers in developing electronic customs declaration systems. In the early 1990s, the U.S. Customs introduced the Automated Commercial System (ACS), which was designed to streamline the filing of import data, as well as track, control, and process all imported goods. Over time, ACS evolved into the Automated Commercial Environment (ACE), a system that allows the trade community to report both imports and exports. By reducing the number of required documents and saving significant amounts of time, ACS revolutionized the customs process. For ACS to operate effectively, international trade stakeholders must submit their information electronically in the form of customs declarations to the relevant supervisory bodies, transport companies, and authorized temporary storage facility owners. The information about consignments is then aggregated at a customs data processing center, where ACS automatically verifies and evaluates the received data, thus minimizing human error (Nikulín, 2020).

In the European Union (EU), the New Computerized Transit System (NCTS) serves as an electronic declaration and processing system designed for the online execution and control of transit customs procedures. NCTS facilitates data exchange between customs

institutions across all EU member states and other state institutions involved in customs clearance and control, regardless of the transportation method. Since 2010, customs declarations in the EU have been submitted exclusively in electronic form via the internet, with stakeholders required to pre-register in the Economic Operators Registration and Identification System (EORI). This shift towards digitalization has streamlined the customs process and improved efficiency across the board (Levinskaya, 2020).

China has also embraced automation in its customs administration, focusing on an automated clearance scheme. As a result, most customs declarations in China are now submitted online, eliminating the need for manual review of each shipment by customs officials. Similarly, Russian customs authorities undertook significant efforts in the 1990s to digitize their operations, leading to the development of an Integrated Automated Information System that is now widely used by customs authorities across the country.

Globally, many nations have worked to eliminate inefficiencies in their customs processes by adopting various technologies that enhance border operations. Today, over 85 countries have implemented customs management systems designed to enable customs authorities to more effectively fulfill their fiscal and control responsibilities. However, it is important to note that simply implementing an automated system does not automatically resolve all procedural bottlenecks, transparency issues, or inconsistencies in clearing processes. To address these challenges, experts have collaborated with several countries to deploy customs management systems in conjunction with Electronic Data Interchange (EDI) systems. These integrated solutions allow parties such as banks, ministries, and private sector shipping lines to

interface seamlessly with one another, using a single window to transmit and receive messages. This integration has significantly improved communication speeds and eliminated the need for duplicate instructions, further enhancing the efficiency and transparency of customs operations.

1.1.2 Regional Perspective of Customs Automated Systems

Over the years, African countries have witnessed rapid growth in trade, necessitating the adoption of Customs Automated Systems to replace manual documentation. This shift has been driven by the need to enhance efficiency and cope with the increasing volumes of cross-border trade. Many African nations, in collaboration with international organizations such as the World Bank, World Customs Organization (WCO), World Trade Organization (WTO), and United Nations Conference on Trade and Development (UNCTAD), have implemented initiatives that have significantly boosted trade across borders. However, the continued reliance on manual processes or the deployment of automated systems without sufficient infrastructure, such as reliable electricity or the capacity for system repairs, has contributed to persistent customs delays in the region (Njinkeu, Dominique, and Hartmann, 2015). These delays often lead to traders resorting to "facilitative payments" to customs officials to expedite the clearance of their goods through border checkpoints, exacerbating corruption and inefficiency.

A variety of software solutions have been developed, often through public-private partnerships, to address these challenges. Among these, the Automated System for Customs Data (ASYCUDA) stands out as the most widespread and successful. Developed by UNCTAD in 1981, ASYCUDA has been implemented in over 90 countries, including 41 African nations that benefited from the program as of 2019

(UNCTAD, 2011; 2019). ASYCUDA is an integrated customs management system designed to modernize and automate customs clearance processes in developing and middle-income countries. It leverages Information and Communication Technology (ICT) to streamline and simplify customs procedures, significantly impacting electronic business and government transactions. By making international trade simpler and more cost-effective, ASYCUDA has enhanced access to global markets for enterprises in developing countries. Additionally, it serves as the core system for establishing a single window for international trade, trade portals, port management training, and the implementation of transit and corridor management.

The Democratic Republic of Congo (DRC) provides a compelling example of the positive impact of electronic systems on cross-border trade. Following the digitalization of its customs processes, the DRC managed to reduce the time required for document preparation by 122 hours for exports and 42 hours for imports. This digital transformation also led to a significant reduction in border compliance times, illustrating the benefits of automating customs operations (Bhero, Hoffman, Lusanga & de Cornig, 2015). Similarly, Morocco's Port of Tangier saw improved cargo flow, both incoming and outgoing, after the establishment of a dedicated area for handling exports and imports, coupled with the installation of a new Scanner System (Cheruiyot and Rotich, 2018). These examples underscore the importance of adopting and implementing electronic systems to streamline customs operations, reduce delays, and ultimately, foster economic growth through more efficient trade practices.

1.1.3 Local Perspective of Customs Automated Systems

As customs agencies worldwide grapple with the challenge of balancing the need for enhanced trade facilitation with the growing demands for compliance, the Kenya

Revenue Authority (KRA) finds itself under similar pressure. Like its global counterparts, KRA is tasked with delivering customer-focused services, such as accurate revenue collection and the prevention of illegal trade, all within the constraints of limited resources. This complex landscape has necessitated the modernization of customs administration to achieve agility, accuracy, security, and transparency through empowering rather than restrictive systems (KRA, 2018).

To address these challenges, KRA has implemented several automated systems, including the Integrated Customs Management System (iCMS), the Electronic Cargo Tracking System (ECT), and advanced Scanning Systems. These systems are designed not only to streamline operations but also to enhance the agency's ability to respond to the dynamic demands of international trade. The implementation of iCMS, in particular, represents a significant step forward in KRA's efforts to modernize and improve its customs operations.

In today's fast-paced and volatile market environment, organizations must be agile, able to swiftly sense and respond to changes to maintain and improve operational performance. According to Grover (2010), information technology (IT) management capabilities provide a crucial platform for firms to develop digitalized processes and knowledge systems that enhance agility. This increased agility, in turn, ensures that operational performance is consistently improved. Weill and Vitale (2012) further highlight that IT provides superior information management capabilities, analytical decision support, and enhanced communication. These technologies enable organizations to create new business models that drive enhanced performance.

Organizations that possess agility as a core capability are better positioned to quickly reconfigure and adapt to technological advancements. This ability to smoothly integrate

and implement new technologies is critical in maintaining a competitive edge. Recognizing this, KRA's decision to adopt and implement customs automated systems, such as iCMS, is a strategic move aimed at boosting its competitiveness and increasing the efficiency of cross-border trade.

The iCMS is a comprehensive system that consolidates all existing customs systems into one modern, robust, and more efficient platform. Built on the latest technology, iCMS is designed with the capability to seamlessly interface with other internal and external systems as needed (KRA, 2018). This integration not only streamlines KRA's operations but also enhances its ability to manage customs processes more effectively, ensuring that it can meet the dual demands of facilitating trade and ensuring compliance. Through these initiatives, KRA is better equipped to navigate the complexities of international trade, delivering services that are both efficient and responsive to the needs of its stakeholders. It aligns operations with international best practices and improves the ease of doing business in East African Communities (EAC).

Aligned with the World Trade Organization's (WTO) mandate for the simplification and harmonization of international trade procedures, the Integrated Customs Management System (iCMS) has played a pivotal role in streamlining and optimizing customs processes. All the East African Countries except Kenya were already using ASYCUDA which predisposed Kenya to implement a system that could seamlessly interface with ASYCUDA. Today, the two systems are able to exchange Customs declaration information and are very reliable for countries like Rwanda, Uganda, South Sudan, Burundi and Congo that rely on the port of Mombasa. The implementation of customs automation, such as iCMS, enables countries to effectively monitor and track the movement of cargo, thereby preventing the potential diversion of transit goods into

local markets or the unauthorized disappearance of containers. This heightened level of oversight is crucial for maintaining the integrity of international trade routes and ensuring that goods reach their intended destinations without interference.

In Kenya, customs automation represents a significant leap forward in modernizing trade operations. By streamlining customs processes and reducing the reliance on manual paperwork, automation facilitates faster clearance times, which in turn saves both time and money for businesses engaged in cross-border transactions. The reduction of bureaucratic hurdles at ports and border points not only accelerates trade flow but also enhances the overall efficiency of the trading environment.

1.2 Statement of the Problem

Efficient cross-border operation is one cardinal business activity of a country, for the reason that at all costs all countries need in one way or another to transact with other business units outside its national boundaries to enhance the globalization of trade (Mugambi, 2017). However, cross-border trade efficiency has its challenges concerning logistics and supply, since tracking orders, determining liabilities for in-transit goods, and promised delivery time frames can be more challenging in cross-border trade because of multicarrier handoffs and border delays (Bowes, 2021).

Technology brings simplification while coping with challenges through multi-carrier software platforms. Such infrastructure has the capability to choose shipping partners and plotting of the routes, with special technology and logistic partners included in international trade strategies, in managing the requirements most efficiently with the least physical paperwork, thus further minimizing the chance of incurring fines and compliance issues. Online customs declarations, identification and response to new regulations will also be supported by these specialised technologies. Customs systems

were adopted by the Customs Department purposely because of their ability to impact the efficiency of cross-border trade in Kenya. These Customs systems adopted include an Integrated Customs Management System (iCMS), Electronic Cargo Tracking System (ECT), and Scanning System.

Few studies conducted in the country have explored the effects of customs automated systems on performance and trade facilitation. However, prior scholars have not examined the Customs automated system, Tax Agency Agility, and efficiency of cross-border trade in Nairobi Inland Container Depot. For instance, (Angalwa, 2022) and (Omosa, 2020) conducted a study on effects of automation of customs systems on revenue performance in Kenya both focusing on revenue performance as the dependent variable. (Kuiru, 2019) conducted a study on the influence of automated systems on customs performance in Kenya while (Lubeka, 2017) conducted a study on computerized system effects and performance of the customs and border control department of Kenya Revenue Authority. Another study was conducted by (Mutai, 2022) on effects of automated customs systems on trade facilitation in Kenya but the study did not look at the moderating effect of agility. Gitaru (2017) in the study on the Effect of system automation, particularly the Simba system, on the Revenue Collection of KRA, reviewed the implementation of strategy and performance of the customs and border control department of KRA.

The facilitation of clearing imports and exports by Customs and allied agencies are some of the weakest links in the entire global supply chain. Revenue collection has previously been applied as the key indicator for Kenya's bulk customs and border control department performance (Morini, De'SaPorto & Inacio, 2017). According to KRA's annual performance report, performance in customs has still been weighed down

by slow growth in imports, with container volumes missing their targets. In the year 2016/17, for example, the department managed to collect 443.5 billion of the 462 billion targets. In this sense, the department missed the set target by collecting 469.97 billion out of the target set, which was 484.97 billion (KRA, 2018). KRA missed its target in the year 2022/23 by 107.0 billion Kenya shillings in the year. Missed deadlines can be detrimental to the country as a whole as it may cause the loss of business opportunities and revenue for the country.

Customs Automated Systems has positive impacts on the volumes of cross-border trade such as reducing the time and cost associated with customs clearance procedures, increased efficiency, improved transparency, increased compliance, and enhanced security of the goods. The problem however has been that delays and downtime have made the customs department to miss a lot of its targets. Missed targets result to low volumes of trade hence affecting efficiency of cross border trade. The motivation behind this study is to fill in the gap and to look at how Tax Agency Agility can moderate the relationship between Customs Automated Systems and the efficiency of cross-border trade in Nairobi Inland Container Depot.

1.3 Objectives of the Study

The study was guided by main objective and specific objectives.

1.3.1 General Objective

The main objective of the study was to determine the moderating effect of Tax Agency Agility on the relationship between Customs Automated Systems and efficiency of cross border trade in Nairobi Inland Container Depot.

1.3.2 Specific Objectives

1. To establish the effect of Integrated Customs Management System execution on efficiency of cross border trade in Nairobi Inland Container Depot.
2. To determine the effect of Electronic Cargo Tracking System execution on efficiency of cross border trade in Nairobi Inland Container Depot.
3. To evaluate the effect of Scanning Systems execution on efficiency of cross border trade in Nairobi Inland Container Depot.
- 4a. To determine the moderating effect of Tax Agency Agility on the relationship between Integrated Customs Management System execution and efficiency of cross border trade in Nairobi Inland Container Depot.
- 4b. To determine the moderating effect of Tax Agency Agility on the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade in Nairobi Inland Container Depot.
- 4c. To determine the moderating effect of Tax Agency Agility on the relationship between Scanning Systems execution and efficiency of cross border trade in Nairobi Inland Container Depot.

1.4 Research Hypothesis

The study was guided by the following null hypothesis.

H₀₁: Integrated Customs Management System execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot.

H₀₂: Electronic Cargo Tracking System execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot.

H₀₃: Scanning Systems execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot.

H_{04a}: Tax Agency Agility does not moderate the relationship between Integrated Customs Management System execution and efficiency of cross border trade in Nairobi Inland Container Depot.

H_{04b}: Tax Agency Agility does not moderate the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade in Nairobi Inland Container Depot.

H_{04c}: Tax Agency Agility does not moderate the relationship between Scanning System execution and efficiency of cross border trade in Nairobi Inland Container Depot.

1.5 Significance of the Study

The purpose of the study was to determine the moderating effect of Tax Agency Agility on the relationship between Customs Automated Systems and efficiency of cross border trade in Nairobi Inland Container Depot. Kenya Revenue Authority are the administrators of the modernization program and are responsible for implementing the automation of customs systems. The study finding is useful to KRA in making informed decisions and put in place proper mechanisms where there are shortcomings as far as customs clearance is concerned. The research is crucial because it supports the ongoing customs management reforms aimed at enhancing the department's performance and efficiency in managing international trade (Kuiru, 2019).

For policymakers, the study offers critical information that can serve as a foundation for developing policies related to revenue collection, cross-border trade, and the handling of transit goods. The outcomes of the study are instrumental for those involved

in crafting regulations and strategies to improve trade facilitation and economic growth. Understanding the effectiveness of customs automation systems helps policymakers make informed decisions that support better revenue management and enhance the efficiency of international trade processes.

This research work is of benefit to other researchers as it increases their stock of information for their research and reference. The study findings equip researchers with knowledge in relation to this topic of study, as it opens up to new areas for research and they are able to come up with other areas that may require further research. Additionally, studies on customs automation systems offer a wealth of information for researchers, which can be utilized to advise other countries on implementing effective trade facilitation measures. By sharing insights and best practices, researchers can help other nations adopt systems that streamline processes, harmonize regulations, and strengthen institutional capacities. This cross-national exchange of knowledge is crucial for improving global trade practices and enhancing the overall efficiency of customs operations (Rippel, 2018).

1.6 Scope of the Study

The purpose of this study was to determine the moderating effect of Tax Agency Agility on the relationship between Customs Automated Systems and efficiency of cross border trade in Nairobi Inland Container Depot. The study was confined to the independent variables which were customs automated systems consisting of Integrated Customs Management System, Electronic Cargo Tracking System and Scanning System. The dependent variable of the study was efficiency of cross border trade and the moderating variable was Tax Agency Agility. The study was conducted in Nairobi Inland Container

Depot and was administered to 281 target respondents consisting of Customs Officers and licensed Clearing Agents obtained through stratified sampling techniques.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Literature review provide an overview and synthesis of existing research on a specific topic. They involve the identification, evaluation and interpretation of relevant empirical studies and other research articles to highlight key findings, identify patterns and draw connections between different studies. Literature review aims to provide a comprehensive understanding of the current state of knowledge in a particular area, identify the gaps or inconsistencies in the existing literature and suggest directions for future research. There are several research studies that have been conducted on the effects of customs automated systems on efficiency of cross border trade. This section discusses review of concepts, theoretical review, empirical review, critiques of existing literature, summary of literature review, research gaps and the conceptual framework

2.2 Review of Concepts

2.2.1 Concept of efficiency of Cross Border Trade

Cross-border trade encompasses the efficient exchange of goods and services between buyers and sellers from different countries, involving both exports and imports. Although international organizations offer varying definitions of cross-border trade, the focus commonly lies on the procedures and controls required for the effective movement of goods across national boundaries (Grainger, 2010). Efficient control strategies are pivotal in reducing associated costs, maximizing operational efficiency, and ensuring compliance with regulatory frameworks (Grainger, 2011). The efficiency of cross-border trade can be examined through four interrelated perspectives: the simplification and harmonization of relevant rules and procedures, the modernization of trade systems and structures, the administration and management of trade and

customs procedures, and the institutional mechanisms for ensuring effective trade facilitation.

Simplification and harmonization involve streamlining and aligning regulations to reduce complexity and enhance clarity, while modernization focuses on updating trade systems and infrastructure with advanced technologies to facilitate smoother operations. Effective administration and management of trade procedures ensure that customs processes are handled efficiently, and robust institutional mechanisms support the implementation and maintenance of trade facilitation measures. In this study, the efficiency of cross-border trade is evaluated through specific metrics such as clearance time, truck turnaround time, and transport costs. These metrics provide concrete indicators of the performance of trade facilitation systems, highlighting how well goods are moved across borders and the impact of various customs and trade procedures on operational efficiency.

2.2.2 Concept of Customs Automation System Execution

The evolution of automation in recent decades has significantly transformed organizational operations, with technological advancements establishing automation as a crucial discipline for adding value. Customs automated systems have become increasingly desirable for both governments and businesses as they streamline processes and enhance efficiency (Muiruri, 2010). Customs systems automation involves utilizing control systems and information technologies to minimize human intervention in the production and processing of goods and services (Gidisu, 2012). When implemented effectively, these systems can significantly improve the customs clearance process for goods entering or leaving a country.

Automated systems have largely replaced traditional manual processing of customs documents, which helps facilitate cross-border trade by normalizing forms and documents, standardizing data, and simplifying the customs clearance process. This acceleration of goods clearance is achieved through various technological innovations. For this study, three key customs tax systems are examined as independent variables: The Integrated Customs Management System (ICMS), the Electronic Cargo Tracking System (ECT), and the Scanning System.

The ICMS is an automated system that integrates all customs administration functions, enhancing control procedures over the import and export of goods. It encompasses aspects such as valuation, verification, and declaration of goods, thereby streamlining the overall customs process (KRA, 2018). The ECT provides real-time monitoring of cargo through an electronic seal fitted on outbound trucks. This system facilitates effective border management and transit cargo monitoring, improving the management of containerized cargo and vehicles in transit (Freeman, 2017). Lastly, the Scanning System employs non-destructive methods to inspect and identify goods in transportation. It is more efficient and cost-effective compared to physical inspections, as it saves time and reduces the need for manual handling (Oduor, 2018).

2.2.3 Concept of Integrated Customs Management Systems

Integrated Customs Management Systems is set to revolutionize customs processing by aligning operations with global best practices, making trade easier in Kenya and the East African Community (EAC) region. It simplifies and optimizes customs processes in line with World Trade Organization (WTO) requirements, streamlining clearance procedures and enhancing efficiency. Customs agencies worldwide are grappling with enhancing trade facilitation while ensuring compliance with regulations. The Kenya

Revenue Authority (KRA) has introduced the Integrated Customs Management System (iCMS), consolidating various customs systems into a single, modern, efficient platform. (OECD, 2023).

As globalization has advanced, customs administration has become central to managing international trade, positioning customs as a crucial element for the competitiveness of countries and multinational companies alike (Erceg, 2019). In this globalized context, customs authorities are tasked with the essential role of overseeing and regulating cross-border trade. The integration of Information and Communication Technology (ICT) has revolutionized customs operations, leading to significant improvements in service efficiency. By automating processes, customs authorities have drastically reduced the reliance on manual methods and the associated data validation challenges (Wilmott, 2021).

This technological transformation has led to the widespread adoption of e-customs systems, which represent the application of ICT in public administration (Granqvist, Hintsa & Mannisto, 2022). E-customs systems are designed to support organizational changes and enhance the quality of services provided by government agencies. These systems facilitate more efficient processing of customs transactions, streamline communication, and improve overall service delivery. By leveraging ICT, e-customs systems contribute to more effective management of international trade, aligning with the broader goals of modernization and enhanced operational performance in customs administration.

2.2.4 Concept of Electronic Cargo Tracking System execution

The Electronic Cargo Tracking System (ECTS) represents a significant advancement in the management and monitoring of transit goods, providing a technological solution

for revenue authorities to oversee cargo movement effectively. This system employs electronic seals affixed to goods, enabling remote monitoring from a Centralized Monitoring Centre using Radio Frequency Identification (RFID) and GPS/GPRS technologies (Raghu Das & Peter Harrop, 2013). The ECTS operates in real-time, enhancing the oversight of cargo as it moves through its journey. A key feature of the system is the virtual fence or Geo-fence, which is established along designated routes used by transporters. At the start of each journey, the electronic seal is activated, and it is deactivated upon arrival at the destination, ensuring accurate tracking and verification of the cargo's route (Nyongesa, 2019).

Efficient cross-border operations are crucial for global trade, as countries increasingly engage in transactions beyond their national boundaries. For stakeholders such as cargo owners, transporters, and freight forwarders, the ECTS not only enhances efficiency in cargo clearance but also provides crucial security assurances. The system's implementation aims to bolster the efficiency of cross-border trade by offering a robust mechanism for monitoring the physical flow of goods and ensuring compliance with trade regulations (Mpata, 2021).

According to the ECTS guidelines, all outbound vehicles, including trucks, tankers, and containers loaded with transit goods, must be equipped with tracking devices. These devices allow for the electronic monitoring of the cargo's location and enable real-time investigation of any potential violations (Musyoka, 2022). The ECTS initiative is designed to ensure that duties are paid on cargo that crosses Kenya's borders and to promote authorized trade practices. Huanye (2020) emphasizes the system's importance to the public sector, particularly for the Kenya Revenue Authority (KRA), as it plays a critical role in customs and border control.

2.2.5 Concept of Scanning Systems execution

Scanner technology has revolutionized the inspection of goods in transportation by offering a non-intrusive, non-destructive method of examination. This technology uses X-ray imaging to inspect the contents of containers or tankers without physically opening them (Dobell, 2017). Such advancements are crucial for addressing port-of-entry delays, which are closely linked to trade policies, customs procedures, and port infrastructure (Lewis, Erera, Nowak, & White-III, 2013). Delays in clearance procedures can impact both large and small businesses, affecting regional trade facilitation goals.

In Ghana, Chalfin (2004) highlighted the role of border scanning technology in enhancing customs service sovereignty, enabling more effective surveillance of state agents and authorities. Similarly, Gidado (2015) explored the implications of port congestion in various locations including Nigeria, Durban, the Suez Canal, and Mombasa. He noted that congestion leads to delays, increased queuing, extended voyage times, and additional costs, all of which disrupt logistics and supply chains and negatively affect trade and transport agreements.

The adoption of scanner technology has a direct impact on revenue collection by improving the accuracy of goods classification and ensuring correct duty assessments. It also plays a significant role in maintaining border security by detecting contraband and prohibited items. Moreover, by reducing cargo clearance times, scanner technology addresses one of the major bottlenecks in current systems: if anomalies are detected, the only option previously was to unload the entire trailer for inspection, which was both time-consuming and costly (KRA, 2020). Scanner technology mitigates this issue

by allowing for more efficient inspection processes, thus enhancing overall operational efficiency (MRA, 2021).

2.2.6 Concept of Tax Agency Agility

Tax Agency Agility is increasingly recognized as a vital capability for achieving business success, particularly in today's competitive and rapidly evolving environment (Lee et al., 2015). Agile organizations excel by continually adapting to new challenges and opportunities, a process that requires ongoing transformation and responsiveness to external pressures such as new competitors, emerging technologies, and shifting market conditions (David Teece et al., 2016). This concept of agility combines reactive and proactive elements, integrating Tax Agency Agility with organizational flexibility (Sherei, Karwowski, Layer, 2007).

Tax Agency Agility involves the firm's capacity to detect and respond to environmental changes effectively. As outlined by Sambamurthy et al. (2003), this capability comprises three interrelated dimensions: customer agility, which leverages customer feedback to gain market intelligence; partnering agility, which involves learning from business partners to enhance responsiveness; and operational agility, which focuses on the rapid redesign of processes to exploit dynamic market conditions. In essence, Tax Agency Agility represents the deliberate ability of an organization to navigate and thrive in a turbulent environment by not only reacting swiftly to changes but also by proactively identifying and seizing opportunities through innovation and continuous learning. This comprehensive approach enables organizations to maintain efficiency and sustain competitiveness in the face of uncertainty.

2.3 Theoretical Review

The theoretical literature review is a methodical evaluation of existing research related to a specific subject, aiming to identify and analyze key theories, concepts, and frameworks pertinent to the topic. This review provides a robust foundation for the study by outlining well-established arguments and theories. In this research, the theoretical review serves to establish and clarify existing theories and their interrelationships. Two significant theories have been adopted for this purpose: The Diffusion of Innovation Theory (DOI) and the Technology Acceptance Model (TAM).

2.3.1 Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) Theory, developed by E. M. Rogers in 1962, stands as one of the earliest frameworks in social science. Originally rooted in communication studies, this theory explores how an idea or product gains momentum and spreads through a specific population or social system over time. The ultimate goal of this diffusion is for individuals within the social system to adopt new ideas, behaviors, or products. Adoption implies a shift in behavior, such as purchasing a new product or embracing a novel approach.

Central to the theory is the notion that for diffusion to occur, the innovation must be perceived as new by potential adopters. The theory aims to elucidate how innovations establish themselves in the market and what factors contribute to their spread. It provides insights into the most effective strategies for reaching markets and securing early adopters (those who first embrace the innovation). According to Rogers (1995), the theory revolves around four main elements: innovation, communication channels, time, and the social system. Rogers identifies five key factors influencing adoption:

complexity, compatibility, trial ability, observability, and relative advantage. These factors determine how readily a new system or innovation is adopted by users.

In relation to the study variables, diffusion of innovation theory suggests that with the fast-changing market environment, organizations are adopting technology for better efficiency of cross border trade and in order to remain agile for a competitive advantage. Technological advancements have significantly transformed transaction processes, particularly through innovations such as the Integrated Customs Management System (iCMS), Electronic Cargo Tracking Systems (ECTs), and non-intrusive inspection methods like scanning systems. The introduction of iCMS has streamlined customs procedures by integrating various functions into a unified platform, enhancing efficiency and accuracy in managing import and export operations. The KRA had an idea to adopt rather introduce new systems to help ease the clearance process. Scanning Systems and other customs automated systems such as iCMS and ECTS are adopted with the main aim of facilitating the efficiency of cross border trade. These systems however have elicited mixed reactions from the industry players. While others are in support of the new adopted products or ideas, others are objecting it based on the cost associated with its implementation (Odour, 2018).

The process of adopting a new idea, behavior, or product does not occur uniformly within a social system; instead, it unfolds in stages where some individuals are more inclined to embrace innovations than others. The key participants in this process include innovators, early adopters, early majority, late majority, and laggards. Innovators are characterized by their willingness to take risks and are typically the first to experiment with new ideas. Early adopters, on the other hand, are eager to engage with emerging technologies and assess their usefulness in societal contexts. The early majority

contributes to the mainstream acceptance of innovations, integrating them into the broader population. The late majority follows suit, incorporating the new idea into their daily routines as part of the general populace.

Finally, laggards are those who adopt innovations much later, often out of necessity rather than choice. While innovators and early adopters are generally open to the uncertainties of new technologies, laggards are more resistant to change and prefer established methods. Over time, as an innovation becomes embedded within mainstream society, it becomes integral to everyday activities, compelling even the most hesitant individuals to adopt it. The diffusion of innovations theory offers a framework for understanding how new technologies and advancements disseminate across societies and cultures. This theory explores the mechanisms and reasons behind the adoption of new ideas, as well as the factors that contribute to their gradual acceptance over extended periods (Halton, 2023). By examining the stages of adoption and the varying responses of different social groups, the theory provides valuable insights into the spread of innovations and the dynamics of technological integration in various settings.

2.3.2 Technology Acceptance Model

The Technology Acceptance Model (TAM), introduced by Davis in 1989, is one of the most influential frameworks for predicting the acceptance and use of information systems (IS) and technology by individual users. TAM addresses how and why individuals decide to adopt or reject new technologies, focusing on the perceived usefulness and ease of use of the systems. This model highlights that acceptance of technology can lead to significant benefits both at the organizational and individual

levels, including enhanced performance, increased financial and time efficiency, and greater convenience (Foley Curley, 1984; Sharda, Barr & McDonnell, 1988).

The model's core objective is to elucidate the underlying processes involved in technology acceptance to predict user behavior and provide theoretical explanations for the successful adoption of technology. Practically, TAM aims to guide practitioners in making informed decisions about system implementation. For instance, the adoption of systems like iCMS, ECTs, and the Scanning Systems, as part of modernization and reform programs, is intended to enhance customs management and streamline efficient cross border trade operations. TAM underscores that for organizations to remain agile and successful in a rapidly changing market, acceptance of technological advancements is crucial.

According to TAM, technology acceptance involves a three-stage process: external factors (such as system design features) provoke cognitive responses (perceived ease of use and perceived usefulness), which then shape attitudes toward the technology and influence actual usage behavior (Davis, 1989; 1993). The perceived usefulness of a system refers to how well users believe the technology will enhance their job performance, while perceived ease of use relates to the anticipated difficulty of using the system and the effort required for its adoption (Venkatesh & Davis, 2000). TAM suggests that user adoption is influenced by their expectations about the technology and their pre-existing attitudes.

Understanding how citizens accept e-government services is crucial, as it can impact potential cost savings and investment choices related to the system. TAM supports efficient border management and cross-border trade by facilitating the acceptance of new technologies among stakeholders. This theoretical framework plays a key role in

decision-making processes regarding technological implementation and future enhancements, aiming for broader inclusivity among customs stakeholders (Bhattacharjee, 2001).

2.3.3 The Dynamic Capabilities Theory

The Dynamic Capabilities Theory, introduced by Teece, Pisano, and Shuen in 1997, is centered on a firm's capacity to adapt and thrive in rapidly changing environments by effectively integrating, building, and reconfiguring both internal and external competencies. This theory highlights the importance of an organization's ability to not only leverage existing strengths but also to continuously evolve and reconstitute its resources and capabilities to address new challenges and opportunities in the business landscape. This adaptability is crucial for achieving sustained success in dynamic markets.

In the context of the study variables, the Dynamic Capabilities Theory posits that in a rapidly evolving environment, the agility of a tax agency can significantly enhance the performance and outcomes of an organization. Tax Agency Agility refers to the agency's ability to swiftly and effectively respond to environmental changes, such as shifts in market conditions, regulatory updates, or technological advancements. By continuously monitoring and adapting to these changes, a tax agency can optimize its operations and improve service delivery. Customs automated systems in this case is the rapidly changing environment where organizations are adopting to the use of technology for efficiency of cross border trade, customer satisfaction, or organizational performance. Organizations and their employees must develop the ability to learn rapidly and create strategic assets that can be leveraged for the better. According to Teece (2018), these strategic assets—including capabilities, technology, and customer

feedback—must be effectively integrated into the company's operations. The success of an organization can be significantly influenced by how well it coordinates and integrates these assets internally. Zahra and Nielsen (2002) further emphasize that both internal and external human resources, along with technological resources, play a critical role in the successful commercialization of technology.

The theory draws a clear distinction between dynamic capabilities and operational or ordinary capabilities. While operational capabilities pertain to the day-to-day functions and processes of an organization, dynamic capabilities are concerned with the organization's ability to innovate, transform, and strategically reorient itself in response to environmental changes. Helfat et al. (2007) further elaborate on this by defining dynamic capabilities as the organization's deliberate efforts to create, extend, or modify its resource base.

A key premise of the Dynamic Capabilities Theory is that an organization's core competencies should be leveraged to secure short-term advantages, which can then be developed into more sustainable, long-term positions. This framework suggests that the ability to remain successful over time is not solely dependent on current capabilities but also on the firm's agility and strategic foresight in reconfiguring its resources to meet future demands. Thus, dynamic capabilities are seen as essential for organizations aiming to navigate and succeed in volatile and unpredictable environments.

Teece's (2018) concept of dynamic capabilities highlights the importance of corporate agility, emphasizing a business's ability to identify and respond to opportunities and threats and seize those opportunities. This is achieved by enhancing, combining, protecting, and, when necessary, reconfiguring both intangible and tangible assets. The theory underscores the strengths and vulnerabilities of a firm's ability to protect its

intellectual property during product modification. Organizations need to possess diverse capabilities in positioning, processes, and agility to effectively penetrate and maintain market share for sustained profitability. In rapidly changing markets, the ability to reconfigure a firm's asset structure and execute necessary internal and external transformations is crucial (Amit & Schoemaker, 1993). The dynamic capabilities approach is relevant to this study because it addresses the unexpected changes in the business environment that require organizations to adjust their internal structures to maintain agility and success.

2.4 Empirical Review

Empirical review consists of studies that are based on empirical evidence meaning they rely on observation or experimentation to collect data and draw conclusions. These studies typically involve the collection of primary data through methods such as surveys, experiments, interviews or observations. It aims to answer specific research questions, test hypotheses or explore phenomena by analysing the collected data (Razzaq, 2021). Examples of empirical literature include experimental studies, observational studies or qualitative research that involve the collection and analysis of original data. Many studies have been conducted by researchers on iCMS, ECTS, Scanning Systems and Tax Agency Agility and their influence on efficiency of Cross Border trade. All these studies aimed at improving the efficiency of cross border trade, collection of revenue by Customs and ensuring border control is maintained.

2.4.1 Integrated Customs Management System execution and efficiency of Cross Border Trade

This system automates all customs administration functions, encompassing every task Customs Officers perform in managing the import and export control procedures. Its

primary goal is to integrate internal and external systems, thereby accelerating cargo clearance. This is achieved through pre-arrival cargo processing and the utilization of Authorized Economic Operators (AEO) (Omosa, 2020). The automation of customs declarations, document processing, and goods clearance leads to significant time savings and enhances the predictability of cross-border trade processes, while also reducing opportunities for traders and Customs officials to manipulate the system (Lihanda, 2022). The Integrated Customs Management System (iCMS) introduces best practice features, such as the automatic upload of cargo import data from shipping manifests to prevent falsification, automatic information exchange with iTax to combat non-compliant traders, and a virtual electronic auction platform that makes customs cargo auctions accessible to a broader audience (KRA, 2018). By streamlining the shipping and clearance process through software applications, this system significantly eases cargo clearance at ports, minimizing delays caused by long queues.

Research on the impact of automated customs systems has been conducted in various countries. For instance, Akbay (2009) examined the computerization of foreign trade transactions in Turkey, noting that the Turkish Customs Administration (TCA) initiated an electronic lodgment program for cargo documentation in November 1999. The study found that after implementation, clearance times significantly decreased, indicating that the reform alleviated the burdens on traders. Similarly, Mohammed (2022) explored the impact of the ASYCUDA system on the performance of the Sudanese Customs Authority. Using a quantitative research design, data was collected through questionnaires from 24 customs officials, and descriptive and inferential statistics were used for analysis. The results suggested that the ASYCUDA system positively influenced the performance of Sudanese Customs, recommending its continued use and enhancement.

In Kenya, Mutai (2022) investigated the effects of automated customs systems on trade facilitation. The study employed a descriptive research design, targeting 683 clearing agents and customs officers. The findings indicated that iCMS had reduced cargo clearance times, thereby lowering the cost of doing business in Kenya. Additionally, the study found that while iCMS, the Single Window System, and ECTS all facilitated trade, iCMS had the most significant impact. (James, 2010) also examined the impact of automation on Kenya Revenue Authority (KRA) customs clearing procedures, finding improvements in efficiency, effectiveness, staff skills, governance, and cost reduction. Furthermore, Angalwa (2022) conducted a study on the effects of customs automation on revenue performance in Kenya, targeting 1,132 officers in clearing and forwarding firms and customs administration in Nairobi. The research revealed that automated systems, including iCMS, had a 53.8% impact on revenue performance, indicating a significant increase in revenue collection since the system's implementation.

The potential benefits of electronic customs procedures include paperless processing of reliable information, cost and delay reduction along the supply chain, and decreased risks associated with cross-border trade. According to Riom (2020), the adoption and proper use of IT could save tax agencies billions annually. This efficiency is already being realized as most traders and administrators using integrated systems report reduced transaction processing times. However, to fully capitalize on these benefits, appropriate measures must be implemented to ensure the effective utilization of automated systems, which will enhance transparency, reduce the likelihood of corruption among Customs officials, and further facilitate cross-border trade.

2.4.2 Electronic Cargo Tracking System execution and efficiency of Cross Border Trade

The Electronic Cargo Tracking System (ECTS) is a technological solution designed to provide real-time monitoring of cargo from its point of origin to its destination, effectively enhancing the security and efficiency of goods in transit (Evans et al., 2016). This system was introduced to aid Customs authorities and private transport companies globally in overseeing the movement of goods remotely, thereby preventing theft and unauthorized dumping of cargo during transit. ECTS employs three core technologies: Global Positioning System (GPS), General Packet Radio Service (GPRS), and Radio Frequency Identification (RFID). GPS determines the cargo's location on a map, GPRS transmits data to the server, and RFID ensures the security of the cargo.

The Regional Electronic Cargo Tracking System (RECTS) is an initiative spearheaded by the Kenya Revenue Authority (KRA) in collaboration with revenue administrations in Uganda and Rwanda, with plans to eventually include all East African Community (EAC) member states and surrounding regions (Syong'oh, 2018). The implementation of a cargo tracking and security system by KRA was driven by the Kenyan government's objective to enhance tax collection, enforce cargo handling regulations more effectively, and maintain Kenya as the preferred trade corridor in East Africa. These efforts are crucial for promoting trade within the region. RECTS is comprised of satellites, a monitoring center, and specialized electronic seals affixed to cargo containers and trucks, which provide accurate location tracking of goods at all times. Since its introduction, the system has notably reduced transit time from 11 days to 4 days and significantly decreased cases of cargo dumping. Additionally, traders have greatly benefited from the system, as it allows for real-time responses from Customs and other authorities in cases of attempted theft or accidents.

Several studies have explored the relationship between the Electronic Cargo Tracking System and cross-border trade. For instance, Bhero et al. (2015) examined the impact of a radio frequency identification system and information interchange on the cargo clearance process at South African border posts. Utilizing a descriptive research methodology, the study involved interviews with border post officials. The findings revealed that average transit time for all types of cargo decreased from 17.40 hours to a minimum of 12.53 hours for 80% of pre-declared cargo. However, transit time slightly increased to 13.60 hours when 100% of the cargo was pre-declared, due to a fixed number of Customs officials processing an increased volume of cargo. In Ghana, (Gidisu, 2012) conducted a case study on the Customs department, highlighting that the implementation of an electronic tracking and monitoring system significantly reduced delays and prevented revenue leakages associated with transit operations.

In Kenya, Kabiru (2016) investigated the effect of ECTS on the operational performance of KRA and transporters operating between Kenya and other East African countries. The study used an exploratory research design and qualitative data collected through questionnaires. The results indicated that the tracking system has improved the overall operational performance of both KRA and the transporters, particularly for outbound cargo. Another study by Mugambi, (2017) focused on the effects of the cargo tracking system on cross-border trade between Kenya and Uganda. This research, also adopting an exploratory design, involved border officials at the Kenya-Uganda border and personnel at the cargo tracking department's head office. The findings showed that the ECTS implemented by KRA has successfully reduced cargo diversion to the local market, decreased the time required to clear cargo at border points, and made the collection of duties and fines more efficient due to the system's implementation.

2.4.3 Scanning System execution and efficiency of Cross Border Trade

Non-intrusive technologies like X-ray cargo scanners are instrumental in reducing the time and costs associated with physical inspections of cargo. As noted by Wolfe (2022), Non-Intrusive Inspection (NII) refers to non-destructive methods of inspecting and identifying goods within transportation systems. Compared to traditional physical inspections, NII is more efficient, cost-effective, and time-saving. This technology not only serves as a deterrent against illegal activities but also aids in detecting special nuclear materials and alleviating congestion at ports. With the rapid growth of global trade, there are increasing threats to supply chain security, making it imperative for Customs administrations to inspect containers, trucks, and other cargo-carrying vehicles to prevent the entry of contraband, smuggled goods, drugs, explosives, or misdeclared cargo (Bastan, 2019).

A study by SARS (2016) at the Port of Elizabeth harbor sought to evaluate the impact of scanners on customs processes. The research, which employed a descriptive design, included Customs officers and cargo owners as its population. The study concluded that scanning improved sea efficiency and had a notable impact on the transport system. However, the costs associated with scanners were identified as potential barriers to trade and revenue collection. Similarly, Cirincione et al. (2020) investigated the effects of cargo scanners on the customs department through a descriptive research approach. They found that while the direct costs of scanning containers were manageable, the combined costs of scanning followed by physical inspection were higher, creating indirect costs like delays, which were discouraging for stakeholders.

In Kenya, Oduor (2020) conducted research on the impact of cargo scanning on revenue collection at the Port of Mombasa. This study, which also utilized a descriptive research

design, focused on how cargo scanners influenced revenue collection. The population included 473 Customs officers at the port. The findings revealed that scanning procedures had a moderately positive effect on revenue collection, with scanner downtime having a significant negative impact. Additionally, the performance of scanner operators was found to have a positive effect on revenue collection. Another study by Kuira (2019) explored the influence of automated systems on customs performance in Kenya. Using a survey design, the research involved KRA officers in the Customs and Border Control department. The analysis of descriptive statistics demonstrated that scanner systems significantly influenced the performance of the Customs and Border Control department.

X-ray scanning technology has revolutionized cross border trade by expediting customs processes and minimizing disruptions to the flow of legitimate trade. Customs authorities can effectively process large volumes of shipments allowing cross border trade. The scanning system also contributes to trade facilitation by promoting accuracy and transparency in customs procedures. The detailed x-ray images provide Customs officers with a clear view of the cargo's internal structure enabling them to accurately assess the declared contents and compare them with the actual cargo. The utilization of the technology is essential for striking the balance between efficiency of cross border trade and security, enabling countries to benefit from the advantages of international trade while protecting their national interests (Cotecna, 2023).

2.4.4 Moderating effect of Tax Agency Agility

Agile firms possess a remarkable ability to withstand shocks and disruptions in their business environments, demonstrating adaptability to new opportunities and an entrepreneurial spirit in developing innovative business models or making significant

operational improvements. These firms often employ strategies like mass customization and postponement, which provide the flexibility needed to respond swiftly to changes in demand (Goldsby & Stank, 2020). Additionally, organizations leverage Information Systems (IS) as a crucial platform for fostering agility, helping them achieve reductions in time and improvements in product quality. IS also facilitates the communication necessary to coordinate work activities, ultimately enhancing operational performance (Frayret & Preiss, 2001). The growing attention to Tax Agency Agility is further fueled by the increasing sophistication of information technologies, which offer superior information management, analytical decision support, and enhanced communication capabilities. These technologies enable firms to create new business models and gain competitive advantages (Weill & Vitale, 2002).

A systematic literature review on organizational agility in industry, conducted by (Mrugalska & Ahmed, 2021) from Poznan University of Technology, highlights the importance of agility for organizations adopting industry technologies. The study reveals that agility is crucial for companies to effectively cope with the changes brought about by the adoption of these technologies. Furthermore, it shows that by embracing industry technologies, companies can significantly enhance their agility across various aspects, such as smart manufacturing, the Internet of Things (IoT), cyber-physical systems, big data and analytics, and cloud computing. Key aspects of agility identified in the study include supply chain agility, workforce agility, information system agility, facilities agility, management agility, manufacturing agility, and technology agility.

In a related study, Sambamurthy, Bharadwaj, & Grover (2020) argue that information technology management capabilities are essential for developing the digitalized processes and knowledge systems that enhance a firm's agility. These capabilities

provide a solid foundation for firms to navigate the complexities of the digital age, enabling them to respond more effectively to market changes and maintain a competitive edge. Picolli & Ives (2021) concluded a study proposing that Information Technology management capabilities are an important part of basis through which firms can launch and sustain competitive success through IT-dependent initiatives. Wu & Wang (2017) conducted a study titled achieving market agility through organizational mindfulness towards Information Technology innovation and information processing capacities. They deployed an Information Technology related process called Information Processing View (IPV) which facilitates and stimulates market agility which was analogous to acting agility in a firm. Another study was conducted by Robert (2009) in the US to determine how process innovation, using Information Technology relates and facilitates both sensing and acting agility in a firm. The research affirms that process innovation stimulates acting agility.

In Kenya, a research effort led by Okotoh (2021) investigated the impact of Tax Agency Agility on the operational effectiveness of Trademark East Africa. Employing a descriptive research methodology, this study focused on 71 employees from Trademark East Africa and associated organizations. The results revealed that Tax Agency Agility plays a significant role in enhancing operational performance. The research underscored that an organization's capacity to adjust to unforeseen changes is vital for sustaining high operational efficacy. Additionally, organizational adaptability was shown to be crucial for consistently capitalizing on competitive opportunities, leading to improved performance. The study also pointed out that a flexible management framework is key to leveraging organizational strengths, discovering novel and better approaches for task execution, and fostering innovation.

2.5 Critique of the Existing Literature

The automation of customs processes and general trade procedures comes with some criticism especially from the practitioners. According to some reviewed literature, system automation requires a large capital allocation by the state in order to be sustained. Also, system automation creates a risk of replacing human labour in cases such as the implementation of the scanning system. The system does the inspection hence reducing physical inspection completely. In a different study, SARS (2016) evaluated the impact of scanning technologies on customs procedures at the Port of Elizabeth. The findings indicated that while the scanners enhanced the efficiency of transport systems, the associated costs could act as a trade barrier and affect revenue collection.

Oduor (2020) research shows that delays caused by traffic still prevail at the goods clearance points in the Kenyan ports caused by various reasons related to technology such as system downtime and also individual agencies who fail to collaborate to achieve a collective goal. Despite ongoing reforms, trade processes in Kenya continue to be lengthy, cumbersome, and expensive, adversely affecting the competitiveness of Kenyan exports in the region. The rising focus on Tax Agency Agility is linked to the advancements in information technologies, which provide advanced information management capabilities, analytical decision support, and improved communication. These technological innovations enable companies to develop new business models and achieve competitive edges.

2.6 Summary of Literature Review

The reviewed literature offered valuable insights into Customs automation systems, Tax Agency Agility, and their impact on cross-border trade efficiency. It highlighted

that these systems can deliver both immediate and long-term advantages at organizational and individual levels, such as enhanced performance, financial and time efficiency, and increased convenience. These theories indicate that the continuous change in the market environment has led to the adoption and change in technology often leading to improvement of operations at the work place. Therefore, by adopting automated systems such as the iCMS, ECTS and the Scanning Systems, all work towards enhancing efficiency and facilitating cross border trade.

The study covered some of the research that had been conducted by researchers on iCMS, ECTS, Scanning Systems and Tax Agency Agility and their influence on efficiency of cross border trade. According to the study carried on iCMS, it was discovered that the system helps in the smooth shipping and clearing of goods in and out of the country and that since implementation, the clearance time has reduced significantly. In the study done on ECTS, it was discovered that the system has helped reduce the level of diversion of cargo to the local market and has enforced security of the cargo.

On a study done on the scanning system, it was discovered that the system has revolutionized cross border trade by expediting customs processes and minimizing disruptions on the flow of trade. That scanners have reduced physical inspection which has helped reduce traffic at the ports. Lastly, a study conducted on Tax Agency Agility proposes that Information Technology management capabilities are an important part of basis through which organizations can launch and sustain competitive success through IT-dependent initiatives. All these studies aimed at improving the efficiency of cross border trade, collection of revenue by Customs and ensuring proper maintenance and control of the border.

2.7 Research Gaps

Akbay (2009) investigated the digitalization of foreign trade transactions in Turkey. To boost efficiency, the Turkish Customs Administration (TCA) launched an electronic cargo documentation system in November 1999. The implementation led to a substantial reduction in clearance times, indicating that the reform significantly alleviated the burden on traders. Another study by Mohammed (2022) examined the effects of the ASYCUDA system on the performance of the Sudanese Customs Authority. Using a quantitative approach with data gathered through questionnaires from 24 customs officials, the analysis through descriptive and inferential statistics suggested that the ASYCUDA system positively impacted Sudanese Customs performance and should be further developed. However, both studies were limited by their focus on Turkey and Sudan.

Kabiru (2016) explored the influence of Electronic Cargo Tracking Systems (ECTs) on the operational performance of the Kenya Revenue Authority (KRA) and transporters across East African countries. This exploratory study utilized qualitative data from questionnaires but faced a methodological limitation.

A study by SARS (2016) at the Port of Elizabeth aimed to assess the impact of scanners on customs processes. The findings indicated that scanning improved maritime efficiency but also introduced costs that could act as trade barriers and affect revenue collection. However, the study lacked clarity on how scanners specifically influenced revenue collection, revealing a conceptual gap.

Mrugalska & Ahmed (2021) from Poznan University of Technology conducted a systematic literature review on organizational agility within the industry. Their research highlighted the importance of agility for adopting industry technologies and how it

enables companies to adapt to technological changes. The study suggested that adopting various technologies enhances agility across different aspects. Nonetheless, it did not provide detailed explanations of the specific technologies involved, presenting a conceptual gap.

2.8 Conceptual Framework

A conceptual framework is a network of interrelated concepts or theories that explains how a specific phenomenon operates and how its components interact (Svinicki, 2010). This framework, often presented as a diagram, allows for the visualization of proposed relationships and interactions (Sekeran & Bougie, 2011). Wanjiku (2016) also describes a conceptual framework as an analytical tool that comes in various forms and applications. The conceptual framework below shows the relationship between independent variables; ICMS, Electronic Cargo Tracking Systems (ECTs), Scanning Systems, Moderating Variable; Tax Agency Agility and the dependent variable efficiency of Cross Border Trade.

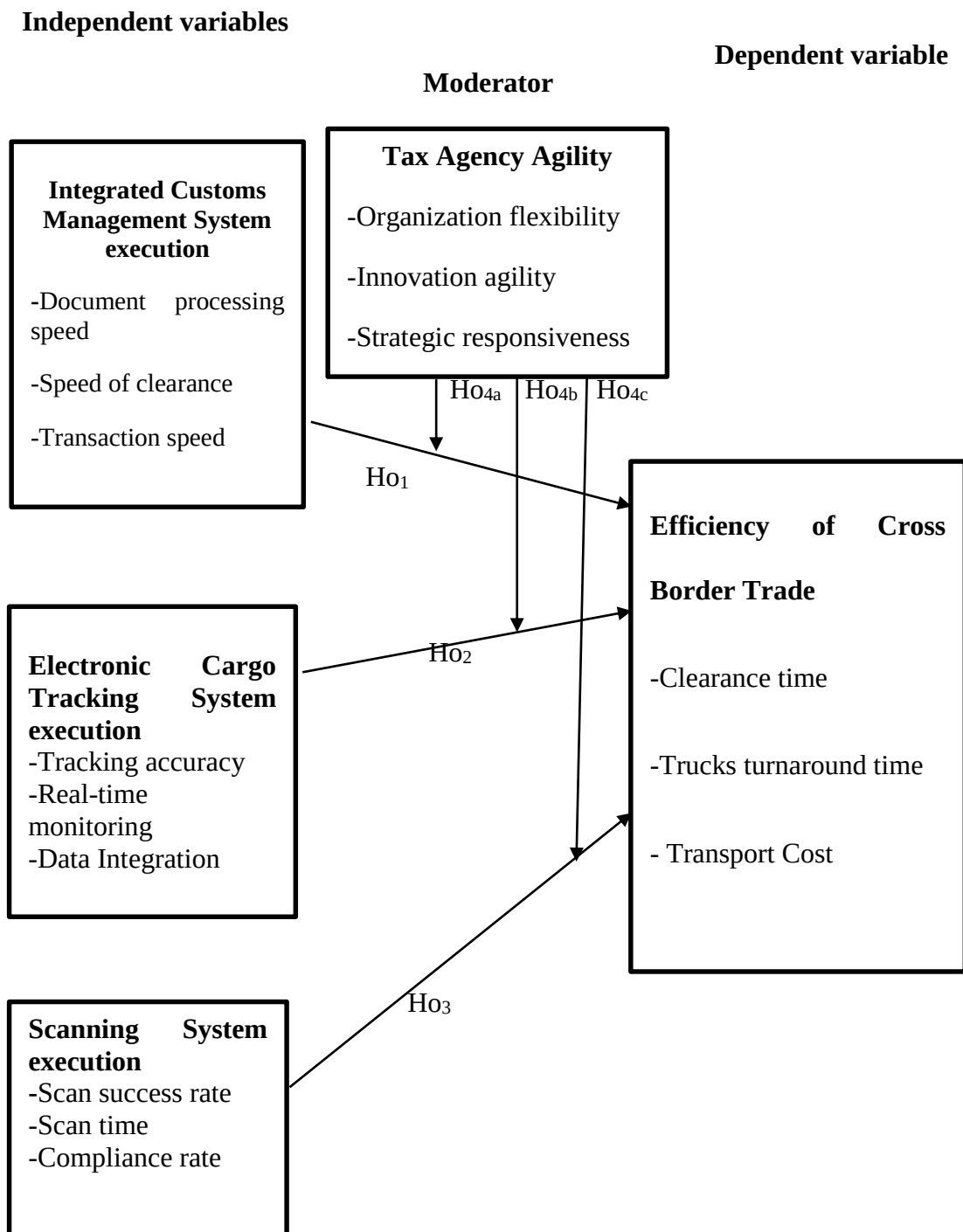


Figure 2.1: Conceptual Framework

Source: Researcher (2024)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

Research methodology refers to the specific procedures or techniques employed to identify, select, process, and analyze information about a topic. It encompasses the study's design, methods, tools, and techniques used for data collection. This includes aspects such as research design, target population, sampling frame, sample and sampling techniques, research instruments, data collection procedures, pilot studies, and data processing and analysis.

3.2 Research Design

Research design is a structured plan for addressing a research question. According to Cooper and Schindler (2010), research design is a framework that provides solutions to problems by answering research questions. For this study, an explanatory research design was utilized. Explanatory research aims to understand how and why a phenomenon occurs, particularly when information is limited. It helps clarify the reasons behind occurrences, enhance understanding of the topic, and predict future events (Tegan & Merkus, 2021). This method is preferred for uncovering causal relationships between variables and determining the reasons behind observed events. Although data might be available, explanatory research seeks to uncover and understand specific causal relationships that have not been thoroughly investigated. It focuses on determining cause-effect relationships by testing hypotheses, thus providing a deeper level of insight (Fidias, 2020). Explanatory research was chosen for this study to assess the impact of customs automated systems on the efficiency of cross-border trade at the Nairobi Inland Container Depot. It involved a detailed and systematic

description of facts and characteristics of the relevant population to discover associations and relationships among the variables (Boru, 2018).

3.3 Target Population

The term "population" refers to the complete set of individuals, events, or objects that a researcher wants to generalize their findings to (Borge & Gall, 1999). It is defined based on factors such as availability of elements, time frame, geographical boundaries, and the topic of interest (Mugambi, 2017). This research targeted Customs Officers and licensed Clearing Agents at the Nairobi Inland Container Depot. Fincham (2008) states that the target population of the study was 950 Customs officers and licensed Clearing Agents (KRA, 2023). The target population is illustrated in the table below.

Table 3.1: Target Population

Target Population	Nairobi Inland Container Depot
Customs Officers	200
Clearing Agents	750
TOTAL	950

Source: (KRA, 2023)

3.4 Sample and Sampling Technique

A sample is a subset of the target population selected to represent that population (Dell, Holleran & Ramakrishnan, 2002). Sample size refers to the number of participants or observations included in the study (Gentles, 2015). This study employed stratified random sampling, where the population was divided into distinct subgroups or strata. A 95% confidence interval and an error level of 0.05 were assumed. The sample size (n) was determined using the Yamane formula:

$$n = \frac{N}{1 + N(e)^2}$$

n is the Sample size, N the Population size and e the Margin of Error (MOE) which is 0.05

The sample was divided into four specific strata; n_1 , n_2 , n_3 , and n_4 using proportions to distribute the sample size.

The sample size was therefore calculated as:

$$n = \frac{950}{1 + 950(0.05)^2}$$

$$n = 281$$

This study thus reached a total of 281 respondents proportionately drawn from Nairobi Inland Container Depot.

3.5 Sampling Frame

A sampling frame is a list of all potential participants within a population from which samples are drawn. It may include individuals, households, or institutions (Sarndal, Swensson & Wretman, 2003). Maxwell (2012) also describes it as a list of people used to gather information for the study. Since researchers often lack direct access to the entire population in social science research, they rely on a sampling frame to represent the population of interest (Munyanya, 2022). Sampling frames can be categorized into list and non-list types. This study utilized a list sampling frame, which comprised segmented respondents from the Customs Department and Clearing and Forwarding firms.

Table 3.2: Sample Frame

Target Group	Target Population	Sample Size $(\frac{n}{N} \times \bar{n})$
Customs Officers	200	59
Clearing Agents	750	222
Total	950	281

3.6 Research Instruments

A research instrument is a tool used to gather, measure, and analyze data pertinent to the research topic. Frels (2013) describes a research instrument as a specific tool employed in the data collection process for a study. In this research, primary data was gathered using questionnaires, which consist of initial items relevant to the subject under investigation. According to Cohen (2013), a structured questionnaire is used for collecting primary data. Franklin (2012) defines a questionnaire as a collection of written or printed questions with multiple-choice answers, designed for surveys or statistical analysis. The questionnaire serves several key purposes: collecting relevant data, ensuring comparability and analytical capability, minimizing bias in question formulation and responses, and making questions engaging and diverse (Jepkosgei, 2022). Closed-ended questions were chosen to simplify administration and to gather necessary information efficiently. Questionnaires are valued for maintaining confidentiality, saving time, and being easy to administer (Mugenda, 2003).

3.7 Data Collection Procedure

Data collection procedures involve the steps taken to ensure that data is gathered effectively and accurately using the chosen instrument (Robson, 2002). For this study,

primary data was collected using questionnaires administered through a drop-and-pick method. Respondents were given time to complete the questionnaires, which were then collected for analysis. The questionnaires were prepared in advance, and a data collection schedule was established to visit sections of the customs department and clearing and forwarding firms at the Nairobi Inland Container Depot. Approval for the research was obtained from the Kenya School of Revenue Administration's department of customs studies, and consent was sought from relevant departments to administer the research instrument.

3.7.1 Missing data and outliers

If the data are Missing Completely at Random (MCAR), both the missing and observed data are representative of the overall population. In this case, standard statistical analyses using the observed data are still valid. However, if the data are Missing at Random (MAR) or Not Missing at Random (NMAR), the summaries derived from the available data may be biased. Little's test was used, to determine whether data within the distribution was Missing Completely at Random or not Missing at Random if $p\text{-value} > 0.05$ we fail to reject the null hypothesis, meaning there is no significant evidence to suggest that the data are not MCAR. This suggests that the missing data are random and independent of the observed and missing values, allowing for the use of standard statistical techniques without bias. In the event of missing data method used to correct this are, Imputation which refers to "filling in" missing data. Proper methods of imputation use multiple imputation to account for the uncertainty in the missing data. Imputation methods require that a model be adopted that links the missing data to the observed data.

Outliers

An assumption of regression is that there are no influential observations. These are extreme values which pull the regression line towards them therefore having a significant impact on the coefficients of the model. Outliers are observations where the observed dependent value does not follow the general trend given the independent value (unusual). In this situation, the residual for that observation is likely to be large unless it is also influential and has pulled the line towards it.

3.8 Pilot Study

A pilot study is a preliminary study conducted to test research protocols, data collection tools, sample recruitment strategies, and other methodologies in preparation for a larger study (Hazzan, Schattner & Mazza, 2006). The purpose of a pilot study is to enhance the effectiveness and efficiency of the research. This study picked 28 respondents from Jomo Kenyatta International Airport that was used for the purpose of pilot testing. The researcher chose Jomo Kenyatta International Airport because clearing operations are done there and it was easier to access the target respondents listed in this study. The respondents did not form part of the final population study. They were administered with a sample of the questionnaires to evaluate so as to ensure that they are concise, clear, comprehensive and reliable. Based on the feedback that was received, modifications were made to ensure that the final instrument is valid the study.

3.8.1 Reliability of the Research Instrument

Reliability refers to the extent to which an instrument produces consistent results over time and across different items within the instrument (Sanders et al., 2009; Triola, 2011). A measure is deemed reliable if it consistently yields the same results and accurately represents the population being studied. In this study, the research instrument

was considered reliable in the event that the nature of response(s) given repeatedly remains the same and stable over time, when the same questionnaire is administered again after some time. According to Cooper and Schindler (2010), a Cronbach's alpha coefficient value of 0.7 or higher indicates reliability. This study utilized Cronbach's alpha to assess the reliability of the research instrument.

3.8.2 Validity of the Research Instrument

Validity pertains to the degree to which a study's results accurately measure what they are intended to measure (Borg et al., 1989). It reflects the extent to which the indicators used effectively measure the intended concept (Cooper & Schindler, 2010). Validity describes the accuracy of a measure and how well it represents the concept. There are four main types of validity: content validity, face validity, criterion validity, and construct validity. Content validity, as defined by Creswell (2013), refers to the extent to which the questions on an instrument represent all possible questions about the content and how the scores reflect these questions.

Face Validity according to (Cook & Lawless, 2006) is validity without empirical testing. Criterion Validity according to (Pallant, 2011) is one which correlates test results with another criterion of interest. Finally, Construct validity, defined by Anastasi and Urbina (1997), assesses whether a test measures a theoretical trait by comparing it to other tests measuring similar qualities to determine how closely correlated the measures are. This study adopted content validity to ensure the accuracy of the data collected. The study also tested factor analysis to determine the validity.

Factor analysis methods are invaluable for researchers aiming to create high-quality measures for constructs that aren't directly observable. An Exploratory Factor Analysis (EFA) offers a snapshot of the statistical relationships between key behaviors, attitudes,

and dispositions related to the construct of interest. Factor analysis is a dimension reduction technique that simplifies the original dataset by expressing it as the product of two significantly smaller matrices along with some random noise. This method captures the variability among observed variables by projecting data from a high-dimensional space to a lower-dimensional one. Engelhardt (2013).

3.9 Regression Assumptions

Diagnostic are typically conducted to empirically assess the quantitative impact of research design flaws, thereby affecting diagnostic precision (Lijmer et al., 1999).

3.9.1 Multicollinearity Test

This scenario arises when there is a strong correlation among the independent variables in a multiple linear regression model. High correlations among predictor variables can lead to unrealistic regression coefficients, resulting in misleading outcomes when attempting to determine the individual effects of variables on the dependent variable (Creswell, 2014). The Variance Inflation Factor (VIF) is used to detect and quantify the degree of collinearity in a multiple regression model. It assesses how much the variance of the estimated regression coefficients is increased compared to a situation where the predictor variables are uncorrelated. A VIF of 1 indicates no correlation among variables, a VIF between 1 and 5 signifies moderate correlation, and a VIF between 5 and 10 indicates high correlation. Higher VIF values suggest stronger correlations between variables. Generally, a VIF above 4 or a tolerance below 0.25 suggests possible multicollinearity that needs further examination. If the VIF exceeds 10 or tolerance drops below 0.1, it indicates significant multicollinearity requiring correction.

3.9.2 Normality Test

The normality test assesses whether a dataset follows a normal distribution (Doornik & Hansen, 2008). Data is considered normally distributed if the p-value exceeds 0.05. A p-value greater than 0.05 confirms the data's normality. The Shapiro-Wilk W is the ratio of the best estimator of the variance to the usual corrected sum of squares estimator of the variance (Shapiro and Wilk 1965).⁵ The statistic is positive and less than or equal to one. If the p-value is less than the chosen alpha level, the null hypothesis is rejected, indicating that the data do not follow a normal distribution. Conversely, if the p-value exceeds the alpha level, the null hypothesis that the data originate from a normally distributed population is not rejected.

3.9.3 Homoscedasticity

Homogeneity of variance, also known as the constancy of variance, assumes that residuals are similar across all levels of the explanatory variables. In regression analysis, the assumptions of homoscedasticity occur when at each level of the predictor variable, the residuals have similar variances (Grimm, & Yarnold, 1995). Levene's test is one method to assess this assumption, as many statistical procedures presume equal variances across different samples. Levene's test evaluates this assumption and tests the null hypothesis that population variances are equal. If the p-value from Levene's test is less than a significance level, typically 0.05, the differences in sample variances are unlikely to result from random sampling from populations with equal variances. Consequently, the null hypothesis of equal variances is rejected, suggesting a variance difference in the population (Levene & Howard, 1960).

3.9.4 Linearity Test

Landau (2004) defines linearity as the consistent rate of change that reflects the relationship between an independent and a dependent variable. The test presumes linearity. Multiple linear regression model demands that the relationship between dependent and independent variables be linear to ensure that the analysis is valid and reliable. Linearity is used to determine if the relationships between the dependent variable and independent variables in regression models follow a straight-line pattern. P-value >0.05 indicates that the data doesn't significantly deviate from a linear relationship.

3.10 Data Analysis

Data analysis involves the methodical organization and examination of completed research instruments post-fieldwork, aiming to enhance understanding and facilitate presentation (Sekaran & Bougie, 2010). In regards to this study, the response collected through the questionnaires was properly checked to ensure that they are correctly filled out which was then used in data analysis. The checking of the data collected consisted of completeness and coding. The data was analyzed using both descriptive and inferential statistics. Coded data was entered into tables and analyzed using frequencies and percentages via the Statistical Package for Social Sciences (SPSS) software. The software generated descriptive statistics, including mean scores, standard deviations, percentages, and frequency distributions, which were then presented in tables, charts, and graphs for clearer interpretation. Inferential statistics helped in formulating the study's hypotheses. To explore the relationship between independent and dependent variables, multiple regression analysis was employed. This analysis aimed to determine how the efficiency of cross-border trade is influenced by Integrated Customs

Management Systems (ICMS), Electronic Cargo Tracking Systems (ECTs), scanning systems, and tax agency agility at Nairobi Inland Container Depot.

The regression analysis took the format below:

Equation (i)

$$EC = \beta_0 + TV + \beta_1 IC + \beta_2 EC + \beta_3 SS + \varepsilon$$

Equation (ii)

$$EC = \beta_0 + TV + \beta_1 IC + \beta_2 EC + \beta_3 SS + \beta_4 TA + \varepsilon$$

Equation (iii)

$$EC = \beta_0 + TV + \beta_1 IC + \beta_2 EC + \beta_3 SS + \beta_4 TA + \beta_5 IC * TA + \varepsilon$$

Equation (iv)

$$EC = \beta_0 + TV + \beta_1 IC + \beta_2 EC + \beta_3 SS + \beta_4 TA + \beta_5 IC * TA + \beta_6 EC * TA + \varepsilon$$

Equation (v)

$$EC = \beta_0 + TV + \beta_1 IC + \beta_2 EC + \beta_3 SS + \beta_4 TA + \beta_5 IC * TA + \beta_6 EC * TA + \beta_7 SS * TA + \varepsilon$$

Where;

TV = Trade volume

EC = Efficiency of Cross Border Trade

β_0 = Constant term

$\beta_1, \beta_2, \beta_3$ coefficients explaining the effects of independent variables IC, EC and SS to dependent variable EC

IC = Integrated Customs Management System

EC = Electronic Cargo Tracking System

SS = Scanning System

TA = Tax Agency Agility

ε = Error term, other factors that might influence cross border trade but are not included in the study.

3.11 Operationalization and Measurement of Variables

The description of variables and their measurement includes: Integrated Customs Management System (ICMS) execution, which supports import and export processes, speeds up transactions, and reduces international trade costs. It improves compliance and facilitates cooperation in customs processing. It is measured by document processing speed, speed of clearance and transaction speed as adopted by (Lihanda, 2022).

Electronic Cargo Tracking System execution facilitates the tracking of goods under customs control by using GPS and GPSR technology which proves to be a much more efficient e-solution in terms of cost and time. It is measured by tracking accuracy, real-time monitoring and data integration as adopted by (Sakhasia, 2017).

Scanning systems produce x-ray images of goods to shorten manual inspection times. It is measured by scan success rate, scan time and compliance rate as adopted by (Cotecna, 2023). Tax agency agility, referring to a company's ability to swiftly adapt to

market changes, customer needs, and technological advancements by adjusting priorities, making prompt decisions, and implementing changes efficiently. It is measured by organization flexibility, innovation agility and strategic responsiveness as adopted (Mrugalska & Ahmed, 2021).

Efficiency of cross border trade focuses on effective regional trade between border regions where trade tends to be shorter distance and focuses on goods and services that serve local cross border markets. It is measured by clearance time, trucks turnaround time and transport cost as adopted by (KRA, 2021).

Trade volume has long been identified as a key factor influencing the efficiency of cross-border trade. Several studies have shown that higher trade volume can lead to both positive and negative effects on efficiency, particularly in customs operations and border management. Kihu (2020),

Table 3.3: Operationalization of the study variables

Variable	Type	Indicators	Source	Data collection instrument and scale	Analysis Method
Integrated Customs Management System execution	Independent Variable	• Document processing speed • Speed of clearance • Transaction speed	(Lihanda, 2022)	5-point Likert Scale Questionnaire	• Regression analysis • Correlation analysis
Electronic Cargo Tracking System execution	Independent Variable	• Tracking accuracy • Real-time monitoring • Data Integration	(Sakhasia, 2017)	5-point Likert Scale Questionnaire	• Regression analysis • Correlation analysis
Scanning System execution	Independent Variable	• Scan success rate • Scan time • Compliance rate	(Cotecna, 2023)	5-point Likert Scale Questionnaire	• Regression analysis • Correlation analysis
Tax Agency Agility	Moderating Variable	• Organization flexibility • Innovation agility • Strategic responsiveness	(Mrugalska & Ahmed, 2021)	5-point Likert Scale Questionnaire	• Regression analysis • Correlation analysis
Efficiency of Cross Border Trade	Dependent Variable	• Clearance time • Trucks turnaround time • Transport cost	KRA (2021)	5-point Likert Scale Questionnaire	• Regression analysis • Correlation analysis
Trade Volume	Control Variable	• Number of Containers Processed: • Frequency of Shipments	Kihu (2020),	5-point Likert Scale Questionnaire	• Regression analysis • Correlation analysis

3.12 Ethical Considerations

Ethical concerns pertain to moral principles and appropriate conduct in social interactions (Graham & Bennett, 2005). (Blaxter et al., 2010) describes ethical concerns as a result from conflicts of interest between the researcher and the researched.

Research permits to collect the data were sought from the Kenya School of Revenue Administration and National Commission for Science, Technology and Innovation (NACOSTI). The researcher guarantees that the respondents were not constrained in any way into participating in this study. All the targeted respondents were fully informed about the details of the research and agreed to participate. While working with the respondents, the data collector ensured that the information provided by these respondents was well safeguarded by assuring them that their personal identities including their names in the data collection instrument of this study shall not be disclosed. Confidentiality was upheld throughout the study as well as professionalism.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

In this chapter, we delve into the process of examining the data we gathered to address the main objectives and specific goals of the study. The study utilizes a questionnaire and analyses data to identify potential correlations. This section focused on reliability, and validity tests, descriptive statistics and demographics analysis, factor analysis and data transformation, statistical assumption testing, correlation analysis and regression analysis, and lastly discussion of findings.

4.2 Missing Data and Outliers' Analysis

If the data are Missing at Random (MAR) or Not Missing at Random (NMAR), the summaries derived from the available data may be biased. Little's test was used, to determine whether data within the distribution was Missing Completely at Random or not Missing at Random if $p\text{-value} > 0.05$ we fail to reject the null hypothesis, meaning there is no significant evidence to suggest that the data are not MCAR. This suggests that the missing data are random and independent of the observed and missing values, allowing for the use of standard statistical techniques without bias. In the event of missing data method used to correct this are, Imputation which refers to "filling in" missing data.

The results from Little's MCAR test on table 4.1 showed that there were no missing values across the items in the dataset, as all items recorded a missing count of zero. This supports the assumption that the data are complete, and thus, there was no need to apply imputation or other missing data handling techniques. Regarding outliers, the table reveals that some items had a few high-end extremes based on the interquartile

range (IQR) method, particularly ICMS1 (18 high extremes), ICMS4 (16 high extremes), ICMS5 (19 high extremes), and ECTS1 (19 high extremes). This indicates the presence of outliers above the upper bound for these items.

To address the identified outliers, a decision was made to retain these values after careful consideration of their potential impact. Each flagged extreme was reviewed to determine whether it represented a genuine variation within the data rather than erroneous data entry. Since these high values likely reflect natural variability rather than errors, they were retained in the analysis to preserve the dataset's integrity and avoid bias introduced by arbitrary data removal. Therefore, the data were deemed appropriate for further analysis without adjustments for outliers.

Table 4.1: Little's MCAR test

	N	Mean	Std. Deviation	Missing		No. of Extremes ^a	
				Count	Percent	Low	High
CBT1	234	4.03	.818	0	.0	9	0
CBT2	234	3.58	1.151	0	.0	0	0
CBT3	234	3.99	1.094	0	.0	0	0
CBT4	234	4.04	1.084	0	.0	0	0
CBT5	234	4.00	1.098	0	.0	0	0
ICMS1	234	3.84	1.030	0	.0	0	0
ICMS2	234	4.15	.929	0	.0	18	0
ICMS3	234	4.00	1.038	0	.0	0	0
ICMS4	234	4.11	.909	0	.0	16	0
ICMS5	234	4.19	.923	0	.0	19	0
ECTS1	234	4.17	.946	0	.0	19	0
ECTS2	234	3.62	.896	0	.0	0	0
ECTS3	234	3.92	.851	0	.0	.	.
ECTS4	234	4.03	.828	0	.0	13	0
ECTS5	234	4.02	.799	0	.0	9	0
SSE1	234	3.91	.787	0	.0	0	0
SSE2	234	4.16	.931	0	.0	18	0
SSE3	234	4.00	1.040	0	.0	0	0
SSE4	234	3.92	1.010	0	.0	0	0
SSE5	234	4.08	.973	0	.0	21	0
TAA1	234	3.77	.919	0	.0	0	0
TAA2	234	4.00	.783	0	.0	9	0
TAA3	234	4.05	.820	0	.0	9	0
TAA4	234	4.03	.815	0	.0	10	0
TAA5	234	3.84	.786	0	.0	1	0
TV1	234	4.02	.818	0	.0	9	0
TV2	234	3.69	1.168	0	.0	0	0
TV3	234	4.00	1.098	0	.0	0	0
TV4	234	3.98	1.116	0	.0	0	0
TV5	234	4.02	1.125	0	.0	0	0

a. Number of cases outside the range (Q1 - 1.5*IQR, Q3 + 1.5*IQR).

(Source: Research 2024)

4.3 Response Rate

Participation from roughly 80% of expected respondents and colleges is foreseen in each of the surveys issued. The doughnut chart in figure 4.1 indicates that out of the

281 questionnaires that were issued, 233 were correctly filled and submitted to the researcher indicating an 83% response rate

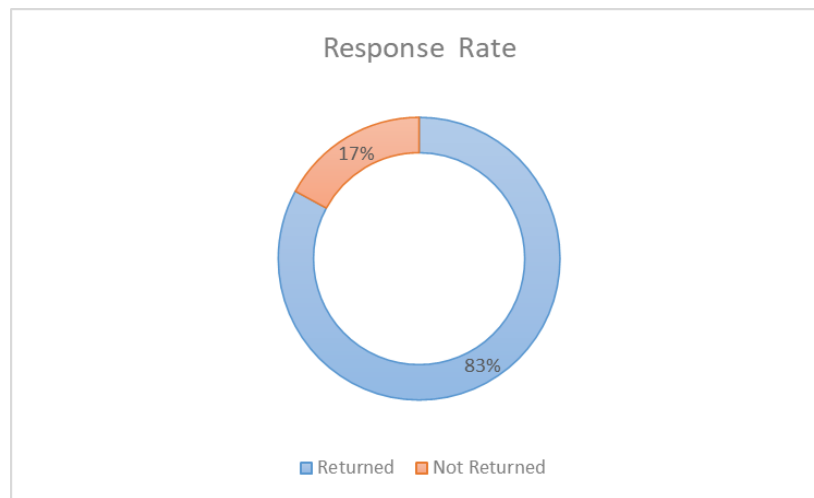


Figure 4.1: Response Rate

(Source: Research 2024)

4.4 Demographics Analysis

Table 4.2, indicate that the sample consists of 233 respondents. Of these, 50.6% (n = 118) are female, and 49.4% (n = 115) are male. The distribution of tenure among the respondents working in the Customs department is as follows: 16.7% (n = 39) have been working for 10 to 15 years, 22.7% (n = 53) for 2 to 5 years, 20.2% (n = 47) for 6 to 10 years, 20.2% (n = 47) for less than a year, and 20.2% (n = 47) for over 15 years. Regarding awareness of the Customs Automated Systems implemented at the Nairobi Inland Container Depot, 50.6% (n = 118) of the respondents reported that they are not aware, while 49.4% (n = 115) indicated that they are aware. The purpose of the frequency table in this study was to provide a clear overview of the sample characteristics. This summary was essential for understanding the demographics and background of the respondents, which supports the interpretation of results by contextualizing the participants' experiences, knowledge, and awareness levels.

Additionally, it allowed for the detection of any potential sampling bias and ensures that different perspectives are adequately represented.

Table 4.2: Frequency Distribution

	Frequency	Percent %
Gender		
Female	118	50.6
Male	115	49.4
Experience		
10 to 15 years	39	16.7
2 to 5 years	53	22.7
6 to 10 years	47	20.2
Less than a year	47	20.2
Over 15 years	47	20.2
Customs Automated Systems implementation awareness		
No	118	50.6
Yes	115	49.4
Total	233	100

(Source: Research 2024)

4.5 Reliability Results

The Cronbach's alpha was used to determine the reliability of the questionnaire responses.

In the study, reliability analysis was conducted to assess the internal consistency of the measurement scales for the variables under investigation. Cronbach's alpha coefficients were calculated for each variable, with a threshold of 0.7 considered acceptable for demonstrating adequate reliability. As shown in Table 4.3, the Cronbach's alpha coefficients for the variables ranged from 0.757 to 0.931, indicating satisfactory internal

consistency. Specifically, the Efficiency of Cross Border Trade had a Cronbach's alpha of 0.764, suggesting good reliability. Similarly, the variables for Integrated Customs Management System Execution (0.911), Electronic Cargo Tracking System Execution (0.766), Scanning Systems Execution (0.819), Tax Agency Agility (0.931), and Trade Volume (0.757) all met or exceeded the acceptable threshold of 0.7. The reliability of these scales was assessed through pilot testing, where initial data was collected using the designed questionnaire, and the reliability coefficients were calculated to ensure that the items consistently measured the intended constructs. The results of the reliability tests support the use of these scales in the analysis of the study's hypotheses, as they exhibit a high level of internal consistency across the variables. Thus, the Cronbach's alpha values affirm that the items within each variable were adequately correlated and reliable for further analysis in the study.

Table 4.3: Reliability Results

Variables	Cronbach's α	Questionnaire Items
Efficiency of cross border trade	0.764	5
Integrated Customs Management System execution	0.911	5
Electronic Cargo Tracking System execution	0.766	5
Scanning Systems execution	0.819	5
Tax Agency Agility	0.931	5
Trade Volume	0.757	5

(Source: Research 2024)

4.6 Descriptive Statistics

Descriptive statistics involves providing a brief overview of the significant aspects of a dataset. This consists of the mean, standard deviation skewness and Kurtosis, and the dispersion of the numbers. It can also use visual elements to simplify the information.

4.6.1 Descriptive statistics Integrated Customs Management System execution

Table 4.4 indicates the descriptive statistics for the Integrated Customs Management System (ICMS) execution indicate overall positive perceptions across various dimensions, as reflected in the responses to five questionnaire items, Respondents generally agree that "Document processing speed has reduced the clearance time of goods at the port" ($M = 3.84$, $SD = 1.032$). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness value of -0.531 indicates a slight negative skew, suggesting that more respondents rated this item positively. The kurtosis value of -0.661 indicates a platykurtic distribution, implying fewer extreme responses compared to a normal distribution. For the statement, "ICMS has reduced the transaction cost of clearance of goods," the mean score is 4.15 ($SD = 0.931$), indicating agreement among respondents. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.877 suggests a leftward skew, indicating more responses on the higher end of the scale. The kurtosis of -0.146 suggests a distribution close to normal, with moderate variability in responses. The item "ICMS has encouraged seamless data exchange, e-documentation, and online payment systems to reduce paperwork and simplify the trading process" has a mean score of 4.00 ($SD = 1.040$), indicating general agreement. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.687 points to a negative skew, indicating that higher ratings are more common. The kurtosis of -0.651 shows a platykurtic distribution, reflecting moderate spread in responses without extreme outliers.

Regarding the statement "Collaboration and information sharing between Customs and other government agencies involved has increased coordination," respondents again

show agreement with a mean of 4.11 (SD = 0.910). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.975 suggests a notable negative skew, indicating a tendency towards higher agreement. The kurtosis of 0.606 indicates a leptokurtic distribution, suggesting a peak around the mean with fewer extreme values. Lastly, for the statement "ICMS has eased the collection of duties and taxes hence fastened the clearance process at the port," the mean score is 4.19 (SD = 0.925), reflecting strong agreement. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -1.021 indicates a pronounced negative skew, showing a significant lean towards higher ratings. The kurtosis of 0.192 is close to normal, suggesting a typical distribution pattern with moderate variability. In general, the mean score across all items is 4.06, indicating that respondents generally agree with the positive impacts of the ICMS.

Table 4.4: Descriptive statistics Integrated Customs Management System execution

Items	N	Mean	Std. Dev	Skewness	Kurtosis
Document processing speed has reduced the clearance time of goods at the port.	233	3.84	1.032	-.531	-.661
ICMS has reduced the transaction cost of clearance of goods.	233	4.15	.931	-.877	-.146
ICMS has encouraged seamless data exchange, e-documentation and online payment systems to reduce paperwork and simplify the trading process.	233	4.00	1.040	-.687	-.651
Collaboration and information sharing between Customs and other government agencies involved has increased coordination.	233	4.11	.910	-.975	.606
ICMS has eased the collection of duties and taxes hence fastened the clearance process at the port.	233	4.19	.925	-1.021	.192
MEAN		4.06			

(Source: Research 2024)

4.6.2 Descriptive statistics Electronic Cargo Tracking System execution

Table 4.5 shows that for the item "ECT has a high level of real-time monitoring which provides real-time updates on the location, condition, and movement of the cargo" had a mean score of 4.17 (SD = 0.948). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. This indicates that respondents generally agreed that the ECT system offers effective real-time monitoring. The negative skewness of -1.106 suggests a distribution with a tail on the lower end, indicating that a higher number of respondents rated this item positively. The kurtosis value of 0.647 suggests a distribution that is slightly more peaked than a normal distribution. The item "ECT has a response time which evaluates the system's responsiveness in handling exceptional events or deviations from expected cargo

movements" had a mean score of 3.62 (SD = 0.898). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. This indicates a more neutral to positive response regarding the system's responsiveness. The skewness of -0.503 and kurtosis of -0.531 show a slight left-tail skew and a somewhat flat distribution, respectively, indicating moderate agreement with some variability in responses. For the item "ECT affects the volumes of trade and accountability," the mean score was 3.92 (SD = 0.853). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. This suggests that respondents generally agreed that ECT has a positive impact on trade volumes and accountability. The skewness of -0.736 indicates a left-skewed distribution, and the kurtosis of 0.173 indicates a distribution close to normal. The item "Cost effectiveness evaluates the economic efficiency of the system, reducing transit time and improving the customs clearance process" had a mean score of 4.03 (SD = 0.830). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. This shows that respondents agreed that the ECT is cost-effective. The skewness of -0.658 and kurtosis of 0.010 suggest a left-skewed and near-normal distribution, respectively. The item "ECT has a high compliance rate which indicates that traders are following the tracking system properly" had a mean score of 4.02 (SD = 0.801). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. This indicates general agreement that the compliance rate is high. The skewness of -0.495 and kurtosis of -0.230 indicate a slight left skew and a slightly flatter than normal distribution. The overall mean for all items was 3.95, reflecting a generally positive perception of the ECT system across all evaluated aspects.

Table 4.5: Descriptive statistics Electronic Cargo Tracking System execution

Items	N	Mean	Std. Dev	Skewness	Kurtosis
ECT has a high level of real-time monitoring which provides real-time updates on the location, condition and movement of the cargo.	233	4.17	.948	-1.106	.647
ECT has a response time which evaluates the system's responsiveness in handling exceptional events or deviations from expected cargo movements.	233	3.62	.898	-.503	-.531
ECT affects the volumes of trade and accountability.	233	3.92	.853	-.736	.173
Cost effectiveness evaluates the economic efficiency of the system, reducing transit time and improving customs clearance process.	233	4.03	.830	-.658	.010
ECT has a high compliance rate which indicates the traders are following the tracking system properly.	233	4.02	.801	-.495	-.230
MEAN		3.95			

(Source: Research 2024)

4.6.3 Descriptive statistics Scanning Systems execution

Table 4.6 indicates the descriptive statistics for items concerning Scanning Systems Execution Each item was rated on a Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5). For the statement "There are sufficient scanning systems at the port," the mean rating was 3.91 (SD = 0.789), indicating that respondents generally agree with this statement. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.379 suggests a slight negative skew, meaning that responses are somewhat more concentrated on the

higher end of the scale. The kurtosis of -0.238 indicates a distribution that is slightly flatter than a normal distribution.

The statement "Accurate and reliable information is produced by the scanning system at the port" received a mean rating of 4.16 (SD = 0.933), showing a stronger agreement among respondents. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness value of -0.910 points to a more pronounced negative skew, indicating a higher concentration of responses towards the "Agree" and "Strongly Agree" end of the scale. The kurtosis value of -0.102 suggests the distribution is close to normal but slightly flatter. Regarding the statement "The scanning system has a reduced scan time which speeds up the clearance of goods," the mean rating was 4.00 (SD = 1.042). This mean value shows that respondents tend to agree with this statement. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.691 indicates a moderate negative skew, and the kurtosis of -0.655 suggests a flatter distribution than normal. For the statement "The scanning system has a high compliance rate which speeds up the clearance time of goods," the mean rating was 3.92 (SD = 1.012), reflecting general agreement among respondents. The skewness of -0.541 shows a slight negative skew, while the kurtosis of -0.727 indicates a flatter distribution. Finally, the statement "Enough skilled manpower is available to operate scanners and fasten the clearance process" had a mean rating of 4.08 (SD = 0.975), suggesting respondents agree with this statement. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.915 indicates a significant negative skew, and the kurtosis of 0.123 suggests a distribution close to normal but slightly peaked. Overall, the mean ratings for these statements are

consistently above 3.91, indicating general agreement with the effectiveness and efficiency of the scanning systems at the port.

Table 4.6: Descriptive statistics Scanning Systems execution

Items	N	Mean	Std. Dev	Skewness	Kurtosis
There are sufficient scanning systems at the port.	233	3.91	.789	-.379	-.238
Accurate and reliable information is produced by the scanning system at the port.	233	4.16	.933	-.910	-.102
The scanning system has a reduced scan time which speeds up the clearance of goods.	233	4.00	1.042	-.691	-.655
The scanning system has a high compliance rate which speeds up the clearance time of goods.	233	3.92	1.012	-.541	-.727
Enough skilled manpower available to operate scanners and fasten the clearance process.	233	4.08	.975	-.915	.123
MEAN		4.01			

(Source: Research 2024)

4.6.4 Descriptive statistics Tax Agency Agility

Table 4.7 shows descriptive statistics for questionnaire statements for Tax Agency Agility. The agency flexibility influences success by continually seizing competitive opportunities for efficiency of cross border trade: The mean score for this item is 3.77 (SD = .921), indicating that respondents generally agree with this statement. The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -.533 suggests a slight negative skew, meaning that more responses lean towards the higher end of the Likert scale. The kurtosis value of -

.461 indicates a relatively flat distribution compared to a normal distribution. The tax agency innovation ensures efficiency in the service delivery process: With a mean score of 4.00 (SD = .785), respondents agree with this statement as well. The skewness of -.478 signifies a slight negative skew, pointing to a tendency for responses to be towards the higher end of the scale. The kurtosis of -.128 shows that the distribution is slightly flatter than normal. Customs Automated Systems has helped drive the tax agency innovation and has enhanced efficiency of cross border trade: This item has a mean score of 4.05 (SD = .821), indicating strong agreement among respondents. The skewness is -.512, suggesting a minor negative skew with a tendency towards higher responses. The kurtosis value of -.363 shows a distribution slightly flatter than the normal distribution.

The tax agency is adaptable to the needs that may arise: The mean score for this item is 4.03 (SD = .817), also indicating agreement. The skewness of -.534 reflects a slight negative skew, meaning a majority of responses are on the higher end. The kurtosis of -.235 suggests a relatively flat distribution. The tax agency reacts purposefully and within an appropriate time scale to customer demands and changes in the marketplace to maintain a competitive advantage: This item has a mean score of 3.84 (SD = .787), showing agreement among respondents. The skewness of -.505 indicates a minor negative skew, suggesting responses are somewhat concentrated towards higher values. The kurtosis value of .345 indicates a more peaked distribution compared to the normal distribution. Overall, the mean of means is 3.94 reflecting a general agreement that the tax agency exhibits agility through flexibility, innovation, adaptability, and responsiveness.

Table 4.7: Descriptive statistics Tax Agency Agility

Items	N	Mean	Std. Dev	Skewness	Kurtosis
The agency flexibility influences success by continually seizing competitive opportunities for efficiency of cross border trade.	233	3.77	.921	-.533	-.461
The tax agency innovation ensures efficiency in the service delivery process	233	4.00	.785	-.478	-.128
Customs Automated Systems has helped drive the tax agency innovation and has enhanced efficiency of cross border trade	233	4.05	.821	-.512	-.363
The tax agency is adaptable to the needs that may arise	233	4.03	.817	-.534	-.235
The tax agency reacts purposefully and within an appropriate time scale to customer demands and changes in the marketplace to maintain a competitive advantage	233	3.84	.787	-.505	.345
MEAN		3.94			

(Source: Research 2024)

4.6.5 Descriptive statistics Efficiency of cross border trade

Table 4.8 indicates descriptive statistics for items based on efficiency of cross border trade Reduced trade cost: The mean score for this item is 4.03, with a standard deviation of 0.820. This indicates that, on average, respondents perceive a large reduction in trade costs due to cross-border trade efficiency improvements (Mean = 4.03, SD = 0.820). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.474 suggests a slight leftward skew,

indicating a tendency towards higher ratings, while the kurtosis of -0.397 indicates a relatively flat distribution compared to a normal distribution.

Improved clearance time: This item has a mean score of 3.58 and a standard deviation of 1.154. The mean suggests a moderate improvement in clearance time (Mean = 3.58, SD = 1.154). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness is -0.077, indicating a distribution that is approximately symmetric. The kurtosis value of -1.437 suggests a distribution that is significantly flatter than a normal distribution.

Enhanced operational efficiency: The mean score is 3.99, with a standard deviation of 1.097, indicating that respondents generally perceive a large enhancement in operational efficiency (Mean = 3.99, SD = 1.097). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.687 indicates a leftward skew, suggesting a preference towards higher ratings. The kurtosis of -0.824 indicates a relatively flat distribution.

Increased transparency and accountability: This item has a mean score of 4.04, with a standard deviation of 1.086, indicating a perception of very large increases in transparency and accountability (Mean = 4.04, SD = 1.086). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.758 suggests a leftward skew, indicating more respondents rated this item highly. The kurtosis of -0.719 indicates a relatively flat distribution.

Streamlined documentation process: The mean score is 4.00, with a standard deviation of 1.101, reflecting a large perception of improvement in the documentation process (Mean = 4.00, SD = 1.101). The relatively low standard deviation indicates high consistency, with respondents largely in agreement. The skewness of -0.696 indicates a slight leftward skew, suggesting a trend towards higher ratings. The kurtosis of -0.828 signifies a relatively flat distribution.

Overall, the mean score across all items is 3.93, suggesting a general perception of large improvements in the efficiency of cross-border trade due to various enhancements.

Table 4.8: Descriptive statistics efficiency of cross border trade

Items	N	Mean	Std. Dev	Skewness	Kurtosis
Reduced trade cost.	233	4.03	.820	-.474	-.397
Improved clearance time.	233	3.58	1.154	-.077	-1.437
Enhanced operational efficiency.	233	3.99	1.097	-.687	-.824
Increased transparency and accountability.	233	4.04	1.086	-.758	-.719
Streamlined documentation process.	233	4.00	1.101	-.696	-.828
MEAN		3.93			

(Source: Research 2024)

4.7 Factor Analysis

In exploratory factor analysis, factor loading simplifies the measure of how closely a variable is linked to a factor. The scree plots and factor extraction loadings were utilized to determine which factors were selected. (Mayer, 2006), stated that the scree plot showed that some factors were not enough to be used.

4.7.1 Validity analysis

Content validity is crucial because it ensures that the questions or items in the instrument fully represent the construct and are relevant to the research objectives. A measurement tool with strong content validity increases the likelihood that the results are meaningful and truly reflect the variable being studied.(Furr & Bacharach, 2014). Content validity is often assessed by having subject matter experts (SMEs) review the items. These experts can be experienced professionals or academics in the field related to the construct. They evaluated whether each item aligned with the construct being

measured and whether the set of items comprehensively covered the entire domain of each of the construct. Coefficients above 0.5 indicate high construct validity.

Table 4.9 found that The Cross Border Trade (CBT) construct consists of five items (CBT1 to CBT5). The correlation coefficients between the items range from 0.508 to 0.862, with the strongest correlation observed between CBT1 and CBT5 (0.862). These strong correlations suggest that the items within the Cross Border Trade construct are highly interrelated, demonstrating that they effectively capture the construct of cross-border trade. The moderate correlations between CBT4 and other items (ranging from 0.508 to 0.945) indicate that the items within this construct are consistently measuring the core concept of cross-border trade, supporting content validity.

The Integrated Customs Management System (ICMS) execution construct includes five items (ICMS1 to ICMS5). The correlation values for this construct range from 0.570 to 0.859, with the highest correlation between ICMS2 and ICMS5 (0.859). These moderate to strong correlations indicate that the items are consistently measuring the execution of the Integrated Customs Management System. The relatively lower correlation between ICMS1 and other items (0.570 to 0.726) might suggest some variability in how this particular item is understood or how it relates to the overall concept of ICMS execution, but overall, the results suggest good construct validity.

For the Electronic Cargo Tracking System (ECTS) execution construct, the correlation coefficients range from 0.645 to 0.897, with the highest correlation between ECTS4 and ECTS1 (0.897). These strong correlations show that the items within this construct are measuring the effectiveness and execution of electronic cargo tracking consistently. The lower correlations between ECTS2 and some other items (ranging from 0.620 to

0.682) suggest some variability, but overall, the results support the validity of the ECTS construct.

The Scanning Systems Execution (SSE) construct has correlation values ranging from 0.545 to 0.880. The highest correlation is found between SSE1 and SSE4 (0.880), indicating strong alignment between these items in measuring scanning systems' execution. The slightly lower correlations between SSE2 and other items (ranging from 0.545 to 0.760) suggest moderate variability. Despite this, the generally high correlations among the items point to good content validity for the scanning systems execution construct.

For the Tax Agency Agility (TAA) construct, the correlation values range from 0.543 to 0.949, with the highest correlation between TAA3 and TAA4 (0.949). The relatively high correlations across the items suggest that the items effectively measure the agility of tax agencies in cross-border trade. The correlation between TAA1 and the other items (0.543 to 0.648) is somewhat lower, indicating that item TAA1 may have a slightly different interpretation or relationship with the overall construct, though it still supports the construct's validity.

The Trade Volume (TV) construct displays correlation coefficients ranging from 0.533 to 0.900, with the highest correlation between TV3 and TV5 (0.900). These strong correlations indicate that the items are consistently capturing the different aspects of trade volume. The slightly lower correlations between TV1 and other items (0.533 to 0.704) suggest moderate variability, but the overall high correlations support the validity of the Trade Volume construct.

Table 4.9: Validity Test

cross border trade	CBT1	1.000	.762	.815	.508	.862
	CBT2	.762	1.000	.675	.535	.543
	CBT3	.815	.675	1.000	.920	.907
	CBT4	.508	.535	.920	1.000	.945
	CBT5	.862	.543	.907	.945	1.000
Integrated Customs Management System execution	ICMS1	1.000	.594	.726	.711	.570
	ICMS2	.594	1.000	.682	.678	.859
	ICMS3	.726	.682	1.000	.711	.633
	ICMS4	.711	.678	.711	1.000	.595
	ICMS5	.570	.859	.633	.595	1.000
Electronic Cargo Tracking System	ECTS1	1.000	.645	.812	.897	.692
	ECTS2	.645	1.000	.620	.682	.665
	ECTS3	.812	.620	1.000	.753	.747
	ECTS4	.897	.682	.753	1.000	.641
	ECTS5	.692	.665	.747	.641	1.000
Scanning Systems execution	SSE1	1.000	.760	.668	.880	.632
	SSE2	.760	1.000	.692	.571	.545
	SSE3	.668	.692	1.000	.822	.564
	SSE4	.880	.571	.822	1.000	.688
	SSE5	.632	.545	.564	.688	1.000
Tax Agency Agility	TAA1	1.000	.648	.635	.610	.543
	TAA2	.648	1.000	.816	.800	.822
	TAA3	.635	.816	1.000	.949	.765
	TAA4	.610	.800	.949	1.000	.799
	TAA5	.543	.822	.765	.799	1.000
Trade Volume	TV1	1.000	.627	.533	.704	.665
	TV2	.627	1.000	.779	.584	.640
	TV3	.533	.779	1.000	.865	.900
	TV4	.704	.584	.865	1.000	.889
	TV5	.665	.640	.900	.889	1.000

(Source: Research 2024)

4.7.2 Factor Loadings

Factors that exceed this point are retained, while those that fall below this point are discarded. In factor analysis, the factor loadings demonstrate the extent and manner in which the observed items are associated with the latent factors.

Table 4.10 shows that for the variable Efficiency of Cross Border Trade (ECBT), the factor loadings range from 0.282 to 0.949. Factors with a loading of 0.7 or higher are generally considered significant (Khosla, 2006). Thus, ECBT1 (0.867), ECBT3 (0.931), ECBT4 (0.949), and ECBT5 (0.938) are selected as they meet this criterion. ECBT2, with a loading of 0.282, is excluded as it falls below the threshold, indicating it explains less variance and is less meaningful. In the case of Integrated Customs Management System Execution (ICMSE), all five factors (ICMSE1 to ICMSE5) have loadings above 0.7, specifically ranging from 0.834 to 0.888. This indicates that each factor significantly contributes to explaining the variance in the data, leading to the selection of all factors for further analysis. For Electronic Cargo Tracking System Execution (ECTSE), the factor loadings vary from 0.155 to 0.920. Based on the criterion of having a loading of 0.7 or higher, ECTSE2 (0.769), ECTSE3 (0.920), ECTSE4 (0.816), and ECTSE5 (0.898) are selected. ECTSE1, with a loading of 0.155, is excluded as it does not meet the threshold, indicating it is not a significant contributor. Regarding Scanning Systems Execution (SSE), the factor loadings range from 0.274 to 0.902. Factors SSE2 (0.810), SSE3 (0.900), SSE4 (0.902), and SSE5 (0.803) are selected because their loadings exceed the 0.7 threshold. SSE1, with a loading of 0.274, is excluded as it does not meet the criterion, suggesting it has a minimal contribution to explaining the variance. Lastly, for Tax Agency Agility (TAA), all five factors (TAA1 to TAA5) exhibit loadings between 0.756 and 0.942, each surpassing the 0.7 threshold.

This indicates that all factors significantly contribute to the variance, warranting their inclusion in the final analysis.

Table 4.10: Factor Extraction

	efficiency of cross border trade	Integrated Customs Management System execution	Electronic Cargo Tracking System execution	Scanning Systems execution	Tax Agency Agility	Trade Volume
ECBT1	.867					
ECBT2	.282					
ECBT3	.931					
ECBT4	.949					
ECBT5	.938					
ICMSE1		.834				
ICMSE2		.888				
ICMSE3		.872				
ICMSE4		.858				
ICMSE5		.850				
ECTSE1			.155			
ECTSE2			.769			
ECTSE3			.920			
ECTSE4			.816			
ECTSE5			.898			
SSE1				.274		
SSE2				.810		
SSE3				.900		
SSE4				.902		
SSE5				.803		
TAA1					.756	
TAA2					.920	
TAA3					.942	
TAA4					.941	
TAA5					.887	
TV1						.724
TV2						.461
TV3						.920
TV4						.908
TV5						.928

(Source: Research 2024)

4.7.3 Data transformation process

To create the construct for Efficiency of Cross-Border Trade (ECBT), we selected items with factor loadings above .70, specifically ECBT1 (loading = .867), ECBT3 (loading = .931), ECBT4 (loading = .949), and ECBT5 (loading = .938). Item ECBT2 was

excluded as it did not meet the threshold (loading = .282). The formula for calculating the mean score of this construct is as follows:

$$\text{ECBT Mean} = \frac{\text{ECBT1} + \text{ECBT3} + \text{ECBT4} + \text{ECBT5}}{4}$$

The Integrated Customs Management System Execution (ICMSE) construct included all items since each one had a factor loading above the .70 threshold. Specifically, the items are ICMSE1 (loading = .834), ICMSE2 (loading = .888), ICMSE3 (loading = .872), ICMSE4 (loading = .858), and ICMSE5 (loading = .850). The mean for this construct was calculated using the formula:

$$\text{ICMSE Mean} = \frac{\text{ICMSE1} + \text{ICMSE2} + \text{ICMSE3} + \text{ICMSE4} + \text{ICMSE5}}{5}$$

For Electronic Cargo Tracking System Execution (ECTSE), items with factor loadings over .70 were selected, including ECTSE2 (loading = .769), ECTSE3 (loading = .920), ECTSE4 (loading = .816), and ECTSE5 (loading = .898). ECTSE1 was excluded due to a loading below the threshold (loading = .155). The formula for calculating this construct's mean is:

$$\text{ECTSE Mean} = \frac{\text{ECTSE2} + \text{ECTSE3} + \text{ECTSE4} + \text{ECTSE5}}{4}$$

The Scanning Systems Execution (SSE) construct comprised items with factor loadings greater than .70, specifically SSE2 (loading = .810), SSE3 (loading = .900), SSE4 (loading = .902), and SSE5 (loading = .803). SSE1 was excluded from this construct as its loading was .274, below the threshold. The construct's mean score was calculated as follows:

$$\text{SSE Mean} = \frac{\text{SSE2} + \text{SSE3} + \text{SSE4} + \text{SSE5}}{4}$$

For the Tax Agency Agility (TAA) construct, all items met the factor loading threshold, with TAA1 (loading = .756), TAA2 (loading = .920), TAA3 (loading = .942), TAA4 (loading = .941), and TAA5 (loading = .887). As all items had factor loadings above .70, the mean score for TAA was computed using all five items:

$$\text{TAA Mean} = \frac{\text{TAA1} + \text{TAA2} + \text{TAA3} + \text{TAA4} + \text{TAA5}}{5}$$

Lastly, the Trade Volume (TV) construct included items with loadings exceeding .70: TV1 (loading = .724), TV3 (loading = .920), TV4 (loading = .908), and TV5 (loading = .928). TV2 was excluded due to its factor loading of .461. The mean score for this construct was calculated as follows:

$$\text{TV Mean} = \frac{\text{TV1} + \text{TV3} + \text{TV4} + \text{TV5}}{4}$$

4.8 Regression Assumptions

The regression assumptions were tested for normality heteroscedasticity, linearity, and multicollinearity. The assumptions are tested and if found to not be violated, the data is fit for regression analysis.

4.8.1 Test for Normality

The normality test assesses whether a dataset follows a normal distribution (Doornik & Hansen, 2008). Data is considered normally distributed if the p-value exceeds 0.05. A p-value greater than 0.05 confirms the data's normality. The Shapiro-Wilk W is the ratio of the best estimator of the variance to the usual corrected sum of squares estimator

of the variance (Shapiro and Wilk 1965).⁵ The statistic is positive and less than or equal to one. Table 4.11 shows that Integrated Customs Management System execution, has a p-value =0.649>0.05, Electronic Cargo Tracking System execution p-value =0.245>0.05, Scanning Systems execution p-value =0.220>0.05, Tax agency agility p-value =0.710>0.05 and lastly trade volume had a p-value of 0.602>0.05. The results indicate that the residuals for each of the variables follow a normal distribution.

Table 4.11: Normality Test

	Obs	W	V	z	Prob>z
Efficiency of cross border trade	233	0.994	1.103	0.227	0.410
Integrated Customs Management System execution	233	0.995	0.848	-0.383	0.649
Electronic Cargo Tracking System execution	233	0.992	1.347	0.691	0.245
Scanning Systems execution	233	0.992	1.396	0.773	0.220
Tax Agency Agility	233	0.995	0.788	-0.554	0.710
Trade Volume	233	0.979	0.520	1.918	0.602

(Source: Research 2024)

4.8.2 Test for Homoscedasticity

The homoscedasticity test assesses whether the variance of errors in a regression model remains constant. If the p-value exceeds 0.05, it suggests that the assumption of constant variance is not violated. Table 4.12 presents the results from the Breusch-Pagan test. Since the p-value is significantly higher than the standard threshold of 0.119 (>0.05), we fail to reject the null hypothesis. This outcome indicates no substantial

evidence of heteroscedasticity in the regression model. Consequently, the assumption of constant residual variance is upheld in this instance.

Table 4.12: Homoscedasticity test

Breusch-Pagan test for heteroskedasticity	
Ho: Constant variance	
Variables: residuals2	
chi2(1)	= 2.43
Prob > chi2	= 0.119

(Source: Research 2024)

4.8.3 Linearity test

The concept of linearity posits that there is a straight-line relationship between independent and dependent variables. This implies that changes in the independent variables result in proportional changes in the dependent variable. The Ramsey RESET test for linearity indicated on table 4.13 shows that the p-value $0.339 > 0.05$, we fail to reject the null hypothesis. This indicates that there is no significant evidence of omitted variable bias or non-linearity in the model.

Table 4.13: Linearity test

Ramsey RESET test using powers of the fitted values of efficiency of cross border trade	
Ho: model has no omitted variables	
F (3, 225) =	= 1.13
Prob > F =	= 0.339

4.8.4 Multicollinearity test

The multicollinearity test employs Variance Inflation Factor (VIF) and Tolerance to assess whether the assumption of low correlation among independent variables in a regression model holds true (Murray, 2012). Detecting multicollinearity is crucial for maintaining the reliability of regression analysis results. Multicollinearity arises when independent variables are strongly correlated, potentially skewing the statistical significance of predictors. Key indicators for evaluating multicollinearity are VIF and Tolerance. VIF quantifies how much the variance of a regression coefficient is increased due to multicollinearity, with values greater than 10 indicating a potential problem. Tolerance, the reciprocal of VIF, measures the proportion of variance in an independent variable not explained by other variables, with values below 0.1 suggesting high multicollinearity.

Table 4.14 provides the VIF and Tolerance values for several systems. For the Integrated Customs Management System execution, the VIF was 1.905 (less than 10), and the Tolerance was 0.525 (greater than 0.1). For the Electronic Cargo Tracking System execution, the VIF was 1.719, and the Tolerance was 0.582. For the Scanning Systems execution, the VIF is 1.662, and the Tolerance was 0.602. For Tax Agency Agility, the VIF was 1.694, and the Tolerance was 0.590. Lastly trade volume had VIF and tolerance of 1.224 and 0.817 respectively. These values indicate that there is no significant multicollinearity among the variables, as all VIF values are less than 10 and all Tolerance values are greater than 0.1. This suggests that the independent variables are not excessively correlated, ensuring that the regression model's coefficients are reliable and the results are stable and interpretable.

Table 4.14: Multicollinearity test

		Collinearity Statistics	
Model		Tolerance	VIF
1	Integrated Customs Management System execution	0.525	1.905
	Electronic Cargo Tracking System execution	0.582	1.719
	Scanning Systems execution	0.602	1.662
	Tax Agency Agility	0.590	1.694
	Trade Volume	0.817	1.224

a. Dependent Variable: efficiency of cross border trade

4.9 Correlation Analysis

The correlation analysis was used to determine the nature of the relationships between the Integrated Customs Management System Execution, Electronic Cargo Tracking System Execution, Scanning Systems Execution, Tax Agency Agility and efficiency of cross border trade. Table 4.14 indicates that Integrated Customs Management System Execution has a positive and significant correlation to efficiency of cross border trade at 0.560 p-value =0.018<0.05. As the execution of the ICMS improves, the efficiency of cross-border trade also increases. This means that better implementation of the ICMS leads to more streamlined customs procedures, faster processing times, reduced delays, and overall smoother cross-border trade operations. Further the correlation matrix shows that Electronic Cargo Tracking System execution has a positive and significant correlation to efficiency of cross border trade at 0.537 p-value =0.014<0.05. Improved execution of the ECTS leads to increased efficiency in cross-border trade. Scanning Systems Execution also has a positive and significant correlation to efficiency of cross border trade at 0.503 p-value =0.020<0.05. As scanning systems are more effectively implemented, the efficiency of cross-border trade is enhanced Further the study also shows that Tax agency agility has a positive and significant correlation to efficiency of

cross border trade at 0.516 p-value =0.000<0.05. Higher agility within tax agencies translates to greater efficiency in cross-border trade. Agility in this context likely refers to the ability of tax agencies to quickly adapt to changes, implement new policies, and respond to issues in a timely manner. The correlation table also showed that trade volume had a positive and significant correlation with efficiency of cross border trade at 0.498 p-value =0.006. On the correlation analysis shows that as customs automated systems improves the efficiency of cross border trades tends to improve proportionately.

Table 4.15: Pairwise Correlations

		CBT	ICMS	ECTS	SSE	TAA	TV
efficiency of cross border trade	Pearson Correlation	1					
	Sig. (2-tailed)						
Integrated Customs Management System execution	Pearson Correlation	.560	1				
	Sig. (2-tailed)	.018**					
Electronic Cargo Tracking System execution	Pearson Correlation	.537	.606	1			
	Sig. (2-tailed)	.014**	.002				
Scanning Systems execution	Pearson Correlation	.503	.539	.465	1		
	Sig. (2-tailed)	.020**	.003**	.012**			
Tax Agency Agility	Pearson Correlation	.516	.511	.465	.538	1	
	Sig. (2-tailed)	.000**	.041**	.043**	.000**		
Trade Volume	Pearson Correlation	.498	.295	.317	.305	.393	1
	Sig. (2-tailed)	.006**	.012**	.012**	.045**	.042**	
	N	233	233	233	233	233	233

** . Correlation is significant at the 0.05 level (2-tailed).

(Source: Research 2024)

4.10 Direct Effect Regression Results

4.10.1 Model Summary

The model summary on table 4.16 indicates that Integrated Customs Management System execution, Electronic Cargo Tracking System execution and Scanning Systems execution correlates to efficiency of cross border trade at 70.2%. Further the model summary shows that Integrated Customs Management System execution, Electronic Cargo Tracking System execution and Scanning Systems execution causes a 49.2% variation in efficiency of cross border trade, the remaining 50.8% was caused by factors not captured in the model. These findings highlight both the impact of system execution on trade and the importance of addressing additional factors.

Table 4.16: Model Summary without moderator

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.702	0.492	0.483	0.718736

a. Predictors: (Constant), Trade volume, Scanning Systems execution, Electronic Cargo Tracking System execution, Integrated Customs Management System execution

4.10.2 Analysis of Variance

The ANOVA table 4.17 shows that there is a significant variation caused on efficiency of cross border trade by customs automation systems with F-statistic of 55.205 p-value =0.000<0.05. This result suggests that customs automation systems play a meaningful role in enhancing trade efficiency, as the low p-value indicates a high level of confidence in this relationship. In practical terms, this implies that implementing or improving automation systems in customs could lead to measurable improvements in cross-border trade processes.

Table 4.17: ANOVA Without moderator

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	114.144	4	28.536	55.205	0.000
	Residual	117.856	228	0.517		
	Total	232.000	232			

a. Dependent Variable: efficiency of cross border trade

b. Predictors: (Constant), trade volume, Scanning Systems execution, Electronic Cargo Tracking System execution, Integrated Customs Management System execution

(Source: Research 2024)

4.10.3 Coefficient regression analysis

The regression model equation was as;

$$EC = 0.654 + 0.304TV + 0.248IC + 0.207EC + 0.180SS$$

Table 4.18 shows Integrated Customs Management System has a positive and significant effect on the efficiency of cross border trade ($\beta = 0.248$, p-value = $0.006 < 0.05$). This means that a unit increase in Integrated Customs Management System execution caused a significant increase in efficiency of cross border trade by 0.248 units. The low p-value ($p < 0.05$) confirms that this effect is unlikely to be due to random chance, highlighting the importance of ICMS in enhancing trade efficiency. Electronic Cargo Tracking System has a positive and significant effect on the efficiency of cross border trade ($\beta = 0.207$, p-value = $0.003 < 0.05$). This means that a unit increase in Electronic Cargo Tracking System execution causes a significant increase in efficiency of cross border trade by 0.207 units. The p-value confirms that the relationship is statistically significant, meaning that the ECTS plays a meaningful role in improving the efficiency of customs operations and trade processes. Lastly, Scanning Systems has a positive and significant effect on the efficiency of cross border trade ($\beta = 0.180$, p-value = $0.008 < 0.05$). This means that a unit increase in Scanning

System execution causes a significant increase in efficiency of cross border trade by 0.180 units. The significance of this result ($p < 0.05$) further supports the idea that scanning technologies contribute to improving efficiency, likely by speeding up inspections and reducing bottlenecks at border crossings.

Table 4.18: Coefficients Regression Analysis

Model	Standardized Coefficients		Unstandardized Coefficients	t	Sig.
	β	Std. Error	β		
(Constant)	0.654	0.235		2.783	0.006
Trade Volume	0.304	0.051	0.412	5.961	0.000
Integrated Customs Management System execution	0.248	0.072	0.270	3.444	0.001
Electronic Cargo Tracking System execution	0.207	0.070	0.259	2.957	0.003
Scanning Systems execution	0.180	0.067	0.294	2.687	0.008

a. Dependent Variable: efficiency of cross border trade

(Source: Research 2024)

4.11 Hierarchical Model process

The hierarchical model process is used According to (Baron& Kenny, 1986) three distinctive steps are followed in the process of moderation:

The initial step is to establish a whether there is a relationship between the independent variable (Integrated Customs Management System execution, Electronic Cargo Tracking System execution and Scanning Systems execution) and the dependent variable (efficiency of cross border trade) without considering the moderating variable.

The second step adds the moderator (Tax Agency Agility) to the regression model and test whether there is a significant effect on efficiency of cross border trade.

The third step will involve creating interaction terms by getting the product of each of the independent variables and the moderator (Integrated Customs Management System

execution* Tax Agency Agility) (Electronic Cargo Tracking System execution* Tax Agency Agility) and (Scanning Systems execution * Tax Agency Agility), after which the effects of the interaction terms are tested by regressing each interaction term hierarchically from the first to the last and testing where there is a significant effect.

Lastly a conclusion of the regression model with all the interactions is tested to determine the significance of the interaction terms, if p-values <0.05 there is significant moderating effect.

The moderator in Model 5 represents the final model, incorporating all interaction terms and the moderator. This model has an R^2 of 0.410 indicating that after introducing Tax Agency Agility as to the Integrated Customs Management System execution, Electronic Cargo Tracking System execution and Scanning Systems execution caused a 41% variation in efficiency of cross border trade. The remaining 59% variation is caused by factors not incorporated in the model. The model F change statistic is significant indicating a significant moderating effect of Tax Agency Agility. The ANOVA table indicates a F statistic is reducing from model 1 to model 5 F-statistic is 56.276, 41.041, 32.002, 26.271 and 22.300 respectively. The model indicates significant values p-value =0.000<0.05 indicating the variance is significant.

The regression model indicates a hierarchical model structure for determining the moderating effect of Tax Agency Agility on the relationship between Customs Automated Systems and efficiency of cross border trade.

The model equations are as follows

Model (i)

$$EC = 0.654 + 0.304TV + 0.248IC + 0.207EC + 0.180SS$$

Equation (ii)

$$EC = 0.363 + 0.279TV + 0.222IC + 0.189EC + 0.141SS + 0.130TA$$

Equation (iii)

$$EC = 1.144 + 0.282TV + 0.329IC + 0.188EC + 0.207SS + 0.396TA + 0.249IC * TA$$

Equation (iv)

$$EC = 1.191 + 0.282TV + 0.358IC + 0.148EC + 0.145SS + 0.380TA + 0.640IC * TA + 0.075EC * TA$$

Equation (v)

$$EC = 0.802 + 0.282TV + 0.372IC + 0.155EC + 0.415SS + 0.366TA + 0.097IC * TA + 0.064EC * TA + 0.075SS * TA$$

The hypotheses tests were conducted and the results summarized on table

The first null hypothesis (H_{01}) stated that Integrated Customs Management System execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that Integrated Customs Management System execution has a significant effect on efficiency of cross border trade $p\text{-value} = 0.038 < 0.05$, thus, null hypothesis is rejected. A unit increase in Integrated Customs Management execution will increase the efficiency of cross border trade by 0.372 units.

The second null hypothesis (H_{02}) stated that Electronic Cargo Tracking System execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that Electronic Cargo Tracking System execution has a significant effect on efficiency of cross border trade $p\text{-value} = 0.025 < 0.05$, thus, null hypothesis is rejected. A unit increase in Electronic Cargo Tracking System execution will increase the efficiency of cross border trade by 0.155 units.

The third null hypothesis (H_{03}) stated that Scanning Systems execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot. The study concluded that Scanning Systems execution has no significant effect on efficiency of cross border trade $p\text{-value} = 0.029 < 0.05$, thus, null hypothesis is rejected. A unit increase in Scanning System execution will increase the efficiency of cross border trade by 0.415 units.

H_{04a} stated that Tax Agency Agility does not moderate the relationship between Integrated Customs Management System execution and efficiency of cross border trade in Nairobi Inland Container Depot. The study found that Tax Agency Agility moderates the relationship between Integrated Customs Management System execution and efficiency of cross border trade $p\text{-value} = 0.040 < 0.05$, thus, null hypothesis is rejected. Beta coefficient of 0.097 which was more than zero, a ΔR^2 of 0.005 and the model was significant with an F of 38.736 indicating that the conditions for moderation were met. Tax Agency Agility moderates the relationship between Integrated Customs Management System execution and efficiency of cross border trade.

H_{04b} stated that Tax Agency Agility does not moderate the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade in Nairobi Inland Container Depot. The study determined that Tax Agency Agility does moderate the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade $p\text{-value} = 0.028 < 0.05$, thus, null hypothesis is rejected. Beta coefficient of 0.064 which was more than zero, a ΔR^2 of 0.001 and the model was significant with an F of 33.237 indicating that the conditions for moderation were met. Tax Agency Agility moderates the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade.

H_{04c} stated that Tax Agency Agility does not moderate the relationship between Scanning System execution and efficiency of cross border trade in Nairobi Inland Container Depot. The study confirmed that Tax Agency Agility does moderate the relationship between Scanning System execution and efficiency of cross border trade p-value = 0.008 < 0.05, thus, null hypothesis is rejected. Beta coefficient of 0.075 which was more than zero, ΔR^2 of 0.003 and the model was significant with an F of 29.260 indicating that the conditions for moderation were met. Tax Agency Agility moderates the relationship between Scanning System execution and efficiency of cross border trade.

Table 4.19: Summary Table

	Model 1	Model 2	Model 3	Model 4	Model 5
Constant	0.654 [0.235] (0.006)	0.363 [0.177] (0.049)	1.144 [0.551] (0.041)	1.191 [0.581] (0.049)	0.802 [0.292] (0.006)
TV	0.304 [0.051] (0.000)	0.279 [0.052] (0.000)	0.282 [0.052] (0.000)	0.282 [0.052] (0.000)	0.282 [0.052] (0.000)
IC	0.248 [0.072] (0.001)	0.222 [0.065] (0.002)	0.329 [0.141] (0.022)	0.358 [0.132] (0.011)	0.372 [0.179] (0.038)
EC	0.207 [0.070] (0.003)	0.189 [0.061] (0.004)	0.188 [0.069] (0.007)	0.148 [0.070] (0.047)	0.155 [0.069] (0.025)
SS	0.180 [0.067] (0.008)	0.141 [0.060] (0.026)	0.207 [0.067] (0.003)	0.145 [0.069] (0.044)	0.415 [0.189] (0.029)
TA	-	0.130 [0.061] (0.041)	0.396 [0.168] (0.020)	0.380 [0.188] (0.048)	0.366 [0.180] (0.043)
IC*TA	-	-	0.249 [0.085] (0.004)	0.640 [0.264] (0.022)	0.097 [0.047] (0.040)
EC*TA	-	-	-	0.075 [0.029] (0.015)	0.064 [0.029] (0.028)
SS*TA	-	-	-	-	0.075 [0.028] (0.008)
R²	0.492	0.502	0.507	0.508	0.511
Δ in R²	-	0.010	0.005	0.001	0.003
F	55.205	45.765	38.736	33.237	29.260
F-Sig	0.000	0.000	0.000	0.000	0.000

Dependent Variable: efficiency of cross border trade

TV: Trade Volume, IC: Integrated Customs Management System execution, EC: Electronic Cargo Tracking System execution, SS: Scanning Systems execution, TA: Tax Agency Agility,

[]=Std. Error ()= p-value

(Source: Research 2024)

4.12 Moderating effects analysis

Interaction between Integrated Customs Management System and Tax Agency Agility

Figure 4.2 shows the moderating effect of Tax Agency Agility on the relationship between Integrated Customs Management System and efficiency of cross border trade. Tax Agency Agility amplifies the positive effect of Integrated Customs Management System thereby promoting efficiency of cross border trade. The nature of integration between the Integrated Customs Management System (ICMS) and Tax Agency Agility in Figure 4.2 can be described as a **synergistic integration**. In this context, the ICMS, which likely involves the use of technology and streamlined processes for customs procedures, works in conjunction with the Tax Agency's agility its ability to adapt, respond quickly, and innovate in its operations.

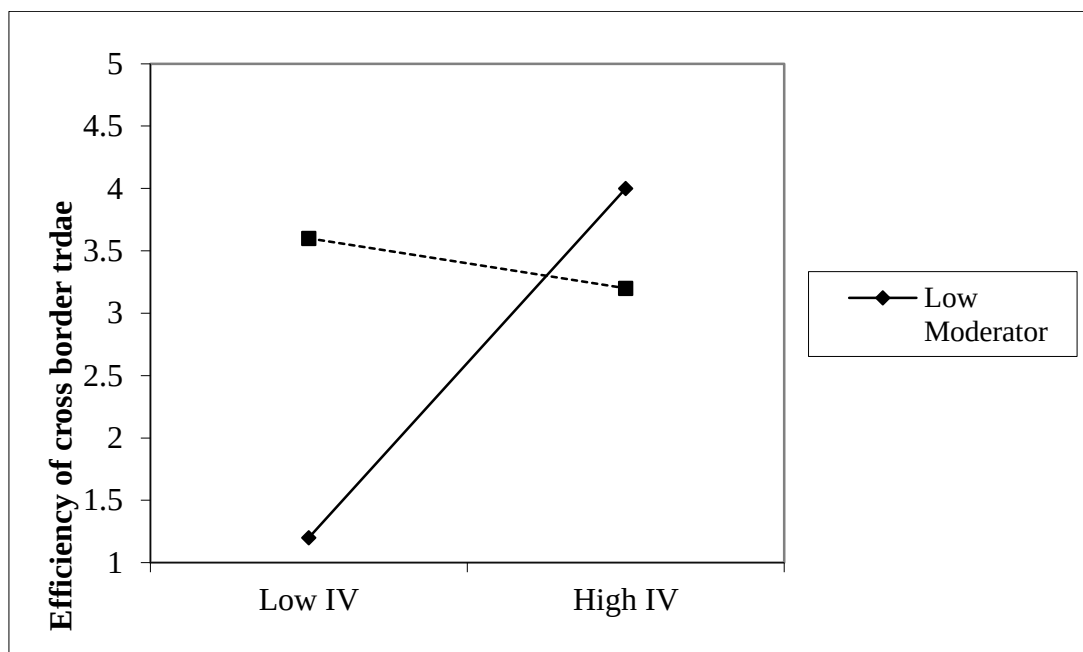


Figure 4.2: MODI graph Integrated Customs Management System and Tax Agency Agility

(Source: Author, 2024)

Interaction between Electronic Cargo Tracking System and Tax Agency Agility

Figure 4.3 shows the moderating effect of Tax Agency Agility on the relationship between Electronic Cargo Tracking System and efficiency of cross border trade. Tax Agency Agility amplifies the positive effect of Electronic Cargo Tracking System thereby promoting efficiency of cross border trade. The nature of integration described in this scenario is **moderation**. Specifically, Tax Agency Agility is a moderator that influences the strength or direction of the relationship between the Electronic Cargo Tracking System (ECTS) and the efficiency of cross-border trade.

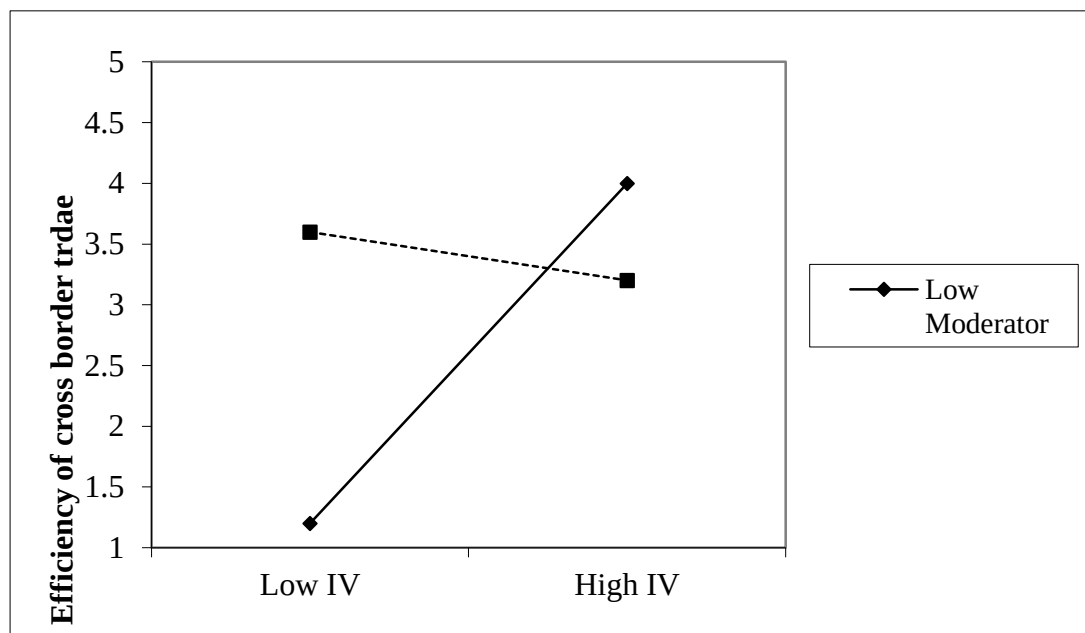


Figure 4.3: MODI graph Electronic Cargo Tracking System and Tax Agency Agility

(Source: Author, 2024)

Interaction between Scanning System and Tax Agency Agility

Figure 4.4 shows the moderating effect of Tax Agency Agility on the relationship between Scanning System and efficiency of cross border trade. Tax Agency Agility amplifies the positive effect of the Scanning System thereby promoting efficiency of

cross border trade. The nature of integration described in this context is **moderation**. Tax Agency Agility is acting as a moderator in the relationship between the Scanning System and the efficiency of cross-border trade. This means that the presence of Tax Agency Agility strengthens or amplifies the positive effect that the Scanning System has on improving the efficiency of cross-border trade.

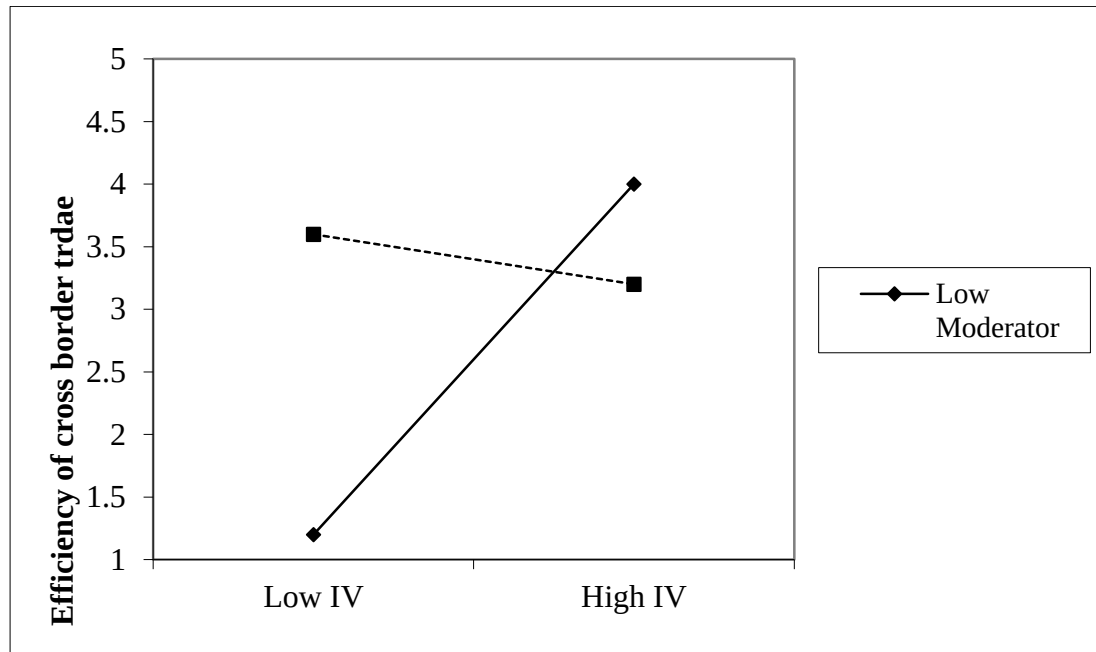


Figure 4.4: MODI graph Scanning System and Tax Agency Agility

(Source: Author, 2024)

4.13 Discussion of Findings

This segment of the study recaps the findings.

4.13.1 Integrated Customs Management System execution and efficiency of cross border trade

The first objective was to establish the influence of Integrated Customs Management System execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that Integrated Customs Management System execution has a positive and significant correlation to efficiency of cross border trade at 56.0% p-value = 0.018.

The coefficient regression analysis shows that Integrated Customs Management System execution has a positive effect on efficiency of cross border trade $\beta=0.372$, p-value =0.038. The study suggests that investing in and executing an ICMS can have substantial benefits for cross-border trade efficiency, leading to faster, more reliable, and cost-effective trading processes. This, in turn, can positively impact businesses and economies engaged in international trade. The findings align with Mohammed's (2022) study, which explored the impact of implementing the ASYCUDA system on the performance of the Sudanese Customs Authority. The results indicated that the ASYCUDA system positively affected the performance of the Sudanese Customs, suggesting continued use and enhancement of the system. The study concurs that in Kenya, (Mutai, 2022) studied the effects of automated customs system on trade facilitation in Kenya. The results indicated that iCMS had reduced the clearance time of the cargo hence reducing the cost of doing business in Kenya. It also established that iCMS, Single Window System and ECTS all facilitate trade but iCMS had the most impact on trade facilitation.

4.13.2 Electronic Cargo Tracking System execution and efficiency of cross border trade

The second specific objective was to determine the influence of Electronic Cargo Tracking System execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study also found that Electronic Cargo Tracking System execution correlates to efficiency of cross border trade positively and significantly at 53.7% p-value =0.014. The coefficient regression analysis shows that Electronic Cargo Tracking System execution has a positive effect on efficiency of cross border trade $\beta=0.155$, p-value =0.025<0.05. The findings suggest that the implementation of an Electronic Cargo Tracking System is a beneficial strategy for enhancing the efficiency

of cross-border trade, with statistically significant evidence supporting its positive impact. The study findings concur with the Kenyan studies, such as the study by Kabiru (2016), who investigated the effects of ECTS (Electronic Cargo Tracking System) on operational performance at the Kenya Revenue Authority (KRA) and among transporters between Kenya and other East African nations. Kabiru's exploratory research design, which employed qualitative data from questionnaires, found that the tracking system significantly improved operational performance for both KRA and the transporters, particularly for outbound cargo.

4.13.3 Scanning Systems execution and efficiency of cross border trade

The first specific objective to evaluate the influence of Scanning Systems execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that Scanning Systems execution has a positive and significant correlation to efficiency of cross border trade 50.3% $p\text{-value} = 0.020 < 0.05$. The coefficient regression analysis shows that Scanning Systems execution has a positive effect on efficiency of cross border trade $\beta = 0.415$, $p\text{-value} = 0.029 < 0.05$. The study demonstrates that implementing and improving scanning systems at borders can lead to tangible benefits in trade efficiency, which in turn can have broad positive impacts on businesses, economies, and security. The study concurred with Oduor, (2018) who conducted a study on effect of cargo scanning on revenue collection at the port of Mombasa in Kenya. The study concluded; scanning procedures had moderate positive effects on revenue collection, scanner downtime significantly affects revenue collection negatively and lastly, scanner operators had a positive effect on revenue collection.

However, the study diverges from SARS (2016), which examined the effects of scanners on customs processes at the Port of Elizabeth. SARS' study found that while

scanning enhanced sea efficiency, the associated costs potentially impeded trade and revenue collection.

4.13.4 Tax Agency Agility and the relationship between Customs Automated Systems and efficiency of cross border trade

The fourth specific objective was to determine the moderating effect of Tax Agency Agility on the relationship between Integrated Customs Management System execution, Electronic Cargo Tracking System execution, Scanning Systems execution and efficiency of cross border trade in Nairobi Inland Container Depot. The study showed that Tax Agency Agility has a positive and significant correlation on efficiency of cross border trade at 51.6% $p\text{-value} = 0.000$. The study also shows that Tax Agency Agility has a moderating effect on the relationship between Integrated Customs Management System execution and efficiency of cross border trade $\beta = 0.097$, $p\text{-value} = 0.040 < 0.05$. The study also showed that Tax Agency Agility moderates the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade $\beta = 0.064$, $p\text{-value} = 0.028 < 0.05$. Lastly Tax Agency Agility moderates the relationship between Scanning Systems execution and efficiency of cross border trade $\beta = 0.075$, $p\text{-value} = 0.008 < 0.05$. The agility of tax agencies plays a crucial role in enhancing the efficiency of cross-border trade. It not only directly improves trade efficiency but also amplifies the positive effects of various technological and procedural implementations (like ICMS, ECTS, and scanning systems). This means that investments in improving the agility of tax agencies can lead to more substantial benefits in trade efficiency, making international trade smoother, faster, and more reliable. The study agreed with (Mrugalska & Ahmed, 2021) from Poznan University of technology, who conducted a study on organizational agility in industry, a systematic literature review. Moreover, the study concurs with the observation that agility is

crucial for organizations adopting industry technologies, helping them adapt to changes. This is consistent with Picolli and Ives (2005), who argued that Information Technology management capabilities are fundamental for firms to achieve and maintain competitive success through IT-dependent strategies.

Table 4.20: Summary of Hypothesis testing

H₀	P-value	Result
H₀₁ Integrated Customs Management System execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot.	0.038	Reject hypothesis
H₀₂ Electronic Cargo Tracking System execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot.	0.025	Reject hypothesis
H₀₃ Scanning Systems execution has no significant effect on efficiency of cross border trade in Nairobi Inland Container Depot.	0.029	Reject hypothesis
H_{04a} Tax Agency Agility does not moderate the relationship between Integrated Customs Management System execution and efficiency of cross border trade in Nairobi Inland Container Depot.	0.040	Reject hypothesis
H_{04b} Tax Agency Agility does not moderate the relationship between Electronic Cargo Tracking System execution and efficiency of cross border trade in Nairobi Inland Container Depot.	0.028	Reject hypothesis
H_{04c} Tax Agency Agility does not moderate the relationship between Scanning System execution and efficiency of cross border trade in Nairobi Inland Container Depot.	0.008	Reject hypothesis

(Source: Research 2024)

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The section offers a brief recap of the research findings, draws conclusions that are in line with the research objectives, and provides recommendations for future research. Also, it discusses possible areas for future study.

5.2 Summary of findings

5.2.1 Integrated Customs Management System execution and efficiency of cross border trade

The study sought to establish the influence of Integrated Customs Management System execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that there is a strong positive relationship between the execution of the ICMS and the efficiency of cross-border trade. This means that as the execution of the ICMS improves, the efficiency of cross-border trade increases, the p-value indicates that the correlation is statistically significant, this means there's a very low probability that this relationship is due to chance. The coefficient analysis shows the degree of change in trade efficiency for each unit increase in the execution of the ICMS, the study suggests that investing in and executing an ICMS can have substantial benefits for cross-border trade efficiency, leading to faster, more reliable, and cost-effective trading processes. This, in turn, can positively impact businesses and economies engaged in international trade.

5.2.2 Electronic Cargo Tracking System execution and efficiency of cross border trade

The study further sought to determine the influence of Electronic Cargo Tracking System execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that there is strong positive relationship between the implementation of ECTS and the efficiency of cross-border trade. This means that as the use of ECTS increases, the efficiency of cross-border trade improves correspondingly. The regression coefficient indicated that there is a positive effect of ECTS on the efficiency of cross-border trade. Specifically, for each unit increase in the implementation of ECTS, there is an expected increase in the efficiency of cross-border trade.

5.2.3 Scanning Systems execution on efficiency of cross border trade

The study also sought to evaluate the influence of Scanning Systems execution on efficiency of cross border trade in Nairobi Inland Container Depot. The research showed that there is a moderately strong relationship between the implementation of scanning systems and the efficiency of cross-border trade, illustrating that as the use of scanning systems increases, the efficiency of cross-border trade tends to improve. The regression coefficient showed a positive effect that as the execution of scanning systems improves, the efficiency of cross-border trade also increases.

5.2.4 Tax Agency Agility and the relationship between Customs Automated Systems and efficiency of cross border trade

The fourth specific objective was to determine the moderating effect of Tax Agency Agility on the relationship between Integrated Customs Management System execution, Electronic Cargo Tracking System execution, Scanning Systems execution and efficiency of cross border trade in Nairobi Inland Container Depot. The study found

that the agility of tax has a strong positive impact on the efficiency of cross-border trade. Meaning that when tax agencies can rapidly adjust to new regulations, technologies, and market conditions, the processes involved in cross border trade become smoother and faster. The study further showed that Tax agency agility strengthens the positive relationship between the implementation of an Integrated Customs Management System (ICMS) and trade efficiency. Tax agency agility also enhances the positive impact of Electronic Cargo Tracking Systems (ECTS) on cross border trade efficiency, though to a lesser extent than ICMS. Tax agency agility slightly strengthens the positive relationship between the use of scanning and cross border trade efficiency.

5.3 Conclusion

The main objective of the study was to determine the moderating effect of Tax Agency Agility on the relationship between Customs Automated Systems and efficiency of cross border trade in Nairobi Inland Container Depot.

More specifically the first specific objective was to establish the influence of Integrated Customs Management System execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study established that Integrated Customs Management System execution has a positive and significant effect on efficiency of cross border trade. This indicates that Integrated Customs Management System execution is important in increasing efficiency of cross border trade.

Secondly the study sought to determine the influence of Electronic Cargo Tracking System execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that Electronic Cargo Tracking System execution has a positive and significant effect on efficiency of cross border trade. This indicates that Electronic

Cargo Tracking System execution is important in increasing efficiency of cross border trade.

The third specific objective was to evaluate the influence of Scanning Systems execution on efficiency of cross border trade in Nairobi Inland Container Depot. The study found that scanning systems positively impacts efficiency of cross border trade. This indicates that Scanning System execution is important in increasing efficiency of cross border trade

Lastly the final specific objective was to determine the moderating effect of Tax Agency Agility on the relationship between Integrated Customs Management System execution, Electronic Cargo Tracking System execution, Scanning Systems execution and efficiency of cross border trade in Nairobi Inland Container Depot. The study found that tax agency agility positively moderates the effects of Integrated Customs Management System execution, Electronic Cargo Tracking System execution, Scanning Systems execution on efficiency of cross border trade.

5.4 Recommendations

5.4.1 Policy Implications

The government should invest in the continuous development and maintenance of Integrated Customs Management Systems (ICMS) to ensure they remain efficient and up-to-date. Policies that support the integration of ICMS across various customs checkpoints can help standardize and streamline processes. The implementation and expansion of ECTS should be prioritized. This includes providing the necessary infrastructure and training to ensure effective use of these systems. Regulatory frameworks should be established to mandate the use of ECTS for all cargo to improve monitoring and reduce delays. Investment in advanced scanning technology and regular

upgrades are necessary to maintain the efficiency of cross-border trade. Policies should encourage the use of scanning systems to ensure security and expedite the inspection process. The government should create policies that promote flexibility and responsiveness in tax agencies. This can be achieved through training, resource allocation, and the adoption of innovative technologies. Encouraging a culture of agility within tax agencies will help them better adapt to changes and improve overall efficiency.

5.4.2 Practical Implications

Management should focus on the seamless execution of ICMS, ECTS, and scanning systems by providing continuous training and resources to staff. Adopting best practices from successful implementations can help improve the efficiency of these systems.

KRA should ensure that all staff are well-versed in the use of ICMS, ECTS, and scanning systems. This includes regular training and updates on the latest system functionalities.

KRA should also work on improving inter-agency collaboration to enhance system integration and data sharing. Traders and businesses should be encouraged to familiarize themselves with the new systems and processes. This can be facilitated through workshops, training sessions, and informational resources provided by KRA. Active participation and feedback from taxpayers can help identify areas for improvement and ensure the systems are user-friendly.

5.4.3 Theoretical Implications

The findings support the Technology Acceptance Model (TAM), which posits that perceived usefulness and ease of use influence the acceptance of technology. The

positive impact of ICMS, ECTS, and scanning systems on trade efficiency demonstrates their perceived usefulness and ease of use.

The study also supports the Diffusion of Innovations Theory, which explains how new ideas and technologies spread within an organization or society. The successful implementation of these systems at the Nairobi Inland Container Depot showcases the practical application of this theory.

The positive moderating effect of tax agency agility aligns with Organizational Agility Theory, which suggests that agile organizations are better at responding to changes and improving performance.

The study's findings reinforce the importance of agility in enhancing the effectiveness of technological systems in organizational settings.

5.4.4 Recommendations for Future Research

Future studies may be conducted to investigate the influence stake holder sensitization on cross border trade.

Investigate the impact of emerging technologies such as blockchain, artificial intelligence, and machine learning on customs management systems and cross-border trade efficiency.

Future research can explore how these new technologies can be integrated with existing systems to further enhance efficiency and security

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APPENDICES

Appendix I: Letter of Introduction

Rina Akello Ochieng',

P.O. BOX 19163-00501,

NAIROBI, KENYA.

TO WHOM IT MAY CONCERN,

**RE: RESEARCH STUDY ON MODERATING EFFECT OF TAX AGENCY
AGILITY ON THE RELATIONSHIP BETWEEN CUSTOMS AUTOMATED
SYSTEMS AND EFFICIENCY OF CROSS BORDER TRADE IN NAIROBI
INLAND CONTAINER DEPOT.**

I am Rina Akello Ochieng', currently a student at the Kenya School of Revenue Administration pursuing a Master's Degree in Tax and Customs Administration. To fulfil the requirements of the Master's program, I am required to carry out a research on the aforementioned topic. You have been identified as one of the respondents in this study based on your job knowledge and experience on this field. I kindly request for your assistance and cooperation towards making this study a success by filling in the attached questionnaire. Your responses during this study will be treated with utmost confidentiality and will only be used for the purpose of this study. Your cooperation in this regard will be highly appreciated.

Thank you in Advance.

Yours sincerely,

Rina Akello Ochieng'

Appendix II: Questionnaire

Please fill in the following questionnaire by answering all given questions as instructed.

Kindly note that the information provided shall be confidential and shall only be used for the purpose of this research. Please do not write your name anywhere on the questionnaire. **(Tick Appropriately).**

SECTION A: Personal Data

1. What is your Gender?

a) Male ☐ ☐

b) Female ☐ ☐

2. How long have you been working for the Customs department?

a) Less than a year ☐ ☐

b) 2-5 years ☐ ☐

c) 6-10 years ☐ ☐

d) 10-15 years ☐ ☐

e) Over 15 years ☐ ☐

Customs Automated System in Nairobi Inland Container Depot.

3. Are you aware of the Customs Automated Systems implemented in Nairobi Inland Container Depot?

a) Yes ☐ ☐

b) No ☐ ☐

If your answer in (4) above is yes, kindly **Tick** where necessary.

SECTION B: Influence of Integrated Customs Management System execution on efficiency of Cross Border Trade in Nairobi Inland Container Depot

Scale: 1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

		1	2	3	4	5
1	Document processing speed has reduced the clearance time of goods at the port.					
2	ICMS has reduced the transaction cost of clearance of goods.					
3	ICMS has encouraged seamless data exchange, e-documentation and online payment systems to reduce paperwork and simplify the trading process.					
4	Collaboration and information sharing between Customs and other government agencies involved has increased coordination.					
5	ICMS has eased the collection of duties and taxes hence fastened the clearance process at the port.					

SECTION C: Influence of Electronic Cargo Tracking System execution on efficiency of Cross Border Trade in Nairobi Inland Container Depot.

Scale: 1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

		1	2	3	4	5
1	ECT has a high level of real-time monitoring which provides real-time updates on the location, condition and movement of the cargo.					
2	ECT has a response time which evaluates the system's responsiveness in handling exceptional events or deviations from expected cargo movements.					
3	ECT affects the volumes of trade and accountability.					
4	Cost effectiveness evaluates the economic efficiency of the system, reducing transit time and improving customs clearance process.					
5	ECT has a high compliance rate which indicates the traders are following the tracking system properly.					

SECTION D: Influence of Scanning System execution on efficiency of Cross Border Trade in Nairobi Inland Container Depot.

Scale: 1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

		1	2	3	4	5
1	There are sufficient scanning systems at the port.					
2	Accurate and reliable information is produced by the scanning system at the port.					
3	The scanning system has a reduced scan time which speeds up the clearance of goods.					
4	The scanning system has a high compliance rate which speeds up the clearance time of goods.					
5	Enough skilled manpower available to operate scanners and fasten the clearance process.					

SECTION E: Tax Agency Agility

To determine the moderating effect of Tax Agency Agility on the relationship between Customs Automated Systems and Efficiency of Cross Border Trade in Nairobi Inland Container Depot.

Scale: 1. Strongly Disagree 2. Disagree 3. Neutral 4. Agree 5. Strongly Agree

		1	2	3	4	5
1	The agency flexibility influences success by continually seizing competitive opportunities for efficiency of cross border trade.					
2	The tax agency innovation ensures efficiency in the service delivery process					
3	Customs Automated Systems has helped drive the tax agency innovation and has enhanced efficiency of cross border trade					
4	The tax agency is adaptable to the needs that may arise					
5	The tax agency reacts purposefully and within an appropriate time scale to customer demands and changes in the marketplace to maintain a competitive advantage					

SECTION F: Efficiency of Cross Border Trade

To what extent has Customs Automated Systems affected efficiency of Cross Border Trade in Nairobi Inland Container Depot with respect to the following indicators.

Scale: 1. Very Small 2. Small 3. Moderate 4. Large 5. Very Large

		1	2	3	4	5
1	Reduced trade cost.					
2	Improved clearance time.					
3	Enhanced operational efficiency.					
4	Increased transparency and accountability.					
5	Streamlined documentation process.					

THANK YOU SO MUCH FOR YOUR TIME

Appendix III: KESRA Introductory Letter



**KENYA REVENUE
AUTHORITY**

ISO 9001:2015 CERTIFIED

PUBLIC

KENYA SCHOOL OF REVENUE ADMINISTRATION

REF: KESRA/NBI/036

4th June 2024

TO: WHOM IT MAY CONCERN

Dear Sir/Madam,

**RE: REQUEST FOR ASSISTANCE TO RINA AKELLO OCHIENG' OF
REGISTRATION NO.: KESRA105/0012/2021 UNDERTAKING MASTERS AT
KESRA**

This is to confirm that the above named is a student at Kenya School of Revenue Administration (KESRA) Nairobi Campus pursuing Masters in Tax and Customs Administration.

The named student is undertaking Research on TOPIC: "Customs automated system, tax agency agility and efficiency of cross border trade in Nairobi Inland Container Depot."

The purpose of this letter is to request for your kind facilitation in enabling the student progress in her research project by allowing access to any relevant information and/or conduct interviews, which are relevant to the project.

Your support to the student in this regard will be highly appreciated.

Thank you,

 Dameris M. Mwiru
 Manager Academic Research,
 KESRA

Tuliye Ushuru, Tujitegemee!

Appendix IV: NACOSTI Research License

 REPUBLIC OF KENYA	
Ref No: 909974	Date of Issue: 18/June/2024
RESEARCH LICENSE	
	
This is to Certify that Ms. Rina Akello Ochieng' of Kenya School of Revenue Administration, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Nairobi on the topic: EFFECTS OF CUSTOMS AUTOMATED SYSTEM ON CROSS BORDER TRADE IN NAIROBI: A CASE STUDY OF JOMO KENYATTA INTERNATIONAL AIRPORT AND INLAND CONTAINER DEPOT for the period ending : 18/June/2025.	
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Applicant Identification Number	Director General NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION
Verification QR Code	
	
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Appendix V: Plagiarism Awareness Certificate



SR648

ISO 9001:2019 Certified Institution

THESIS WRITING COURSE

PLAGIARISM AWARENESS CERTIFICATE

This certificate is awarded to

RINA AKELLO OCHIENG'

KESRA105/0012/2021

In recognition for passing the University's plagiarism

Awareness test for Thesis entitled: CUSTOMS AUTOMATED SYSTEM, TAX AGENCY AGILITY AND EFFICIENCY OF CROSS BORDER TRADE IN NAIROBI INLAND CONTAINER DEPOT similarity index of 8% and striving to maintain academic integrity.

Word count:24217

Awarded by

Prof. Anne Syomwene Kisilu

CERM-ESA Project Leader Date: 02/09//2024