INFLUENCE OF AUTOMATED SYSTEMS ON CUSTOMS REVENUE COLLECTION IN KENYA: A CASE OF NAMANGA BORDER IN KAJIADO COUNTY, KENYA

VINCENT MUGADIA KITAZI

A RESEARCH PROJECT SUBMITTED IN PARTIAL FULFILLMENT FOR THE AWARD OF A DEGREE IN MASTER OF BUSINESS ADMINISTRATION (ACCOUNTING OPTION) OF MOUNT KENYA UNIVERSITY

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DECLARATION AND APPROVAL

Declaration by the Student

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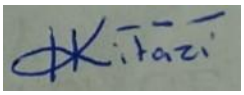
Signed: ……  …… Date: …….14/11/2024……

VINCENT MUGADIA KITAZI

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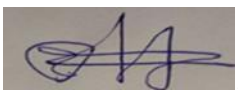
Signed: ……  ……. Date: ……14/11/2024…….

DR. OSCAR SANGORO

DEDICATION

I dedicate this work to my family, friends and colleagues for all their support during this study. I am sincerely grateful for your encouragement.

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I express my profound gratitude to my supervisor, Dr. Oscar Sangoro, for his unwavering support and invaluable guidance, which played a crucial role in enabling the timely

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ABSTRACT

Customs plays a vital role in the economic stability of any nation. Globally, customs administrations are tasked with essential duties, including revenue collection, societal protection, and safeguarding the security of supply chains. As the world increasingly operates as an interconnected global village, the exchange of goods and services across borders has become a universal priority. In Kenya, however, the Customs and Border Control Department has often fallen short of meeting the revenue targets set by the treasury. For instance, during the 2016/2017 financial year, the department managed to collect only 443.5 billion Kenyan shillings, falling short of the 462-billion-shilling target. In the subsequent financial year, 2017/2018, the collection totaled 469.97 billion against a target of 484.97 billion shillings (KRA, 2019). Kenya shares in merchandise trade remains very low at 2.7% in 2021, Kenya's

share in world exports declined from 3.5% in 2018 to 2.5% in 2022, the lowest regional share, (KRA, 2022). The main objective was to determine the influence of automated system on customs revenue collection in Kenya: A case of Namanga Border. The specific objectives were to determine the effect of Regional Electronic Cargo Tracking System, Integrated Customs Management System, **S**canning technology and duty computation system on customs revenue collection at Namanga border in Kenya. The study was supported by Unified Theory of Acceptance and Use of Technology, Technological Change Theory, System Theory, Diffusion of Innovation theory. The study adopted descriptive research design. The target population was 234 KRA officials at Namanga border and a sample size of 148 respondents. This study used primary data which was collected using structured questionnaires. The inferential statistics comprises correlation analysis and multiple regression analysis. The correlation results revealed significant positive associations between Regional Electronic Cargo Tracking System, Integrated Customs Management System, **S**canning technology and duty computation system with customs revenue collection (r=.640, p=.002; r=.730, p=000; r=.678, p=001, r=.539, p=000). Regression analysis further indicated that Regional Electronic Cargo Tracking System (β=.227, p=0.002), Integrated Customs Management System (β=.394, p=0.000), **S**canning technology (β=.257, p=0.001) and duty computation system (β=.293, p=0.000) were positively and significantly related to customs revenue collection. The study concluded that regional electronic cargo tracking system, integrated customs management system, **s**canning technology and duty computation system significantly affects customs revenue collection. The study recommends that, KRA should formulate policies that govern customs revenue collection and collection of taxes in general. Therefore, future research can be done on other factors not included in the study such as effect of compliance cost on customs revenue collection.

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ASYCUDA Automated System for Customs Data and Management

EGMS Excise Goods Management System

ETR Electronic Tax Registers

ICMS Integrated Customs Management System.

ICT Information and Communications Technology

ITAX Integrated Tax Management System

KRA Kenya Revenue Authority.

RARMP Revenue Administration Reform and Modernization Program

RECTS Regional Electronic Cargo Tracking System

NACOSTI National Commission for Science, Technology and Innovation

OSBP One Stop Border Post

TRA Tanzania Revenue Authority. **WCO**

World Customs Organization.

CHAPTER ONE

INTRODUCTION

1.0 Introduction

This chapter presents a comprehensive discussion of the study's background, covering perspectives from global, regional, and local contexts. It subsequently addresses the statement of the problem, outlines the study's objectives, and specifies the research hypotheses. Additionally, the chapter highlights the study's significance, scope, limitations, delimitations, assumptions, and provides operational definitions of essential terms.

1.1 Background of the study

Taxation is essential for a state's development, providing funds for infrastructure, social redistribution, and establishing a fiscal social contract between the government and its citizens. When tax revenues are insufficient to cover necessary expenditures in critical sectors like infrastructure, health, and education, this gap becomes a persistent issue (Forstater, 2019). Generally, citizens are willing to pay taxes if they believe the tax system is fair and perceive that tax revenues are used to serve their interests.

Customs also plays a critical role in any country's economy, with customs administrations worldwide responsible for revenue generation, societal protection, and securing the supply chain. Additionally, customs operations focus on enhancing trade facilitation to stimulate investment and help reduce poverty (World Customs Organization, 2022). Yet, 21st-century challenges have placed unprecedented demands on customs. Today, customs administrations must respond swiftly to these evolving challenges, which require an in-depth understanding of globalization, international trade dynamics, the technical intricacies of supply chains,

emerging political directions, and the increasing complexity of the global environment (Gordhan, 2020).

Customs revenue collection is the process by which customs authorities gather taxes, tariffs, and duties on goods entering or exiting a country. The revenue is crucial for national budgets, providing funds that support public services and infrastructure. Customs revenue collection also serves as a regulatory tool, helping to control imports and exports, protect local industries, and enforce trade policies. Effective customs revenue collection relies on accurate valuation, classification, and risk management to minimize evasion and fraud (World Customs Organization, 2020).

Globalization has fueled an unprecedented increase in the movement of goods, capital, and services across international borders and territories. This global exchange has transformed the world into a vast, interconnected marketplace through the establishment of shared markets and economic unions. These unions, characterized by common external trade policies, unrestricted flow of goods and services, mobility of production factors among member nations, and synchronized economic policies, have facilitated seamless cross-border interactions. A pivotal aspect in advancing international trade has been the reduction or elimination of trade barriers, which can create hurdles for businesses. In theory, free trade implies removing all such obstacles, save for those necessary for health or national security. Trade liberalization has thus reduced tariff barriers and increasingly focused on removing non-tariff barriers to ease and speed up legitimate international trade (OECD, 2021).

Automated systems have become an essential means to enhance efficiency in tax administration. Specifically, under electronic lodgment, systems are designed to handle customs entry data, validation, tax and duty calculations, electronic submissions, and rejections with detailed error feedback. These systems streamline processes like confirmation receipts, form printing, and report generation, allowing customs agents to submit entries from

their offices with full authenticity and seamless lodging. This design speeds up import release, helping meet trade facilitation goals (UNCTAD, 2021).

In Asia and the Pacific's developing regions, trade-related costs remain comparatively high. Many countries are actively strategizing to simplify international trade processes to harness the maximum benefits. Reducing trade costs while amplifying the trade and welfare benefits stemming from streamlined customs procedures has become a pressing issue, particularly for developing nations. Factors such as excessive documentation, outdated technology, unclear requirements, and a lack of transparency in import and export processes act as barriers to efficient trade (Chris, 2020).

In regions like Russia and Spain, new digital VAT reporting systems demonstrate technology's potential for advanced analytics in tax management. The adoption of e-Customs platforms has thus become a strategic focal point for governments worldwide to ensure compliance and ease of trade. In developed nations, such systems have significantly bolstered customs revenue performance, underscoring the importance of digital solutions in modern tax administration (Dobell, 2022).

Germany's adoption of an automated customs system has reduced trade barriers, facilitating the free flow of goods within the European Union (OECD, 2021). In China, automation has achieved 78% efficiency, simplifying customs and enabling harmonization with other users (Alcedo & Cajala, 2022). Meanwhile, Mexico's government has integrated automated customs procedures to bolster revenue collection and trade facilitation with neighboring countries. The Mexican system is instrumental in curbing the infiltration of illegitimate goods, such as illegal drugs (Horvat, 2021).

Reports from the Global Alliance for Customs Performance and World Economic Forum (2022) show that developing nations, such as those in Sub-Saharan Africa, have adopted extensive customs reforms, including both hard infrastructure (e.g., roads, ports, ICT systems)

and soft infrastructure (e.g., process streamlining, corruption reduction). In SSA, reform often involves creating or enhancing roads, railways, and ICT systems, while addressing customs and border protocols to foster smoother cross-border trade.

Globally, over 85 countries have implemented customs management systems, which enable efficient oversight of fiscal and control responsibilities. However, automated systems alone cannot completely eliminate issues like procedural delays, opaque processes, or inconsistent clearing protocols. The increasing demand for global logistics is seen not only in developed markets but also in emerging economies, where traditional companies like COSCO and Sinotrans in China have modernized their structures to match global trends (China State Council, 2021).

In Africa, the persistence of manual customs documentation or inadequately supported automated systems often leads to delays, impacting trade facilitation and increasing the chances of "facilitative payments" to expedite clearance. As Shinyekwa and Otieno (2021) state, effective border management is crucial for seamless, cost-efficient cross-border trade, especially in landlocked developing nations that depend heavily on distant seaports.

In the East African Community (EAC), integrated systems between Kenya and Uganda have facilitated a significant trade relationship, with Uganda consistently being one of Kenya's top trading partners. Since 1997, trade volumes between these nations have grown substantially, with the EAC prioritizing cooperation in economic, political, and social spheres to drive regional development. The EAC's primary goal is to foster economic integration, encompassing a customs union, common market, monetary union, and eventually, a political federation (KNBS, 2017).

Information and communication technology (ICT) has become a cornerstone of efficient tax and customs administration. The World Customs Organization and the World Trade Organization have promoted ICT adoption through various instruments, such as the WTO

Trade Facilitation Agreement and the WCO Revised Kyoto Convention. These initiatives have been incorporated into the East African Community Customs Management Act (EACCMA), emphasizing the role of technology in customs processes (WTO, 2021).

Numerous African nations have adopted the Automated System for Customs Data and Management (ASYCUDA), which has become essential for managing customs declarations, accounting, and transit procedures. However, delays remain prevalent in high-traffic border posts, such as Beitbridge and Chirundu, with average waiting times of 24 to 46 hours. Customs inspections are a leading cause of these delays, negatively affecting trade (UNECE, 2021; WCO, 2022).

In Ghana, the Customs Excise and Preventive Service struggles with corruption, which hinders trade efficiency. Similar issues affect developing nations where ports, including Mombasa, face persistent delays due to customs formalities. Missing documents and errors in import/export declarations are also major delay factors, disrupting the flow of trade (UNCTAD, 2019).

In Kenya, like many other countries, customs automation has become a priority among agencies involved in international trade. These agencies oversee goods crossing borders, manage classifications and origins, enforce trade policies, and collect revenue. Customs operations significantly impact international trade, either positively or negatively (Isaac, 2022). In Kenya, customs operations of clearing and forwarding firms are regulated by the Kenya Revenue Authority (KRA), specifically within its Customs Services department.

To modernize tax administration, the Kenya Revenue Authority implemented the Revenue Administration Reform and Modernization Program (RARMP). This initiative introduced systems like the Integrated Tax Management System (iTax), Integrated Customs

Management System (ICMS), Regional Electronic Cargo Tracking System (RECTS), and Excise Goods Management System (EGMS), enhancing KRA's efficiency as a modern tax entity (KRA, 2020).

Kenya's customs operations use various systems, such as the Cargo Tracking System, Cargo Manifest, Customs Oil Stocks Information System, and Manifest Management System. These systems facilitate customs processes by monitoring stocks, reconciling lodgments, and providing valuation data for goods entering the country (Okoth, 2022).

In Kenya, the 'Single Window' approach was introduced by the customs department as a governance model focused on public service excellence. Through this interface, citizens and businesses access government services more seamlessly, reducing transaction costs and improving service efficiency (Akinyi & Mupelwa, 2021).

The Revised Kyoto Convention is widely regarded as the benchmark for customs modernization. Recognizing Kenya's need for a reliable customs system, the Kenya Revenue Authority launched the Simba System in 2005, a web-based system aimed at transforming customs processes. The current Simba system includes multiple subsystems and requires several authentication steps, sometimes leading to delays. Nonetheless, the system represents a major step in KRA's customs reform initiatives (Gitaru, 2022).

1.1.1 Customs Revenue Collection

Over the past decade, customs performance in Kenya has been under continuous evaluation and improvement. Key reforms in customs duties have included streamlining tariff codes, lowered average tariff rates, and narrowed the range of tariff bands. These changes, which have been ongoing since the 1990s, were motivated by conditions tied to development assistance, preferential trade agreements, and adherence to World Trade Organization (WTO) standards. As part of these efforts, tariff rates (especially those affecting imported intermediate goods) and the number of tariff bands have been progressively reduced. Customs

reform has coincided with trade liberalization initiatives aimed at shifting the focus from an import-substitution industrial strategy toward a model that supports export-led industrialization, ultimately promoting greater trade openness (Kamau, 2021).

A critical foundation for any effective customs administration is the establishment of a reliable, automated IT infrastructure capable of speeding up cargo clearance and facilitating the electronic transfer of information within the trade network. Various consultancy reports by the International Monetary Fund's fiscal advisory division have repeatedly identified the lack of such a system as a significant obstacle to trade efficiency. In response, the Kenya Revenue Authority's 2008 report highlighted the Simba 2005 system as a core component of customs modernization efforts in Kenya. This web-based platform has enabled automation for approximately 90% of customs operations, significantly reducing the need for taxpayers to make physical visits to KRA offices. Over recent years, this system has contributed to substantial gains, with customs revenue increasing from KShs. 96 billion in the 2003/04 fiscal year to KShs. 331 billion by the 2013/14 fiscal year.

The implementation of the New Computerized Transit System (NCTS) marks a significant advancement in customs procedures, representing a collaborative endeavor among customs officers, international freight forwarders, and business owners to establish conditions for a smoother, faster, and more effective flow of goods. The NCTS offers numerous advantages for customs officials and business stakeholders, notably benefitting forwarders, certified importers and exporters, transport companies, and various other participants in the transport and trade ecosystem (Babić, 2022).

According to Djankov (2010), even a single day's delay in getting goods to their destination can result in a 1 percent reduction in the total trade volume of an affected country, effectively adding an equivalent of 70 kilometers to transport distances. Delays impacting time-sensitive goods have an even greater effect, with trade volume decreasing by as much as 6 percent.

While larger firms often have the capacity to absorb the expenses associated with time delays and continue trading, these additional costs may prevent smaller firms from entering or participating in cross-border transactions. To avoid these delays, firms may attempt to optimize their supply chains, reduce the volume of goods traded, or change the nature of products they export or import. Consequently, recognizing that trade can be a significant driver of economic growth, many countries have prioritized streamlining inefficient customs practices by adopting advanced technology solutions to eliminate bottlenecks.

1.1.2 Namanga Border in Kenya

Customs refers to the government authority responsible for overseeing customs law, collecting various duties and taxes, and ensuring compliance with other legal and regulatory measures related to the import, export, transport, and storage of goods. Within Kenya, the Customs & Border Control Department, formerly known as the Customs and Excise Department, operates under the Kenya Revenue Authority. This department was formally established by an Act of Parliament in 1978 and stands as the largest of KRA's four revenue departments in terms of workforce, revenue generation, and its expansive operational reach across the country. The department aims to attain global recognition as a progressive, modernized customs administration, aligning with the evolving expectations of the 21stcentury customer (Shinyekwa & Othieno, 2019).

The Namanga One Stop Border Post (OSBP) is a joint border crossing facility between Tanzania and Kenya, it is one of the busiest border crossings between the two countries. Prior to the opening of the OSBP, it could take up to two days to clear customs at the Namanga border crossing, average crossing times are now 30 minutes. Introduction of the One Stop Border Post (OSBP) included improvements in the road infrastructure and simplification of the customs procedures. Namanga OSBP has very good infrastructure housed in a modern building with good facilities, ample parking available and very good road to Arusha.

Inspection is conducted by a multiagency team resulting in smooth processing and quick flow of traffic and no matter from which side of the border the crossing takes place there is only a requirement for customs procedure to take place at the point of entry reducing the customs/immigration administrative process in half.

1.2 Statement of the problem

In today's dynamic environment, organizations and states must embrace not only infrastructure, processes and people but also technology to achieve optimal economic productivity. The increasing volumes of international trade and the involvement of structural diverse groups in the international supply chain has made it necessary for technology to not only automate but also accelerate customs procedures. Various concerns have been raised by the public, particularly by traders and investors engaged in both domestic and international commerce, about the bureaucratic inefficiencies within the customs process and its impact on trade facilitation. These concerns have been highlighted in several reports, including one by the Organisation for Economic Co-operation and Development (OECD, 2020), which focuses on how the administrative hurdles in customs procedures can hamper the smooth flow of goods and services across borders.

The Kenya Revenue Authority (KRA)'s decision to implement the automation of its Customs Systems was a direct response to the government's growing interest in fostering smoother cross-border trade, enhancing tax collection processes, strengthening the enforcement of cargo handling regulations, and ultimately ensuring that Kenya remains the preferred logistics hub for East Africa's trade. According to Kiragu (2016), the shift toward automation was intended to address several challenges faced by the country's trade infrastructure and customs procedures. Despite this effort, Tibbs (2015) pointed out that KRA faced significant challenges in managing issues such as the loss of tax revenue due to the illegal dumping of

goods, the need to enhance the security of transit goods, and the requirement to increase cargo throughput by eliminating physical escorts for goods in transit. In addition, there were calls to optimize internal processes at KRA to minimize human intervention, automate the collection of critical data, and improve reporting mechanisms to assist with better operational decision-making. Ensuring the competitiveness of Kenya as the leading trade route for East and Central Africa was also an ongoing challenge for KRA.

Customs departments globally are tasked with several mandates, including revenue collection, border security, the compilation of international trade statistics, and trade facilitation (Ayuma, 2018). Within Kenya, revenue generation has long been the primary metric used to assess the performance of the Customs and Border Control Department (Morini, De'SaPorto, & Inaciao, 2017). However, the department has faced criticism for its failure to consistently meet its revenue targets. Specifically, there have been instances where the department has failed to achieve its revenue collection goals. For example, in the 2016/2017 financial year, the department managed to collect KSh 443.5 billion, falling short of its target of KSh 462 billion. The following year, in 2017/2018, the shortfall persisted, with the department collecting KSh 469.97 billion against a target of KSh 484.97 billion (KRA, 2019). Despite these efforts, Kenya's share in global merchandise trade remains relatively low, accounting for only 2.7% of global trade in 2021. Moreover, Kenya's share in world exports declined significantly from 3.5% in 2018 to just 2.5% in 2022, marking the lowest regional share (KRA, 2022).

From the existing empirical studies by previous researchers such as Duval, Utoktham and Kravchenko (2018) who conducted a study on the effect of implementation of digitalization on trade costs in Asia. Hence conceptual gap and contextual gap. Sameti and Rafie (2020) analyzed the effects of customs duty tax and economic growth in South Africa. They used panel data regression thus conceptual and methodological gaps. This study therefore sought

to fill in the gaps by focusing on the influence of automated system on customs revenue collection in Kenya: A case of Namanga Border.

1.3 Purpose of the study

The purpose of the study was to determine the influence of automated system on customs revenue collection in Kenya:A case of Namanga Border.

1.4 Objectives of the study

The specific objectives of study were:

i. To determine the effect of Regional Electronic Cargo Tracking System on customs revenue collection at Namanga border in Kenya ii. To access influence of Integrated Customs Management System (ICMS) on customs revenue collection at Namanga border in Kenya iii. To access influence of scanning technology on customs revenue collection at

Namanga border in Kenya iv. To access influence of duty computation system on customs revenue collection at

Namanga border in Kenya

1.5 Research Questions

The study was guided by the following research questions:

i. What is the effect of Regional Electronic Cargo Tracking System on customs revenue collection at Namanga border in Kenya ii. What is the effect o Integrated Customs Management System on customs revenue collection at Namanga border in Kenya iii. What is the effect of Scanning technology on customs revenue collection at

Namanga border in Kenya

iv. What is the effect of Duty computation system on customs revenue collection at

Namanga border in Kenya

1.6 Significance of the study

The study will be of importance to the following stakeholders

Numerous concerns have been raised, particularly by businesses and individuals involved in domestic and international commerce, regarding the inefficiencies and bureaucratic hurdles within the customs process and their negative effects on trade facilitation. These issues have been thoroughly documented in several reports, including a 2020 report by the Organisation for Economic Co-operation and Development (OECD), which highlights the challenges posed by the administrative bottlenecks within customs procedures. These barriers significantly hinder the seamless movement of goods and services across international borders, ultimately affecting global trade flows.

In response to these ongoing challenges, the Kenya Revenue Authority (KRA) made the strategic decision to modernize and automate its Customs Systems. This move was part of the government's broader initiative to streamline cross-border trade processes, improve tax collection methods, strengthen the enforcement of cargo handling regulations, and position Kenya as the leading logistics hub for East African trade. Kiragu (2016) noted that the introduction of automation aimed to resolve several critical issues within Kenya's trade infrastructure, including inefficiencies within the customs process. However, Tibbs (2015) pointed out that despite these technological advancements, KRA continued to face significant hurdles, including the loss of tax revenue from illicit goods imports, the need for improved security for goods in transit, and the challenge of increasing cargo throughput by removing the necessity for physical escorts for goods in transit. Furthermore, there were growing calls to optimize KRA's internal processes by reducing human intervention, automating the collection of essential trade data, and improving reporting systems to enable better

decisionmaking. Maintaining Kenya's competitive edge as the primary gateway for trade in East and Central Africa also remained a significant challenge for the authority.

Customs authorities around the world are charged with a variety of responsibilities, including revenue collection, border security, compiling international trade statistics, and facilitating trade (Ayuma, 2018). In Kenya, the Customs and Border Control Department has long been assessed primarily based on its ability to generate revenue. However, the department has faced considerable criticism for its failure to consistently meet revenue targets. This issue became especially apparent in instances where the department failed to meet its projected revenue collections. For example, in the 2016/2017 financial year, KRA collected KSh 443.5 billion, which was below the target of KSh 462 billion. The shortfall continued into the 2017/2018 financial year, with KRA collecting KSh 469.97 billion against the target of KSh 484.97 billion (KRA, 2019). Despite these efforts, Kenya's global share of merchandise trade remained relatively low, accounting for only 2.7% of global trade in 2021. Moreover, the country's share of global exports saw a significant decline, dropping from 3.5% in 2018 to 2.5% in 2022, marking Kenya's lowest regional share (KRA, 2022).

The study will also fill knowledge gaps in literature on the influence of automated system on customs revenue collection of and propel further research by scholars in other countries and in different aspects of customs revenue such as Regional Electronic Cargo Tracking System, Integrated Customs Management System, **S**canning technology and duty computation system.

1.7 Scope of the Study

The research aimed to examine the impact of automated systems on customs revenue collection in Kenya, specifically focusing on the Namanga Border. The primary objective was to assess how various technologies, including the Regional Electronic Cargo Tracking

System, Integrated Customs Management System, Scanning Technology, and Duty Computation System, influence the efficiency of customs revenue collection at this particular border point. The study targeted a total population of 234 Kenya Revenue Authority (KRA) officials stationed at Namanga Border, with a sample size of 148 respondents selected to participate. To gather relevant data, primary information was collected through the use of structured questionnaires featuring closed-ended questions. The research was conducted over a period extending from April 2024 to October 2024.

1.8 Study limitations

The research faced several limitations that could potentially impede the access to the necessary information needed for the study. One of the key challenges was the possibility that the respondents, particularly those targeted for participation, might hesitate or be unwilling to share accurate information. This reluctance could stem from concerns that the data they provide might be misused, either by being used to intimidate them or by portraying the organization in a negative light. To mitigate this concern, the researcher planned to present an official introduction letter from Mount Kenya University. This letter was intended to reassure participants that their responses would be handled with the utmost confidentiality and would solely be used for academic research purposes, without any intentions to harm or misrepresent them or their organization.

1.9 Delimitation of the Study

In research, delimitations are regarded as the decisions made by the researcher to outline the scope and boundaries of the study (Simon, 2019). Matthews and Kostelis (2021) further emphasize this perspective, noting that delimitations provide an opportunity for the researcher to clarify any limitations they have set for the research. In this particular study, the focus will

be on a case study involving a single organization. The research will examine several independent variables, including the regional electronic cargo tracking system, the integrated customs management system, scanning technology, and the duty computation system. The dependent variable in the study will be the collection of customs revenue. To achieve this, a descriptive research design will be employed, with questionnaires serving as the primary tool for gathering data from respondents. The data collected will be analyzed using descriptive statistics to summarize the key findings. Furthermore, the study will analyze data from the past five financial periods in Kenya to provide a comprehensive overview of trends and patterns related to the topic under investigation.

1.10 Assumptions of the Study

The study assumed that Kenya Revenue Authority will have improved customs revenue collection by incorporation of automated system. The study also assumed that respondents will voluntarily agree to participate in the study and honestly give their feedback which will result in improvement of customs revenue collection.

1.11 Operational definition of key terms

Integrated Customs Management System: This refers to a comprehensive system designed to link the internal operations of the Kenya Revenue Authority (KRA) with the systems of external stakeholders, aiming to streamline and expedite the process of cargo clearance. The system is organized through a centralized repository that integrates various functional modules, allowing for efficient management and monitoring of customs procedures. **One-Stop Border Post:** A One-Stop Border Post (OSBP) is a shared facility situated at a border crossing between two neighboring countries or in close proximity to such a crossing. In this facility, the border agencies from both nations—such as Customs, Immigration, Police,

health, and veterinary authorities—collaborate to perform their respective functions. These agencies are responsible for inspecting goods, individuals, and vehicles, facilitating the seamless movement of goods and travelers across the border, and ensuring compliance with both national and international regulations.

Regional Electronic Cargo Tracking System: This is an advanced tracking system designed to monitor the movement of transit vehicles carrying goods along the northern corridor. It involves the installation of electronic seals (e-seals) on the cargo vehicles, which are equipped with a 60-day power capacity, allowing for continuous tracking. These seals are connected to the system via the General Packet Radio Service (GPRS) platform, providing real-time monitoring and ensuring that goods in transit are securely tracked throughout their journey.

Scanner Technology: This refers to a non-intrusive inspection technique used in the transport system to inspect and identify cargo by generating X-ray images. The technology is employed to examine the contents of goods without opening them, thereby reducing the time required for cargo clearance at ports of entry. The use of scanner technology is particularly aimed at speeding up the inspection process for imported goods, ensuring that clearance procedures are both efficient and secure.

Systems Automation: Systems automation involves the use of both software and hardware to manage business operations with minimal human intervention. By automating key processes, businesses can improve efficiency, reduce the likelihood of errors, and ensure that tasks are performed swiftly and accurately. In the context of customs and trade, systems automation enables the seamless handling of various operations, such as cargo clearance, data processing, and reporting, thus enhancing the overall functionality of customs procedures.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter offers a comprehensive review of the literature regarding the influence of automated systems on customs revenue collection in Kenya, specifically at the Namanga Border. It explores the effects of key systems such as the Regional Electronic Cargo Tracking System, Integrated Customs Management System, Scanning Technology, and Duty Computation System on the efficiency and effectiveness of customs operations. The chapter begins by examining relevant theories that support the study, followed by an empirical review of past research that highlights the practical applications and outcomes of automation in customs. It also presents a conceptual framework that links the study's variables, demonstrating how these technological systems can enhance customs processes and revenue collection. The chapter concludes with a summary of the reviewed literature, identifying key findings and research gaps that this study seeks to address.

2.1 Empirical Review

This section discusses empirical studies of study variables

2.1.1 Regional Electronic Cargo Tracking System and Customs Revenue Collection The introduction of electronic tracking for transit goods in Jordan led to a significant reduction in smuggling along the country's roads; however, it inadvertently resulted in a shift towards more sophisticated and organized smuggling activities at the customs stations after the electronic seals were removed from the transit goods (Alfitiani, 2020). This shift in smuggling

methods indicates that, while the electronic tracking system was successful in curbing smuggling along the transportation routes, it did not fully eliminate the issue, particularly at the critical border stations. In response to this challenge, the Regional

Electronic Cargo Tracking System (RECTS) has been implemented by Kenya, Uganda, and Rwanda with the aim of addressing similar issues that had long plagued the region, particularly those associated with the use of licensed tracking vendors. The RECTS initiative seeks to offer a more advanced and effective solution to ensure the security of goods in transit across these countries and prevent the diversion of goods from their approved routes. In Uganda, the implementation of the Regional E-Cargo Tracking System project, with an investment of $3,600,000, was primarily driven by the need to overcome significant delays caused by the use of physical escorts, which have been recognized as a major non-tariff barrier to trade in the region (WTO). According to the Uganda Revenue Authority (URA), physical escorts significantly lengthened the transit period, increasing it from just one day to between three and four days, leading to substantial increases in transport costs. This extended duration results in an estimated additional cost of $400 to $500 for each consignment due to the increase in the time spent in transit, which directly impacts the efficiency and competitiveness of trade in the region (Okoth, 2022). By implementing electronic cargo tracking, Uganda aims to streamline the process, reduce unnecessary delays, and minimize the financial burden caused by extended transit periods.

The Electronic Cargo Tracking System (ECTS) is a comprehensive, multi-tiered system that has been developed to monitor goods remotely while they are in transit, allowing for tight control over the cargo as it moves through the supply chain from its point of origin to its final destination. This real-time monitoring system uses advanced technologies such as Radio Frequency Identification (RFID) and GPS/GPRS to track the movement of goods. It is now a legal requirement for all outbound trucks, vehicles, tankers, and containers carrying goods for

transit to be equipped with a tracking device, which serves as the basic mechanism for tracking and vehicle monitoring. Furthermore, these vehicles must be fitted with an electronic seal that continuously reports the truck's location and immediately alerts authorities if any violations or irregularities occur during transit (Musyoki, 2019). This system is designed to enhance the integrity of cargo movement and prevent unauthorized deviations from the approved routes, thus strengthening customs controls and improving revenue collection.

In a study by Odago (2021), the impact of adopting the Electronic Cargo Tracking System (ECTS) on excise revenue collection at Jomo Kenyatta International Airport in Kenya was analyzed. The findings of the study revealed that the introduction of ECTS had a significant and positive effect on excise revenue collection in the country, underscoring the importance of the system in enhancing the efficiency and effectiveness of customs operations. Similarly, Lweis (2012) highlighted the profound impact that Information and Communication Technology (ICT) has on customs clearance processes, especially in West Africa, where all stakeholders rely heavily on ICT to ensure the smooth flow of information, facilitate the digital payment of duties, monitor cargo movement, and eventually clear and forward goods. The study emphasized the role of ICT in streamlining customs procedures and improving overall trade efficiency.

Mugambi (2021) conducted a study to assess the effect of the Electronic Cargo Tracking System (ECTS) on cross-border trade between Kenya and Uganda. The research found that the system, adopted by the Kenya Revenue Authority, has significantly reduced the diversion of cargo to the local market, leading to a more secure and transparent system of handling goods in transit. Additionally, the ECTS has reduced the time required to clear cargo at border points, making customs procedures faster and more efficient. This system has also simplified the collection of duties and fines, further enhancing the efficiency of customs operations and improving the overall trade experience between the two countries.

Kabiru (2020) investigated the relationship between the electronic cargo tracking system and operational performance at the Kenya Revenue Authority, as well as its impact on transporters. The study identified that one of the main challenges in implementing the system was a slight disconnect between the expectations of the revenue authorities and the systems provided by the vendors. The research also highlighted the critical role of IT infrastructure in ensuring the successful implementation of the ECTS. A robust and reliable IT infrastructure is essential for the effective functioning of the system, enabling real-time tracking and ensuring that any violations or deviations are promptly reported.

According to Njuguna and Maina (2020), the Regional Electronic Cargo Tracking System (RECTS) utilizes GPS technology to offer real-time tracking of goods as they move from the point of entry to their final destination. The system significantly reduces unauthorized diversions, smuggling, and transit fraud by sending alerts whenever a vehicle deviates from its authorized route or if tampering is detected. The literature stresses the importance of the RECTS in ensuring cargo security, reducing revenue leakage, and maintaining the integrity of goods during transit. By guaranteeing that goods declared at customs are not tampered with during the journey, the system helps to prevent revenue loss and improves the overall efficiency of customs operations.

2.1.2 Integrated Customs Management System and Customs Revenue Collection

An Integrated Customs Management System (ICMS) is a comprehensive digital platform that supports customs administrations in managing import/export processes, revenue collection, and compliance enforcement. By integrating various customs functions including declaration processing, risk assessment, duty calculation, and revenue collection ICMS enhances efficiency, transparency, and accountability. An Integrated Customs Management System consolidates all aspects of customs administration, allowing for seamless data sharing across

departments and improved decision-making. The system typically includes modules for cargo tracking, declaration processing, and automated duty computation, thereby facilitating realtime processing and enhancing revenue collection accuracy (Ahmed & Kim, 2020).

According to Ward and Dietmar (2020), automation in customs processes offers several key advantages, such as expediting the release of cargo that is passing through customs clearance. It also simplifies procedures and documentation by adhering to international standards, which reduces the need for physical inspections of goods. Moreover, automation separates the payment of duties and taxes from the physical clearance process, enabling faster electronic submission of customs declarations via Direct Trader Input (DTI) or other online platforms. Holniker (2020) further emphasizes the benefits of automation, particularly in reducing the need for customs auditing of documents, which streamlines the entire process and increases efficiency.

Swindley (2020) expands on these benefits by including the role of automation in improving payment and accounting processes. The system helps to register and track payments made by importers and exporters, ensuring accuracy and transparency. Additionally, automation enhances risk management by enabling customs to identify consignments that pose higher risks, such as those that might involve duty and tax evasion, illegal drugs, or materials linked to terrorism. The system also plays a crucial role in generating and reporting trade statistics, which are essential for disseminating foreign trade data and producing management reports. This facilitates better communication between customs authorities, traders, and other government entities. Ultimately, the most significant advantage of automation is the reduction in administrative costs, both directly and indirectly, and the enhanced effectiveness in the collection of customs revenue. The automation of tax calculations ensures the uniform

application of laws and regulations, thereby increasing the collection of duties and taxes and enhancing overall security within the system.

According to (Chen & Wang, 2019). ICMS improves customs efficiency by reducing processing time and the administrative burden associated with manual customs procedures. According to research, countries that have adopted ICMS report shorter cargo clearance times and reduced congestion at border checkpoints, which, in turn, incentivizes compliance and further improves revenue collection Additionally, the system reduces costs associated with paper-based processes, enabling customs departments to focus resources on revenue-generating activities.

Singh & Perez, (2022) argued that ICMS is often integrated with risk management tools that flag high-risk shipments for further inspection, enhancing compliance and safeguarding revenue. This system allows customs to prioritize inspections, focus on high-value or highrisk goods, and improve revenue protection. Studies highlight the effectiveness of risk-based assessment within ICMS, which improves both security and revenue outcomes

Mwonge (2021) conducted a study to investigate the impact of electronic tax filing on customs tax collection in Uganda. The findings revealed that the introduction of the e-filing system (e-Tax) has significantly contributed to the collection of customs revenue, with approximately UShs 7 trillion worth of revenue processed through electronic payments. This revenue stems from over 1.4 million payments, supported by more than 360,000 tax returns submitted online. The study also highlighted the need for improvements in the system, recommending that the tax authority upgrade the e-Tax servers to enhance performance and incorporate more user-friendly features to increase taxpayer engagement. Additionally, the study suggested that a nationwide sensitization program be launched to encourage greater adoption of the e-filing system across the country.

In a similar context, Madola (2019) explored the factors influencing the adoption of the Integrated Tax Management System (ITMS) by Small and Medium-sized Enterprises (SMEs) in Nairobi. The study found that taxpayers' perceptions of e-filing technology, including its ease of use and perceived usefulness, play a critical role in determining the adoption and usage of the system. Of the 245 taxpayers interviewed in Nairobi, over 88.9% considered efiling to be a beneficial innovation, and they expressed that the system's efficiency motivated them to comply with their tax obligations, particularly in comparison to the traditional manual system. However, the study also pointed out that the Kenya Revenue Authority (KRA) has not implemented sufficient measures to ensure that taxpayers are fully trained in using the system. This lack of proper guidance may explain why some taxpayers have not yet embraced e-filing, despite recognizing its potential benefits and efficiency.

2.1.3 Scanning Technology and Customs Revenue Collection

Scanning technology, including X-ray and gamma-ray systems, enables customs officials to examine goods quickly and effectively. By providing real-time imaging of cargo, scanning technology enhances customs' ability to detect illegal goods, under-declared goods, or misclassified items, which might otherwise evade appropriate taxation. The literature suggests that implementing such technology reduces smuggling, aids in accurate duty assessment, and increases compliance (Chen & Luo, 2020)

Cargo scanning, or Non-Intrusive Inspection (NII), employs advanced, non-destructive methods to inspect and identify goods moving through transportation systems, playing a pivotal role in maintaining the security of the supply chain (Peterson, 2017). This inspection process is vital for safeguarding society against organized transnational threats, including terrorism, the smuggling of hazardous substances, and environmental crimes, all while ensuring that legitimate trade can continue smoothly (World Bank, 2021). As global cargo

traffic continues to rise, there is an increasing need for more effective and efficient inspection procedures to manage this flow. To address this, Customs Administrations have adopted risk profiling techniques at checkpoints to identify discrepancies between the goods declared and those actually being transported, detect any illicit materials, and mitigate potential threats to public safety and national security.

Singapore has adopted a state-of-the-art scanning technology known as the Passport System, which uses imaging technology to analyze and identify materials based on their atomic number. This enables the system to detect dangerous items such as firearms, drugs, and other contraband items with high accuracy (Freeman, 2019). Additionally, Chalfin (2020) explored how such border scanning technologies enhance the sovereignty and operational independence of customs authorities in Ghana. These systems provide enhanced surveillance capabilities, allowing for more effective monitoring of state agents and officials as they perform their duties, ensuring greater accountability and security in border management processes.

The scanning system in use also includes real-time tracking of cargo, from the loading point to its ultimate destination or offloading location (NCTTCA, 2022). This integration of realtime tracking ensures the security of cargo, preventing unauthorized offloading or theft during transit. This system is particularly valuable for monitoring goods transiting through Kenya on their way to neighboring East African countries, as it bolsters trade competitiveness by improving cargo security along these crucial trade routes. Previously, goods in transit were accompanied by security escorts to ensure safe passage, but the introduction of the scanning system has significantly reduced the need for such escorts, thereby enhancing the efficiency of the supply chain (Agrawal, 2020).

The system also leads to significant cost reductions through better cargo predictability and faster truck turnaround times, which, in turn, reduces overall transportation expenses. In addition, it helps traders anticipate the arrival of their goods, streamlining inventory and supply chain management. Moreover, the Regional Electronic Cargo Tracking System (RECTS) is instrumental in cutting down on delays by sending alerts to officials when a truck remains in one location longer than required. However, while this electronic system is highly effective in tracking goods in transit, it is not entirely foolproof. It requires constant monitoring and may occasionally lose track of certain shipments due to diversions or technical issues, leading to challenges in ensuring complete tracking coverage (OECD, 2022).

This scanning system utilizes X-ray technology to scan goods in transit for both commercial and security purposes, and its benefits are far-reaching in the context of customs operations (Dobell, 2020). The system enables customs officers to accurately identify goods, facilitating the correct classification and, therefore, the proper calculation of taxes and duties. This, in turn, ensures that border security is maintained, as it can quickly identify prohibited or dangerous items. Furthermore, the implementation of this system has reduced cargo clearance times, helping to alleviate the congestion previously experienced at customs borders (MRA, 2021). Prior to its adoption, any discrepancies between declared and actual goods required time-consuming physical inspections, which led to delays and increased the overall cost of business operations (KRA, 2021).

Wulf and Matityahu (2020) explained that the core purpose of container scanning equipment is to inspect the contents of containers without the need to physically open them. This method, often referred to as "nonintrusive examination," allows customs authorities to inspect a greater volume of consignments more efficiently, without causing unnecessary delays in processing. It also plays an essential role in identifying illicit goods that may be hidden within legitimate

shipments. To ensure the cost-effectiveness of acquiring such equipment, a comprehensive cost-benefit analysis should be carried out before purchasing these technologies to guarantee their financial sustainability.

The increasing volume of goods being processed at ports has led to a shortage of customs officers assigned to the verification section, which in turn has created congestion, as the number of containers each officer is expected to inspect cannot meet the growing demand. The adoption of scanning technology has had a significant impact on revenue collection by improving the accuracy of goods classification and ensuring the correct duties are applied. This technology is also vital for maintaining border security by identifying contraband and prohibited items more efficiently. Ultimately, the use of scanning equipment has significantly reduced cargo clearance times, streamlining operations and improving the overall efficiency of customs procedures (MRA, 2019).

Customs officers receive detailed information about the goods selected for examination on their screens, which helps them make faster, more accurate decisions. In Singapore, the Passport System has been adopted to streamline the inspection process, with projected images providing detailed scans of goods. This system uses high-energy X-rays to identify a range of prohibited items, including firearms, ammunition, and narcotics (Freeman, 2021). Gidado (2021) examined the negative consequences of congestion at ports, noting that delays and long queues of cargo create bottlenecks in the supply chain, leading to higher costs for businesses operating in the region. These inefficiencies further exacerbate the already high costs associated with international trade. Wanyama (2019) also pointed out that inefficiencies in customs processes, such as slow document processing and poor coordination, result in extended clearance times, which fuel corruption at border points and negatively impact trade flows.

2.1.4 Duty Computation System and Customs Revenue Collection

Duty Computation System" refers to systems and software used to calculate customs duties, taxes, and other import/export-related charges. These systems are essential in international trade for accurately determining the financial obligations imposed on goods crossing borders. Here is an overview of the literature and concepts related to Duty Computation Systems, with citations for further exploration. Duty Computation Systems facilitate the calculation of duties, including import tariffs, excise duties, value-added taxes (VAT), and other charges. These systems automate the assessment of goods, taking into account harmonized system (HS) codes, trade agreements, and tariffs. Effective duty computation systems integrate seamlessly with customs clearance and supply chain management processes, reducing manual errors and ensuring compliance with local regulations (Patel & Desai, 2019).

Duty computation system is a critical component of customs operations, responsible for accurately calculating and assessing import duties, taxes, and fees applicable to imported goods. Duty computation system utilizes internationally standardized Harmonized System (HS) Codes to classify imported goods based on their nature, composition, and intended use. Tariff classification is essential for determining the applicable duty rates and regulatory requirements associated with each product category. The World Customs Organization (WCO, 2020) emphasizes the significance of HS codes in duty computation, stating that HS codes provide a standardized framework for classifying goods in international trade, enabling customs authorities to apply the correct duty rates and enforce trade regulations consistently.

In Malaysia, Azmi and Kamarulzaman (2020) highlighted that while the country has quickly adopted a computerized duty system, its reliability remains a concern due to the high level of perceived risk among the public. This perception has led to a lack of trust in the system, which has hindered its full effectiveness. Similarly, in many developing nations, Nisar (2021)

observed that despite the implementation of computerized systems, tax authorities continue to face considerable challenges in ensuring compliance. The adoption of such systems has not been enough to overcome the barriers to tax compliance, with various issues, including technological limitations, insufficient user engagement, and a lack of proper support infrastructure, contributing to the persistent challenges in these countries.

International trade relies on accurate and efficient duty computation, as errors can lead to substantial financial penalties, shipment delays, and legal consequences. As global trade grows in complexity, Duty Computation Systems help businesses comply with dynamic regulatory environments, taking into account free trade agreements, quotas, and other jurisdiction-specific factors (Singh & Garg, 2021). Technological advances, such as artificial intelligence (AI), machine learning, and blockchain, are transforming duty computation systems. AI models help predict tariff changes and optimize duty costs, while blockchain provides secure tracking of goods, enhancing transparency and reducing the risk of duty evasion. The literature highlights automation as key to streamlining the trade compliance process and reducing human error (Chen et al., 2020).

Alcedo and Cajala (2021) conducted a study to assess the current computerization efforts of the Bureau of Customs (BOC), specifically focusing on import and export transactions. The researchers used an explanatory research approach, collecting data through a validated questionnaire. The study targeted customs brokers/representatives, shipping agents/freight forwarders, and Value-Added Service Providers (VASP) through incidental sampling. The results revealed that respondents agreed the BOC's computerization program had met its intended benefits, although the elimination of corruption was only partially successful. Additionally, while respondents believed the overall computerization of BOC operations was

effective, the effectiveness of the import/export documentation process was rated as only fairly effective.

In Kariuki's (2022) study, it was emphasized that Information and Communication Technology (ICT) plays a crucial role in improving revenue administration. The versatile nature of ICT facilitates access to both historical and current data, reduces computational errors, minimizes data processing time, and helps in cutting costs. The study also highlighted that ICT adoption leads to improved client services, encourages voluntary tax compliance, and ultimately results in increased revenue collection. Moreover, the technology reduces the frequency of interactions between tax authority staff and taxpayers, which streamlines the decision-making process and contributes to a more efficient revenue administration system.

Duncan (2020) explored the key factors that facilitate the successful adoption of technology to enhance tax compliance. His study concluded that three critical elements are necessary for this to happen: a flexible Information Technology structure, a competent IT skill base, and a strong customer orientation. Kamau (2022) investigated the impact of online technology adoption as a strategy to improve tax compliance in Kenya. His study, which focused on large taxpayers of the Kenya Revenue Authority, found that the implementation of technology had a positive effect on enhancing tax compliance levels among large taxpayers.

2.2 Theoretical Framework

Theoretical frameworks provide a structure to support and guide research by explaining, predicting, and understanding phenomena within critical assumptions. This study is guided by several theories: the Unified Theory of Acceptance and Use of Technology (UTAUT), which explores factors influencing technology adoption; Technological Change Theory, which examines technology evolution and adaptation; System Theory, focusing on interconnections within a system; Diffusion of Innovation Theory, which explains how new

technologies spread; and Technological Determinism, suggesting technology drives societal change. Together, these theories offer a comprehensive foundation for exploring the research topic.

2.2.1 The Unified Theory of Acceptance and Use of Technology.

The Unified Theory of Acceptance and Use of Technology (UTAUT) was developed by Venkatesh et al. (2000) and is considered one of the most prominent models explaining technology acceptance. This theory was created by combining elements from eight distinct theoretical frameworks. UTAUT's primary goal is to clarify user intentions regarding technology usage and behavior, proposing a unified model for information system adoption and subsequent use. These eight theories are: the Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Motivational Model (MM), Theory of Planned Behavior (TPB), a combined model of Planned Behavior and Technology Acceptance (CTPB-TAM), the Model of PC Utilization (MPCU), Innovation Diffusion Theory (IDT), and Social Cognitive Theory (SCT).

From these theories, UTAUT identifies four core factors that directly influence technology acceptance: Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions. Additionally, the theory posits that these constructs are moderated by variables such as age, gender, experience, and the voluntariness of use. According to the theory, these factors collectively shape user behavior, where a younger individual with technical expertise, for example, is more likely to find a new system useful and easy to use, potentially influencing their peers to adopt the system as well.

The UTAUT model, developed by Venkatesh et al. (2003), offers an explanation of the key factors influencing technology adoption and use. It emphasizes the importance of performance expectancy, effort expectancy, social influence, and facilitating conditions in shaping user behavior. Furthermore, these constructs are moderated by demographic and

situational factors such as age, gender, experience, and whether the technology adoption is voluntary. For instance, individuals who are younger and tech-savvy are likely to view a new information system as highly useful, user-friendly, and capable of influencing others in their social circles to adopt the system.

The development of UTAUT stemmed from the consolidation and review of principles from eight prior models, including the Technology Acceptance Model and others. The model has been widely applied by researchers in various fields, although it has also faced criticism, particularly in comparison to other technology acceptance frameworks like the Technology Acceptance Model (Venkatesh & Zhang, 2020).

Moreover, UTAUT incorporates an organization's economic environment, industry structure, and internal framework, all of which are vital for the growth and development of businesses. The theory addresses the shift from manual operations to computerized systems, which makes tasks more efficient and faster. In organizations, management introduces information systems to automate specific tasks, representing a significant shift from traditional methods to modern, technology-driven approaches. This shift exemplifies how many businesses have transitioned from manual systems to digital solutions, fostering greater efficiency and productivity (Venkatesh, 2016).

Business growth follows a cyclical process, which includes stages such as introduction, growth, peak, and decline. These stages parallel the adoption of information technology within organizations, where capital increases during the growth phase, remains stable during the peak phase, and eventually decreases during the decline stage. At this point, many firms face closure due to the diminishing returns. As capital and output increase, expenditure also rises at a similar rate. Modern information systems, such as business systems that process data

and produce outputs, play a critical role in these stages, contributing to the overall success and growth of firms (Venkatesh, 2016).

Earlier research on the acceptance and use of technology showed that as firms adopt advanced technologies, they experience growth in output, capital, and expenditure. The use of computerized systems has facilitated this growth, helping businesses expand their markets, increase production, and raise labor costs. These indicators demonstrate the positive impact of advanced technology on firm growth within the industry. The firm operates as a collective entity, using various processes to achieve organizational objectives and goals (Gupta, 2008). Entrepreneurs initiate business ideas and organize them for implementation. Once the business idea is executed, the company grows as a result of the entrepreneur's vision and efforts. Entrepreneurs, as the creators of business ideas and development processes, play a crucial role in shaping the direction of their ventures. The introduction of information systems has mostly had a positive impact on organizations, supporting business development and enhancing operations (Gupta, 2011).

In the original UTAUT paper (Venkatesh et al., 2003), the theory was shown to explain 70% of the variation in users' intentions to adopt technology, a higher percentage than any of the previous eight models or their extensions. UTAUT is particularly useful for capturing initial perceptions of newly introduced technologies and how these perceptions evolve as users gain more experience. This theory is relevant to this study as it helps explain the adoption of information and communication technologies (ICT) within the customs and border control department of KRA. The UTAUT framework supports the argument for adopting RECTS (Real-time Electronic Cargo Tracking Systems) to enhance security in transit cargo operations.

2.2.2 Technological Change Theory

Technological change theory is defined as the comprehensive process of innovation, invention, and the diffusion of technology. This theory, developed by Everett M. Rogers, seeks to explain how new technologies are adopted, particularly within the context of custom systems management. Initially, technological change was explained through the 'Linear Model of Innovation,' a now-outdated framework. This model has since been replaced by a more sophisticated approach that views technological change as an ongoing process of innovation. The new model involves multiple stages, including research, production, dissemination, and eventual use (Tidd et al., 1997). In modern technological change models, the innovation process is often depicted as a continuous curve that shows how costs tend to decrease over time as technology evolves, leading to more widespread adoption (Coronado et al., 2018).

The primary focus of technological change theory is on the adoption of Integrated Customs Management Systems by customs authorities, which play a pivotal role in modernizing customs operations. The older 'Linear Model of Innovation,' which emphasized a step-by-step progression, has now been largely replaced by a more dynamic and fluid model of technological change. This model encompasses not just the development of new technologies but also their dissemination and the way they are integrated into systems across various sectors. According to Tidd, Bessant, and Pavitt (2005), technological change is no longer seen as a linear, predictable process but as one that involves continuous innovation in all phases—research, production, dissemination, and usage. The modeling of technological change now often reflects this process, showing a gradual decrease in costs and improvements in efficiency over time, which encourages further adoption of new technologies.

Technological change has been particularly transformative in the context of customs systems management, where the adoption of new technology has significantly enhanced the ability to

manage international trade more effectively. Over time, there has been a steady evolution of customs management systems, driven by technological advancements that have aimed to improve efficiency, reduce costs, and streamline processes. In Kenya, for instance, the implementation of the Electronic Single Window System in 2014 marked a major technological shift that dramatically improved the process of cargo clearance. This system was designed to simplify the documentation of goods crossing Kenya's borders, making the process not only faster but also more efficient (Djanitey, 2019). The Electronic Single Window System was a major technological innovation that helped to significantly reduce delays and expenses associated with customs clearance. The system allowed for greater transparency and improved efficiency in the clearance of goods, while ensuring that all necessary levies, duties, taxes, and other charges were collected.

Kenya's adoption of the Single Window System is just one example of how technological changes in customs systems management have facilitated trade. The system was introduced to improve Kenya's position as a hub for international trade, making it easier for businesses to engage in cross-border transactions. The key objective of the system was to eliminate bottlenecks at the border by reducing the time and cost associated with cargo clearance, without compromising the necessary customs controls. These kinds of technological advancements are important for encouraging trade facilitation, as they reduce transaction times, lower operational costs, and enhance compliance with regulatory requirements. By implementing such customized systems, Kenya has been able to support international trade, while improving its global competitiveness.

In 2005, the Kenya Revenue Authority (KRA) introduced the Simba 2005 system with technical support from the government of Senegal. This system was part of a broader modernization initiative aimed at improving the efficiency of the customs department. The KRA, which handles imports and exports and is a significant source of revenue for the

country, implemented the Simba 2005 system to streamline the clearance of goods, making the process more efficient and reducing administrative burdens. The system allowed traders to submit their required documentation electronically for both imports and exports, and it facilitated the easier lodging of customs clearance information. This innovation significantly reduced the time spent processing goods and helped improve overall efficiency in the customs clearance process (Mbui, 2021).

Kenya's introduction of the Electronic Single Window System in 2014 represented a substantial leap forward in the modernization of the country's customs operations (Djanitey, 2018). This technological change was aimed at addressing the challenges of border clearance by making the process faster, easier, and more transparent. By enabling digital submission of documentation, the system simplified customs procedures, reducing delays, and enhancing trade efficiency. Furthermore, the system reduced costs associated with border clearance and helped maintain the necessary oversight of duties, taxes, and other charges on imports and exports. As a result, the Single Window System played a critical role in increasing Kenya's competitiveness in international trade by making it more efficient, reducing the cost of doing business, and streamlining cross-border trade processes. The success of the Electronic Single Window System is part of a broader effort to enhance trade facilitation through the use of innovative customs management systems, which is vital for promoting economic growth in the region. Through the adoption of these advanced technologies, customs operations have become more efficient, less costly, and better equipped to handle the complexities of modern trade.

2.2.3 System Theory

The system theory, developed by notable scholars such as Ludwig von Bertalanffy (1974), Boulding (1985), Rapoport (1986), and Skyttner (1996), was initially formulated outside the business context but has since found significant application in organizational management

(McSherry & Warr, 2010). The fundamental premise of systems theory is that an organization is viewed as a whole entity composed of interrelated sub-units, which collectively form the complete system (von Bertalanffy, 1974). Skyttner (1996) further emphasizes that the primary purpose of systems theory is to explain the entire system, not just isolated parts or components of the organization.

The influence of systems theory spans across various fields, with contributions from thinkers in multiple disciplines. For example, Alexander Bogdanov in the field of physics, Ludwig von Bertalanffy in biology, Béla H. Bánáthy in linguistics, and Talcott Parsons in sociology have all contributed to the broader understanding of systems. Other notable figures include Howard T. and Eugene Odum, who studied ecological systems, Fritjof Capra, who explored organizational theory, Peter Senge, who focused on management, and Richard A. Swanson, who applied the theory to human resource development. Educational theorists like Debora Hammond and Alfonso Montuori also applied systems theory in their respective fields.

By the 1970s, systems theory had gained significant traction within organizational research, driven by the limitations of classical models in explaining the increasingly complex and dynamic nature of organizational behavior. Classical models, which emphasized rigid control and minimized interactions, were inadequate in accounting for the multifaceted behaviors exhibited by organizations. Systems theory, on the other hand, emphasizes the maximization of interactions and the promotion of democratic governance within organizations (Scott, 1974). This shift toward systems thinking was particularly influenced by the increasing recognition of the complex and rapidly changing nature of organizational environments, as well as the limitations of traditional approaches (Ashmos & Huber, 1987).

In contrast to the mechanistic view of organizations, systems theory presents organizations as organic systems dynamic entities that evolve and adapt in response to external and internal

factors (Morgan, 1986). This shift in perspective gave rise to key theoretical developments, including the influential open systems approach (Katz & Kahn, 1966), which highlights the importance of an organization's interactions with its environment. Due to the abstract nature of systems theory, the contingency view was introduced to address the specific relationships within and between subsystems of the organization, as well as the organization's interactions with its external environment. This perspective helps explain how organizations operate and adapt to changing conditions (Lawrence & Lorsch, 1967).

According to systems theory, the effectiveness of an organization depends on the proper functioning of each of its components. Therefore, improving outcomes, such as revenue collection in the customs department, cannot be achieved by focusing solely on one part of the system, like automating the customs system. While the implementation of technologies like cargo tracking systems, scanner technology, and customs valuation systems may streamline customs procedures, reduce clearance times, and increase transparency, these technologies are only a part of the broader system. As such, the customs department may still struggle to meet its revenue collection targets despite technological advances. This highlights the importance of examining other factors that could be influencing revenue performance. In this study, systems theory will be applied to better understand how the integrated customs management system, as a whole, affects customs revenue collection. By considering the entire system, including its components and interactions, the study aims to uncover the underlying factors that impact the efficiency and effectiveness of revenue collection in the customs sector.

2.2.4 Diffusion of Innovation Theory

The Diffusion of Innovation (DOI) theory, advanced by Rogers (1995) and later elaborated by others such as Chong and Ooi (2008), outlines five key attributes that influence the adoption of an innovation. These attributes are relative advantage, compatibility, complexity,

trialability, and observability. Relative advantage refers to the degree to which an innovation is perceived as superior to the idea or technology it replaces. Compatibility is defined as how consistent the innovation is with the existing values, past experiences, and needs of potential adopters. Complexity involves the perceived difficulty of using and understanding the innovation, while trialability is the extent to which an innovation can be tested or experimented with on a limited basis. Finally, observability is the visibility of the innovation's benefits or results to others (Rogers, 1995).

Rogers (2003) further expanded the theory, focusing on the process of how, why, and at what rate new ideas and technologies spread within society. In this context, diffusion is the process through which an innovation is communicated over time among members of a social system. The theory suggests that adoption occurs when an individual or organization fully integrates a new innovation into their activities, while rejection occurs when they decide not to adopt it. Four key components influence the transfer of innovation: the innovation itself, the communication channels through which it spreads, the time required for diffusion, and the social system involved (Rogers, 2003).

The Diffusion of Innovation theory is closely tied to the adoption of new technologies, such as the introduction of the Regional Electronic Cargo Tracking System (RECTS) to secure transit cargo. This innovation theory provides a framework for understanding why and how such technological advancements might be adopted within a social system. As one of the oldest theories in social sciences, the DOI theory explains the gradual adoption of an idea or product by a population over time. It highlights the importance of the five attributes in determining how easily an innovation will be accepted by its target audience. In the case of the RECTS system, the theory provides insight into the potential barriers to adoption, such as the relative advantage it offers over traditional cargo tracking systems, the compatibility of

the technology with existing practices, and the perceived complexity or ease of use for potential adopters.

The Diffusion of Innovation theory suggests that the adoption of new technology is influenced by various factors, including the innovation's perceived benefits and compatibility with existing practices. These factors determine whether an innovation is seen as beneficial and worth adopting. For instance, the introduction of an electronic cargo tracking system might be viewed favorably due to its ability to improve efficiency, transparency, and security in cargo management. However, its adoption may face challenges if users perceive the system as too complex or incompatible with their existing systems.

The theory also emphasizes the role of human capital in the adoption process, suggesting that new technologies are often more efficient than their predecessors, driving organizations to invest in technological improvements to enhance their operations. In the context of tax systems, for example, the adoption of electronic tax filing systems has been shown to reduce operational costs and improve performance in tax departments. However, the DOI theory also highlights potential resistance from users, particularly when they lack the necessary skills or experience to use new technologies effectively. This is evident in the adoption of digital tax platforms by the Kenya Revenue Authority (KRA), where taxpayers may have been reluctant to embrace electronic systems due to their perceived complexity and the need for specialized skills (Li & Sui, 2011).

The Diffusion of Innovation theory provides a valuable lens for understanding the factors that influence the adoption of new technologies, including the perceived relative advantages, compatibility, complexity, trialability, and observability of an innovation. By considering these attributes, organizations can better understand the barriers to adoption and design strategies to encourage the widespread use of innovations such as electronic tax systems or cargo tracking technologies.

The late majority is made up of the following 34% of adopters. They are skeptics, traditionalists, and frugal. These are expensive and necessitate completely pre-assembled, foolproof solutions. They are only motivated to buy technology to stay competitive, and they frequently enlist the services of a single knowledgeable consultant to help them grasp it. Laggards make up the final 16% of adopters. Laggards are anti-innovation naysayers who just want the status quo to continue. They do not believe that technology can boost productivity or prevent new technology expenditures. Roger's concept has achieved widespread acceptance and application in fields such as marketing as well as management science. Chong and Ooi, 2008). This theory is important for this study as it supports duty computation and customs administrations to enhance customs revenue collection

2.2.5 Technological Determinism

Technological determinism is a reductionist theory that links technology to the nature and structure of society. Introduced by the German economist Karl Marx, it argues that technological change is the primary driver of societal transformation. According to this theory, the development of new technologies leads to changes in society, which may even result in the loss of existing knowledge as society adapts to new tools and systems. The theory posits that technological advancements are inevitable and that the characteristics of these technologies largely determine how they are used by the society in which they are developed (Bimber, 1990). Merritt (1996) further defines technological determinism as the belief that technology is a dominant, governing force in society, influencing and shaping social structures and behaviors.

One of the core principles of technological determinism is that technological change drives social change. As new technologies emerge, they enable new capabilities, which in turn lead to shifts in cultural, economic, and political systems. However, there is a more moderate or weaker view of technological determinism, which suggests that while technology influences

culture and society, it is still ultimately controlled by human decision-making. In this view, technology serves a mediating function rather than being an autonomous force. As technology becomes more widespread and less controlled by individuals or small groups, it might appear to take on an autonomous role. This form of technological determinism is known as autonomous technological determinism.

Critics of technological determinism argue that technology does not exert a direct, unchallenged influence on society. Mackenzie and Wajeman (1999) dismiss the theory as "technological politics," asserting that technologies are the result of compromises between political, economic, and cultural factors. According to their perspective, technologies do not evolve due to an inherent scientific or technological logic but instead are shaped by the influences of various stakeholders involved in their creation. Similarly, William & Edge (1996) contend that organizational, political, economic, and cultural factors play a significant role in the design and implementation of technologies. Chandler (2000) emphasizes that factors beyond just technological considerations, such as economic pressures, political issues, and cultural attitudes, also drive the development and deployment of technology.

Over time, technological determinism has evolved and been refined. In the context of this study, the theory is relevant in understanding the impact of technological uptake on customs revenue collection in Kenya. Technological determinism suggests that the introduction and adoption of new technologies in customs management systems—such as electronic tax filing or cargo tracking systems—could significantly influence the efficiency and effectiveness of revenue collection. The theory proposes that the integration of advanced technologies within customs operations might lead to improvements in transparency, efficiency, and overall revenue generation, making it a valuable framework for assessing the relationship between technology and customs performance.

While technological determinism presents a view that technology drives societal change, this perspective is not without its critics. The theory has evolved to acknowledge the role of human agency in shaping technological development, yet it remains a useful tool for understanding the potential impacts of technology on sectors like customs revenue collection in Kenya. By considering both technological and socio-political factors, this study aims to explore how technological innovations can enhance the efficiency of customs systems and contribute to better revenue outcomes.

2.3 Conceptual Framework

The conceptual framework of this study explores the relationship between customs revenue collection (dependent variable) and several technological innovations (independent variables), including the regional electronic cargo tracking system, integrated customs management system, scanning technology, and duty computation system. These technologies enhance customs operations by improving efficiency, transparency, and compliance. The regional electronic cargo tracking system ensures real-time monitoring of cargo, reducing opportunities for tax evasion, while the integrated customs management system streamlines clearance and payment processes, minimizing delays and errors. Scanning technology facilitates non-intrusive inspections, speeding up assessments, and boosting compliance, while the duty computation system automates tax calculations, ensuring accurate duty assessments. Together, these innovations contribute to more effective customs procedures, ultimately leading to improved revenue collection.

Independent variables **Dependent variable**

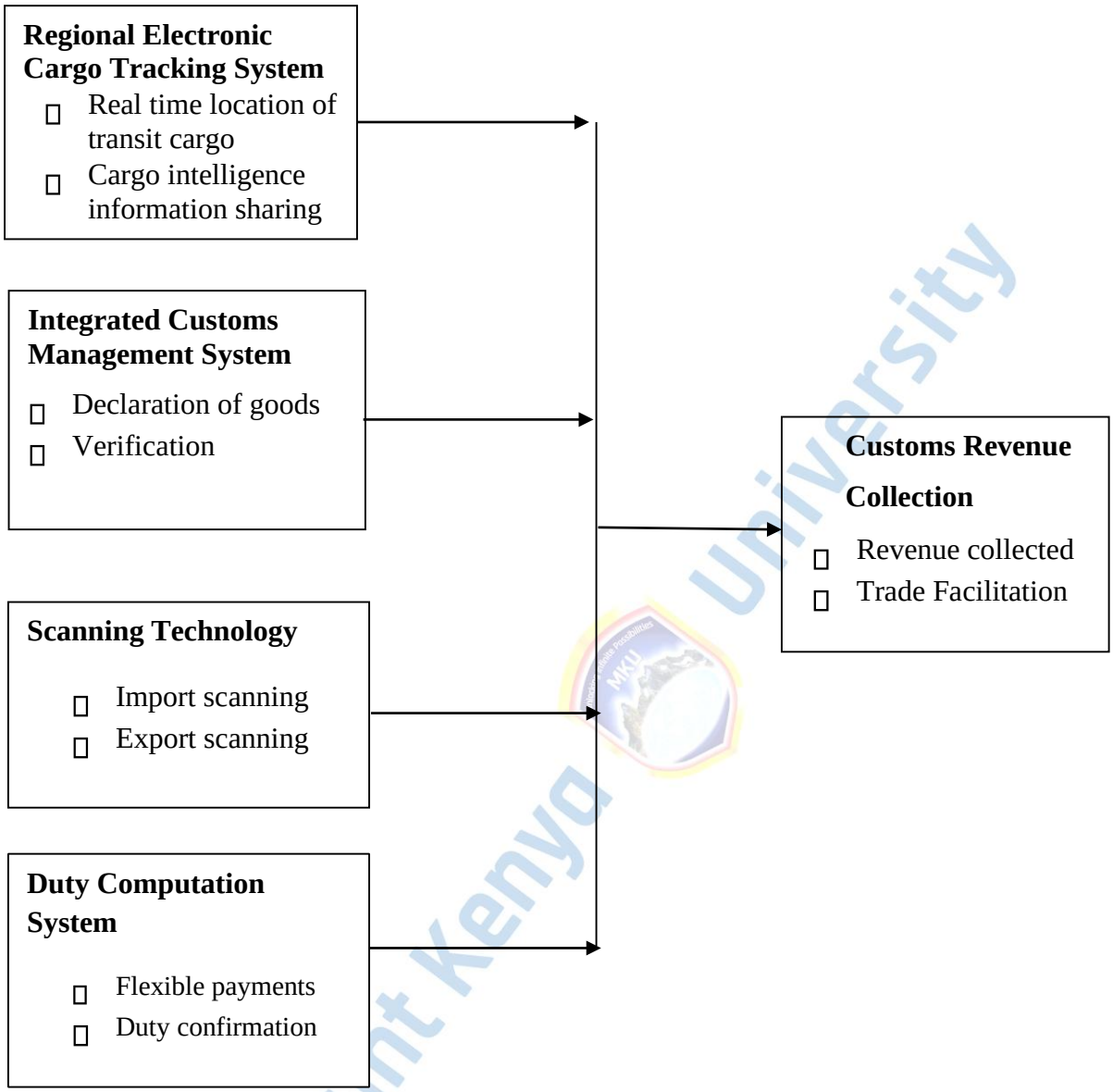

Figure 1: Conceptual Framework

Source: (Researcher, 2024)

2.4 Recap of Literature Review

Azmi and Kamarulzaman (2020) highlighted that although there has been rapid adoption of the computerized duty system in the country, its reliability remains an issue due to the high perception of risk among the public. Similarly, Mugambi (2019) explored the impact of the Electronic Cargo Tracking System (ECTS) on cross-border trade between Kenya and Uganda, revealing key challenges and opportunities in the use of technology for trade facilitation. Duncan (2020) examined factors that facilitate the successful adoption of technology as a tool for enhancing tax compliance, while Kamau (2014) focused on the role of online technology in improving taxpayer compliance in Kenya, demonstrating its effectiveness as a strategy for compliance enhancement. These studies collectively emphasize the importance of addressing public concerns, facilitating adoption, and ensuring the effective implementation of technological systems for improved performance in customs and tax management.

2.5 Research Gap.

Azmi and Kamarulzaman (2020) noted that despite the rapid adoption of the computerized duty system in Malaysia, the system's reliability remains an issue due to the high perception of risk among the public. This study was conducted in Malaysia, creating a contextual gap when considering the situation in other regions, particularly in Kenya. Similarly, Mugambi (2019) examined the effect of the Electronic Cargo Tracking System (ECTS) on cross-border trade between Kenya and Uganda. The study found that the system had successfully reduced cargo diversion, improved clearance times at border points, and facilitated easier collection of duties and fines. However, the focus on cross-border trade introduces a conceptual gap, as it does not fully address customs revenue collection in broader contexts. Additionally, Alcedo and Cajala (2019) assessed the Bureau of Customs' computerization program in the Philippines, focusing on import and export transactions. The study, which used an explanatory

research method and validated questionnaires, found that respondents believed the program's benefits were achieved. However, the methodological approach, including incidental sampling, introduces a methodological gap, limiting the study's generalizability and precision. These studies reveal various gaps (contextual, conceptual, and methodological) that inform and shape the current research on customs systems and revenue collection.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

Chapter three outlines the research methodology, detailing the research design, target and sample populations, data collection methods and tools, data analysis techniques, as well as the determination of validity and reliability. It also highlighted the ethical considerations observed during the study.

3.1 Research Design

A research design is essentially a structured plan developed to gather and utilize data in a way that facilitates the efficient extraction of the necessary information (Siedlecki, 2020). According to Khan (2018), a research design is akin to a blueprint, outlining the methods and techniques used by the researcher to investigate the relationship between dependent and independent variables. Researchers generally consider research design as the framework for how data is collected, analyzed, interpreted, and presented in a study (Creswell, 2013). The primary objective of a research design is to ensure that the evidence collected is sufficient to answer the research question as clearly and without bias as possible (Imenda, 2014). For this particular study, a descriptive research design was employed. As noted by Shields, Patricia, and Rangarajan (2013), descriptive research is specifically aimed at detailing the characteristics of a population or phenomenon under investigation. This type of research typically involves gathering data that addresses questions related to the subjects being studied, providing a comprehensive understanding of their nature.

3.2 Target Population

The target population refers to the complete group to which the study's results can be generalized (Berg & Lune, 2019). According to Cooper and Schindler (2015), the study population consists of individuals, households, or organizations that share similar traits, from

which the researcher draws conclusions. Borg and Crall (2009) define the target population as a comprehensive set of individuals, events, or objects, either real or theoretical, to which the research findings are applicable. In this study, the target population consisted of 234 customs officers from the Kenya Revenue Authority (KRA) stationed at the Namanga border.

3.3 Sampling Technique and Sample Size

Kothari and Gang (2014) described sampling as the procedure of choosing a sample from a larger population. It represents a list of all potential members within a population eligible for sampling, including individuals, households, or organizations. For this study, the sample size was calculated using Yamane's (1967) formula, which assumes a normal distribution of respondents in relation to the study's parameters. Applying the Yamane formula with a 5% precision level, the required sample size was determined as follows (Yamane, 1967).

Yamane (1967) formula was adopted in computation of the sample size.

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

Where by:

n = desired sample size

N = Target population under study

E = Signifies the Margin of error in this case taken as 5%

$n = \frac{234}{1+234 * 0.05^2} n = 148$ respondents

3.4 Sampling Frame

A sampling frame is a complete list or database of elements from which researchers select a sample. The accuracy of a sampling frame is crucial, as it should represent the entire population under study; any errors in the frame can lead to biases and affect the validity of the results. Studies highlight the need for a well-defined sampling frame to minimize selection bias and provide accurate population estimates (Kish, 2019). The sampling frame refers to the

complete list of all units within a population from which the sample is drawn (Cooper & Schindler, 2003). It serves as a physical representation of the target population and includes all units that could potentially be part of the sample (Kothari, 2008). In this study, the sampling frame consisted of a list of KRA officials.

Table 1: Sample Frame

Item	Target	Sample
KRA Customs Officers	85	54
KRA Clerks	107	68
KRA Border Control Officers	42	26
Grand Total	**234**	
148		

Source: KRA (2024)

3.5 Data Collection Instruments

Data collection instruments are essential in both qualitative and quantitative research, ensuring that data is collected in a structured and reliable manner. The literature emphasizes that selecting the right instrument based on the study objectives, research questions, and context is critical to obtaining accurate and relevant data. The appropriate design and testing of data collection instruments improve data quality and support the validity and reliability of study findings (Babbie, 2016). The data collection tool used in this study was the questionnaire. According to Davies & Hughes (2015), a questionnaire is a research tool made up of a series of questions designed to gather information from participants. Maxwell (2012) emphasized the importance of describing the primary method(s) for data collection from participants. Questionnaires were chosen because they are efficient tools for collecting data,

enabling respondents to express their views on the research problem. A 5-point Likert scale, ranging from 1 (strongly agree) to 5 (strongly disagree), was used to capture responses to the questions.

3.6 Piloting of Research Instruments

A pilot study is a smaller version of a larger study conducted to assess the feasibility of the research design (Leon, Davis & Kraemer, 2010). It plays a crucial role in evaluating the reliability of the research questionnaire and ensuring its validity (Cooper & Schindler, 2011). According to Mugenda & Mugenda (2003), a small sample, typically 10% of the intended respondents, is sufficient for a pilot study. The purpose of the pilot study is to enhance the effectiveness and efficiency of the research. The questionnaire was tested to identify any potential weaknesses and make necessary adjustments to ensure the instrument's reliability, appropriateness, and clarity. For this purpose, 14 Border Control Officers from the Malaba border were selected to test the consistency and reliability of the research tools. These participants were excluded from the final study.

3.6.1 Validity of Research Instrument

Kervin (2010) explains that validity in research pertains to accurately measuring the intended concept. It is the extent to which an instrument used to gather data truly measures what it is meant to measure and addresses the research question (Saunders & Rojon, 2014). According to Surbhi (2017), the validity of a research instrument refers to its ability to measure the phenomenon with precision. Berg and Gall (1989) define validity as the degree to which the test items represent the content the test is designed to measure. To ensure the validity of the data collection instruments, the researcher verified that the tools met the required standards for gathering the intended data. The research instrument used in this study was a questionnaire with closed-ended questions. The relevant form of validity for this study was content validity.

To establish this, the researcher identified the content to be represented and selected items that accurately reflected all areas of the content. A tax expert from MKU University was consulted to review the content of the instrument.

3.6.2 Reliability of Research Instruments

Typically, reliability coefficients of 0.70 or higher are considered adequate (deVaus, 2012) Nunnally (1978) suggested that a Cronbach's alpha value of 0.7 or higher indicates that the research instrument is reliable. In this study, reliability was assessed using the Cronbach's alpha test, which yields values ranging from 0 to 1. A higher Cronbach's alpha value reflects better internal consistency among the items in the instrument. Typically, a value above 0.7 is considered acceptable. Cronbach's alpha was calculated based on the correlations between individual items in a scale. The findings of the test are found in table 2. Table 2 shows the test for reliability for items of the questionnaires for each variable constrict. For customs revenue collection the α =0.981, for Regional Electronic Cargo Tracking System α=0.974. For Integrated Customs Management System α=0.926. **S**canning technology, the alpha values were 0.983. For duty computation system α=0.917. The alpha values are high and >0.7 signifying high levels of reliability in the responses.

Table 2: Cronbach Test for reliability

	α	**Items**
Customs Revenue Collection	0.981	5
Regional Electronic Cargo Tracking System	0.974	5
Integrated Customs Management System	0.926	5
Scanning technology	0.983	3
Duty computation system	0.917	5

(Source: Research 2024)

3.7 Data Collection Procedure

Kumar (2011) emphasized the importance of considering the socioeconomic and demographic characteristics of the study population when selecting a data collection method. A questionnaire, a common primary data collection tool, involves respondents providing written answers to questions (Albuquerque et al., 2014). The questionnaire in this study was designed with close-ended questions and was personally delivered to the respondents. It is important to understand the study population's attitude and willingness to participate. The questionnaires were self-administered, and each included a consent letter that introduced the researcher and outlined the study's purpose. The researcher obtained a consent letter from Mount Kenya University and research permits from the National Commission for Science, Technology, and Innovation (NACOSTI) before collecting data. The questionnaires were administered using the drop-and-pick method and collected after two weeks.

3.8 Data Analysis

Yin (2009) defines data analysis as the process of editing and reducing accumulated data into a manageable form, summarizing it, identifying patterns, and applying statistical techniques. The collected data was edited, cleaned, and coded for completeness. After cleaning, the data was analyzed using both descriptive and inferential statistics. Descriptive statistics, such as the mean and standard deviation, were used to summarize the data, while inferential statistics, including correlation analysis and multiple regression analysis, were applied to test the hypotheses. The study's findings were presented in the form of tables and charts.

3.8.1 Regression Model of the Study.

In relation to establishing the relationship between the dependent and independent variables the study used multiple regression analysis:

$Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$:

Where;

Y= Customs Revenue Collection α

= constant term

X_1 = Regional Electronic Cargo Tracking System

X_2 = Integrated Customs Management System

X_3= Scanning Technology

X_4= Duty Computation System Customs

ε = error term

3.9 Ethical Considerations

Ethical considerations in research refer to the principles and standards that guide researchers in conducting studies responsibly, respecting participants' rights, and ensuring that the research process does not harm individuals or groups involved. These considerations typically include obtaining informed consent, ensuring confidentiality, protecting vulnerable populations, and maintaining integrity and transparency throughout the research. Ethical considerations are essential to uphold trust and accountability in research and prevent potential harm or exploitation of participants (Resnik, 2020). Muganda (2003) emphasizes that safeguarding the rights and welfare of participants is a primary ethical responsibility for everyone involved in the research. The research objectives were clearly communicated to the

respondents to obtain their informed consent. A strong emphasis was placed on maintaining confidentiality regarding the information provided by respondents through the completed questionnaires. The researcher ensured that the data collected was solely for academic purposes and that participation was voluntary, free from any form of coercion or bribery. Prior to data collection, the researcher obtained a consent letter from Mount Kenya University and a permit from NACOSTI.

CHAPTER FOUR

RESEARCH FINDINGS, ANALYSIS AND PRESENTATION

4.0 Introduction

This chapter outlines the response rate, demographic data, reliability testing, descriptive analysis, correlation analysis, regression analysis, and a discussion of the findings related to the influence of the regional electronic cargo tracking system, integrated customs

management system, scanning technology, and duty computation system on the collection of customs revenue.

4.1 Response Rate

The response rate represents the proportion of individuals from the sample population who participate in a survey, and it plays a vital role in assessing the quality of survey-based research. As such, the response rate is an important indicator of survey quality, ensuring the accuracy and reliability of the results (Babbie, 2013; Hair et al., 2010). According to Bailey (2000), a response rate of 50% is sufficient, though a rate above 70% is preferred. The study distributed 148 questionnaires to the target firms, with 120 respondents completing and returning them, yielding a response rate of 81%. Figure 2 summarizes the respondent details.

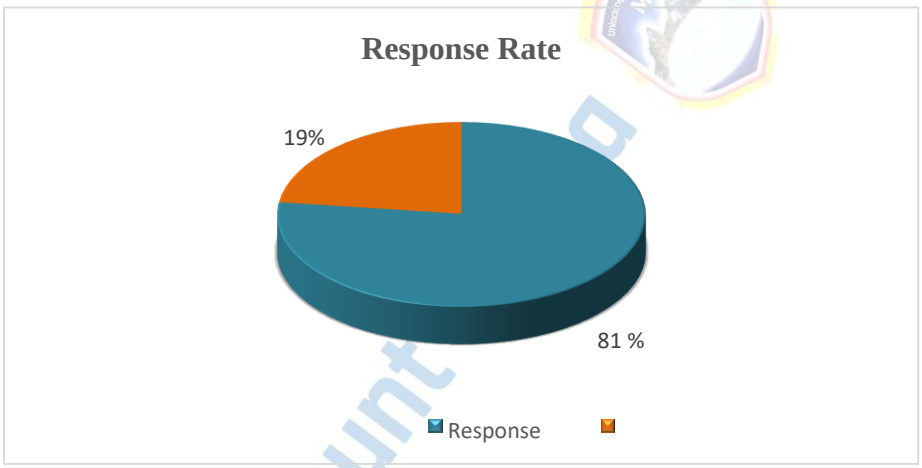

Figure 2: Response Rate

(Source: Research Data 2024)

4.2 Demographic Characteristics of the Respondents

4.2.1 Gender

The study aimed to determine the gender of the respondents. The findings showed that 60% of the respondents were male, while 40% were female. This indicates that the majority of respondents were male. The low representation of women within the organization raises concerns, and it is essential for the organization to take measures to address this disparity in order to foster diversity and inclusivity.

Table 3: Respondent Gender

Gender	Frequency	Percentage
Male	72	60
Female	48	40
Total	**120**	**100 (Source: Research 2024)**

4.2.2 Respondents Age

The respondents were asked to indicate their age range on the questionnaire to evaluate the diversity of age groups among them, as shown in Table 4.3. The results revealed that 22.5% were under 30 years old, 54.2% were between 31 and 40 years old, 13.3% were between 41 and 50 years old, and 10% were over 50 years old. This suggests that the respondents came from a variety of age groups. The majority of the respondents were older, implying a more mature and responsible group, while the presence of younger individuals could bring fresh perspectives and innovative ideas to the team.

Table 4: Age of the Respondents

Age of the Respondents	Frequency	Percent
Below 30 Years	27	22.5
31- 40 Years	65	54.2
41-50 Years	16	13.3
Above 50 years	12	10
Total	**120**	**100**

(Source: Research 2024)

4.2.3 Highest Level of Education

The researcher aimed to determine the highest level of education among the respondents. Table 5 shows that 7.5% of the respondents held certificates, followed by 20% who had diplomas.60% were bachelor degree holders, while 12.5% had other qualifications. This implied most respondents had bachelor degree thus, they were more competent and knowledgeable in matters of taxation.

Table 5: Education level

Highest Level of education	Frequency	Percent
Certificate	9	7.5
Diploma	24	20
Bachelor	72	60
Others	15	12.5
Total	**120**	**100**

(Source: Research 2024)

4.3 Descriptive statistics

Descriptive statistics summarize the key characteristics and patterns within the data, providing insights into the mean and standard deviation. These techniques are used to assess, describe, and present research data clearly and efficiently, ensuring that the information is both informative and easy to understand.

4.3.1 Descriptive statistics on Regional Electronic Cargo Tracking System

The descriptive statistics for regional electronic cargo tracking system responses were summarized on Table 6. On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree.

Table 6: Regional Electronic Cargo Tracking System

Items	N	Mean	Std. Deviation
RECTS has reduced cases of loss of cargo by putting tracking measures during cargo transport.	120	4.06	.811
RECTS has facilitated the tracking of Transit vehicles and Cargo		4.03	.867
RECTS has helped in the Transit tamper detection		4.01	.832
RECTS has reduced labor time incurred previously during tracking of transit goods.		4.00	.804

Tracking of cargo in transit using the RECTS system ensures Rapid Response Unit immediate and fast response to alerts within their jurisdiction	3.92	.805

(Source: Research 2024)

Table 6 illustrates the level of regional electronic cargo tracking system on customs revenue collection. The statement on RECTS has reduced cases of loss of cargo by putting tracking measures during cargo transport had a mean score of 4.06 (SD = 0.811). In addition, RECTS has facilitated the tracking of Transit vehicles and Cargo the mean score was 4.03 (SD = 0.867). Further, RECTS has helped in the Transit tamper detection was 4.01 (SD = 0.832). RECTS has reduced labor time incurred previously during tracking of transit goods was 4.00 (SD = 0.804). Lastly, tracking of cargo in transit using the RECTS system ensures Rapid Response Unit immediate and fast response to alerts within their jurisdiction was 3.92 (SD = 0.810).

4.3.2 Descriptive statistics on Integrated Customs Management System

The descriptive statistics for Integrated Customs Management System responses were summarized on table 7. On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

Table 7: Integrated Customs Management System

Items	N	Mean	Std. Deviation
ICMS is critical in streamlining customs procedures	120	4.04	.862
ICMS Training is available to all stakeholders		4.10	.836

Containerized cargo theft has reduced since incorporation of cargo tracking system	4.03	.822
The use of ICMS has reduced risks associated with clearance of products	3.99	.897
Using ICMS decentralizes customs operations affecting time costs	3.97	.909

(Source: Research 2024)

The descriptive statistics presented in Table 7 reveal that respondents largely agreed on the importance of the Integrated Customs Management System (ICMS) in enhancing customs procedures, with a mean score of 4.04 (SD = 0.862). The statement regarding the availability of ICMS training for all stakeholders received a mean score of 4.10 (SD = 0.836). Respondents also agreed that the implementation of the cargo tracking system has reduced containerized cargo theft, as reflected in the mean score of 4.03 (SD = 0.822). For the statement regarding the reduction of risks associated with product clearance due to ICMS, the mean score was 3.99 (SD = 0.897). Lastly, the statement indicating that ICMS decentralizes customs operations and affects time costs had a mean score of 3.97 (SD = 0.909).

4.3.3 Descriptive statistics on Scanning Technology

The descriptive statistics for Scanning Technology responses were summarized on Table 8. On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

Table 8: Scanning Technology

Items	N	Mean	Std. Deviation
Scanners affect accountability and efficiency of customs officers and cargo owners	120	4.01	.809

Exposure of goods to high energy X-ray affects full implementation	4.04	.888
Access controls affected the quality of service and clearance time at the Namanga border	4.00	.858
Costs implications affect revenue authorities' investment in Scanner Technology	3.99	.813
Human labour will soon be rendered obsolete by the use of scanners	4.03	.831

(Source: Research 2024)

The results outlined in Table 8 reveal that scanners affect accountability and efficiency of customs officers and cargo owners received a mean score of 4.01 (SD = 0.809), The statement that exposure of goods to high energy X-ray affects full implementation had a mean score of 4.04 (SD = 0.888). For the item on access controls affected the quality of service and clearance time at the Namanga border, the mean score was 4.00 (SD = 0.858). The item on costs implications affects revenue authorities' investment in Scanner Technology received a mean score of 3.99 (SD = 0.813). Finally, the statement Human labour will soon be rendered obsolete by the use of scanners had a mean score of 4.03 (SD = 0.831).

4.3.4 Descriptive statistics on Duty Computation System

The descriptive statistics for Duty Computation System responses were summarized on Table 9. On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

Table 9: Duty Computation System

Items	N	Mean	Std. Deviation

We can make more clearances on products 120 due to use of duty computation system resulting to more taxes to the KRA	3.96	.826
The owners of the goods can pay their duties at the comfort of their homes/offices electronically	3.87	.854
Confirmation of duties paid is confirmed instantly due to the use of duty computation system	4.23	.813

(Source: Research 2024)

The results shown in Table 9 reveal that respondents agreed that the use of the duty computation system allows for more product clearances, leading to higher tax revenues for KRA, with a mean score of 3.96 and a standard deviation of 0.826. Additionally, the statement that goods owners can pay their duties electronically from the comfort of their homes or offices received a mean score of 3.87 (SD = 0.854). Furthermore, respondents confirmed that the duty computation system enables instant verification of duties paid, with a mean score of 4.23 (SD = 0.813).

4.3.5 Descriptive statistics on Customs Revenue Collection

The descriptive statistics for customs revenue collection responses were summarized on Table 10. On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

Table 10: Customs Revenue Collection

Items	N	Mean	Std. Deviation
System automation has enhanced tax revenue collection	120	3.95	.798
Customs Revenue collection in terms of volume has increased tremendously		4.28	.841
All taxpayers have reported satisfaction with the revenue system		3.99	.809
KRA has offered an enabling environment for tax filing		4.20	.813
Time taken to declare goods to Customs has reduced significantly		4.02	.808

(Source: Research 2024)

Table 10 illustrates the level of Customs Revenue collection. The statement on System automation has enhanced tax revenue collection, this item had a mean score of 3.95 (SD = 0.798). For Customs Revenue collection in terms of volume has increased tremendously, the mean score for this item was 4.28 (SD = 0.841). Further, For All taxpayers have reported satisfaction with the revenue system Respondents rated this item with a mean score of 3.99 (SD = 0.809). In addition, for KRA has offered an enabling environment for tax filing, this statement received a mean score of 4.20 (SD = 0.813). Time taken to declare goods to Customs has reduced significantly. The mean score of 4.02 (SD = 0.808).

4.4 Correlation Analysis

The correlation analysis was conducted checking the various correlations between all the variables in the study.

Table 11: Correlation Analysis

Variables	Customs revenue collection	Regional Electronic Cargo Tracking System	Integrated Customs Management System	Scanning technology	Duty computation system
Customs revenue collection	1.000				
Regional Electronic Cargo Tracking System	0.640**	1.000			
Sig. (2-tailed)	0.002				
N	120				
Integrated Customs Management System	0.713**	0.383**	1.000		
Sig. (2-tailed)	0.000	0.001			
N	120				
Scanning technology	0.678**	0.374**	0.320**	1.000	
Sig. (2-tailed)	0.001	0.004	0.000		
N	120				
Duty computation system	0.539**	0.329**	0.284**	0.295**	1.000
Sig. (2- 0.000 0.000 0.001	0.001		tailed)		
N	120				

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

(Source: Research 2024)

Correlation analysis assesses the strength and direction of the relationship between variables. Pearson correlation analysis was conducted to examine the relationship between the study variables. It is important to note that a Pearson coefficient of less than 0.3 indicates a weak relationship, while a coefficient of 0.5 suggests a strong correlation between the variables being tested (Cooper & Schindler, 2014). Regional Electronic Cargo Tracking System had a significant association and strong correlation with customs revenue collection at r=0.640 and p=0.002<0.05. Integrated Customs Management System also had a significant association and strongest correlation with customs revenue collection at r=0.730 and p=0.000<0.05. **S**canning technology had had a significant association with customs revenue collection r=0.678 and p=0.001<0.05. Duty computation system had had a significant association and lowest correlation with customs revenue collection r=0.539 and p=0.000<0.05

4.5 Regression analysis

The results presented in Table 12 indicate the model fitness

Table 12: Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.736a	0.541	0.535	0.484157

a. Predictors: (Constant), Regional Electronic Cargo Tracking System, Integrated Customs Management System, **S**canning technology and Duty computation system

The results presented in Table 12 indicate that the Regional Electronic Cargo Tracking System, Integrated Customs Management System, Scanning Technology, and Duty Computation System are all significantly correlated with customs revenue collection, with a correlation coefficient of 73.6% (R = 0.736). These variables explain 54.1% of the variation

in customs revenue collection (R^2 = 0.541). This suggests that 45.9% of the changes in customs revenue collection are influenced by other factors not included in the study. Additionally, even after adjustments, the study accounts for 53.5% of the variation in customs revenue collection (Adjusted R^2 = 0.535).

4.5.1 Analysis of Variance

The ANOVA (Analysis of Variance) was conducted to assess the appropriateness of the model for the study. The results, summarized in Table 13, show that further ANOVA tests were performed to evaluate the model's ability to explain the relationships between the variables as proposed in the conceptual model. The findings from Table 13 reveal an F value of 56.035 with a significance level of 0.000, which is well below the confidence threshold of 0.05, confirming that the model is statistically significant. This indicates that each independent variable (Regional Electronic Cargo Tracking System, Integrated Customs Management System, Scanning Technology, and Duty Computation System) plays a significant role in influencing the dependent variable, customs revenue collection.

Table 13: Analysis of Variance (ANOVA)

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	31.829	4	7.957	56.035	.000[b]
	Residual	16.336	115	.142		

Total	**48.165**	**119**

a. Dependent Variable: customs revenue collection

b. Predictors: (Constant), Regional Electronic Cargo Tracking System, Integrated Customs Management System, **S**canning technology and Duty computation system

4.5.2 Model Summary

The model effectively explains the relationship between the Regional Electronic Cargo Tracking System, Integrated Customs Management System, Scanning Technology, and Duty Computation System in relation to customs revenue collection. The analysis confirms that these independent variables significantly influence the dependent variable, highlighting the importance of each component in contributing to the changes observed in the collection of customs revenue.

Table 14: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.368	0.159		2.314	0.022
	Regional Electronic Cargo Tracking System	0.227	0.044	0.233	5.159	0.002
	Scanning technology	0.257	0.038	0.273	6.763	0.001
	Duty computation system	0.293	0.037	0.211	7.918	0.000

a. Dependent Variable: Customs Revenue Collection

(Source: Research 2024)

4.5.3 Model Summary

The model works in explaining the relationship between Regional Electronic Cargo Tracking System, Integrated Customs Management System, Scanning technology and Duty computation system on Customs Revenue Collection

Table 15: Regression Coefficients

		Standardiz

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.368	0.159		2.314	0.022
	Regional Electronic Cargo Tracking System	0.227	0.044	0.233	5.159	0.002
	Integrated Customs Management System	0.394	0.053	0.308	7.433	0.000
	Scanning technology	0.257	0.038	0.273	6.763	0.001
	Duty computation system	0.293	0.037	0.211	7.918	0.000

a. Dependent Variable: Customs Revenue Collection

(Source: Research 2024)

The statistical analysis shown in Table 15 reveals strong positive correlations between the Regional Electronic Cargo Tracking System and Customs Revenue Collection, with a beta coefficient (β) of 0.227 and a p-value of 0.002, which is below the commonly accepted significance threshold of 0.05. This indicates that the relationship between the adoption of the electronic cargo tracking system and improved customs revenue collection is statistically significant. These findings are in line with the research conducted by Odago (2021), who explored the influence of Electronic Cargo Tracking System adoption on excise revenue collection at Jomo Kenyatta International Airport in Kenya. The study found that the implementation of the Electronic Cargo Tracking System (ECTS) had a notable positive impact on excise revenue collection, underscoring the potential for such technologies to enhance revenue generation in customs operations.

Additionally, the study highlighted that the relationship between the Integrated Customs Management System (ICMS) and Customs Revenue Collection was statistically significant, with a beta value (β) of 0.394 and a p-value of 0.000, which is well below the 0.05 significance level. This suggests that the ICMS plays a critical role in improving customs revenue collection. The findings align with those of Madola (2019), who investigated the factors influencing the adoption of the Integrated Tax Management System (ITMS) by small and medium-sized enterprises (SMEs) in Nairobi. Madola's study emphasized that taxpayers' perceptions of e-filing technology, including its ease of use and perceived benefits, significantly influenced the adoption and usage of the system. Furthermore, over 88.9% of 245 taxpayers surveyed in Nairobi viewed e-filing as beneficial and were motivated to comply with their tax obligations due to the system's efficiency compared to manual processes. However, it was noted that Kenya Revenue Authority (KRA) had not adequately educated taxpayers on how to use the system, which may explain the reluctance of some individuals to adopt the technology.

Mwonge (2021) conducted a study examining the impact of electronic tax filing on customs tax collection in Uganda. His findings revealed that with the implementation of the electronic tax (e-tax) system, the Uganda Revenue Authority (URA) was able to process at least UShs 7 trillion worth of revenue through 1.4 million electronic payments, representing over 360,000 tax returns. Based on these results, Mwonge recommended that the URA upgrade its e-tax servers, incorporate more user-friendly features to encourage greater taxpayer engagement, and launch a nationwide awareness campaign to promote broader adoption of the system.

In Table 14, the statistical analysis indicates a significant positive correlation between Scanning Technology and Customs Revenue Collection, with a beta coefficient (β) of 0.257 and a p-value of 0.001, both of which are below the 0.05 threshold for statistical significance. This suggests that the implementation of scanning technology has a notable effect on customs

revenue collection. According to Wulf & Matityahu (2020), container scanning systems are designed to inspect the contents of containers without opening them, a process referred to as "nonintrusive examination." These scanning systems allow customs authorities to inspect more consignments efficiently, without causing significant delays, and help identify illicit goods. The decision to acquire scanning technology should be based on a thorough costbenefit analysis to ensure that the technology provides a positive return on investment.

Singapore's adoption of an advanced scanning system, known as the Passport System, has proven to be effective in identifying materials such as drugs, guns, and other contraband. This system uses atomic number-based imaging technology to detect these items (Freeman, 2019). Chalfin (2020) further explained the role of border scanning technologies in safeguarding the sovereignty of customs services in Ghana, highlighting the importance of using technology to monitor and control the actions of state agents and officials during their duties. Scanning systems also offer the benefit of real-time cargo tracking, from the loading point to the destination, enhancing security by preventing theft and illegal dumping of goods in transit. The NCTTCA (2022) noted that scanning technology is especially valuable in monitoring cargo moving through Kenya to other East African countries, contributing to greater trade security and eliminating the need for costly security escorts that were previously required along transit routes (Agrawal, 2020).

The study also showed a strong positive relationship between the Duty Computation System and Customs Revenue Collection, with a beta coefficient (β) of 0.293 and a p-value of 0.000, both of which are below the 0.05 significance level, indicating statistical significance. These findings are consistent with those of Azmi and Kamarulzaman (2020), who noted that while the adoption of computerized duty systems has been rapid, there are still issues related to public skepticism about the reliability of these systems, especially in developing countries. Nisar (2021) observed that many tax authorities in developing countries continue to face

challenges in ensuring compliance, despite the adoption of computerized systems. In a study by Alcedo and Cajala (2021), the focus was on the Bureau of Customs (BOC) computerization program, specifically its impact on import and export transactions. The research employed an explanatory approach, utilizing a validated questionnaire to gather data from customs brokers, shipping agents, freight forwarders, and value-added service providers (VASPs). The findings indicated that respondents agreed that the benefits of the BOC's computerization program had largely been achieved, though the elimination of corruption was only partially successful. Nevertheless, respondents unanimously agreed that the BOC's computerization efforts were effective, with the import/export documentation system being deemed somewhat effective. These results demonstrate the significant role that technology plays in improving customs revenue collection and the overall efficiency of customs operations. The study suggests that integrating advanced technologies like cargo tracking systems, scanning technology, and duty computation systems can enhance revenue generation, but the successful implementation of these systems depends on effective training, public awareness, and continuous upgrades to ensure they meet the needs of both customs authorities and taxpayers.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the findings, conclusions and recommendations based on the results of the study. Furthermore, the researcher will make suggestions for further studies that can be conducted by other researchers.

5.1 Summary of Findings

The aim of this study was to explore the impact of automated systems on customs revenue collection in Kenya, specifically focusing on the Namanga Border. More precisely, the study sought to examine the influence of the Regional Electronic Cargo Tracking System on customs revenue collection at the Namanga border. Additionally, it aimed to assess the effect of the Integrated Customs Management System (ICMS) on customs revenue collection at the same border. The study also looked into the role of scanning technology in enhancing customs revenue collection at the Namanga border in Kenya.

The findings indicate that the combined implementation of the Regional Electronic Cargo Tracking System, Integrated Customs Management System, scanning technology, and Duty Computation System accounted for a substantial 54.1% ($R^2 = 0.541$) of the variance in customs revenue collection at the Namanga border. Moreover, the overall model used in the study was found to be statistically significant, suggesting that these automated systems play a critical role in improving customs revenue collection at this border post in Kenya.

5.2.1 Regional Electronic Cargo Tracking System

The first objective of this study was to establish the effect of Regional Electronic Cargo Tracking System on customs revenue collection at the at Namanga border in Kenya. Correlation analysis showed that Regional Electronic Cargo Tracking System on customs revenue collection has a positive effect and significant relationship. Further, regression analysis shows that there is a significant positive relationship between Regional Electronic Cargo Tracking System on customs revenue collection at the at Namanga border in Kenya.

5.2.2 Integrated Customs Management System

The second objective of this study was to determine the effect of Integrated Customs Management System on customs revenue collection at the at Namanga border in Kenya. Correlation analysis showed that Integrated Customs Management System on customs revenue collection has a positive effect and significant relationship. In addition, regression analysis shows that there is a significant positive relationship between Integrated Customs Management System on customs revenue collection at the at Namanga border in Kenya.

5.2.3 Scanning Technology

The third objective of this study was to find out the effect of scanning technology on customs revenue collection at the at Namanga border in Kenya. Correlation analysis showed that scanning technology on customs revenue collection has a positive effect and significant relationship. In addition, regression analysis shows that there is a significant positive relationship between scanning technology on customs revenue collection at the at Namanga border in Kenya.

5.2.4 Duty computation system

The fourth objective of this study was to establish the effect of Duty computation system on customs revenue collection at the at Namanga border in Kenya. Correlation analysis showed that Duty computation system on customs revenue collection has a positive effect and significant relationship. Further, regression analysis shows that there is a significant positive relationship between Duty computation system on customs revenue collection at the at Namanga border in Kenya.

5.3 Conclusions

The study established that Regional Electronic Cargo Tracking System has a positive effect on customs revenue collection at the at Namanga border in Kenya. The study findings found out that RECTS has reduced cases of loss of cargo by putting tracking measures during cargo transport

It is also concluded that, Integrated Customs Management System affects customs revenue collection at the at Namanga border in Kenya. The study findings revealed that ICMS is critical in streamlining customs procedures and ICMS Training is available to all stakeholders

Based on the findings, the study concluded that scanning technology has a significant impact on customs revenue collection at the Namanga border in Kenya. Respondents acknowledged that the use of scanners enhances the accountability and efficiency of customs officers and cargo owners. Additionally, it was noted that the exposure of goods to high-energy X-ray scanning could potentially impact the full implementation of the technology.

The study also concluded that the Duty Computation System plays a crucial role in influencing customs revenue collection at the Namanga border. Respondents agreed that the system provides real-time confirmation of duties paid, which enhances the efficiency and transparency of the customs process, leading to improved revenue collection.

5.4 Recommendations

The study derived various recommendations from the results, findings and conclusion.

5.4.1 Implication for Theory

The findings from this study significantly expand the body of knowledge, contributing to the existing literature by providing empirical evidence that Regional Electronic Cargo Tracking

System, Integrated Customs Management System, scanning technology, and Duty Computation System directly influence customs revenue collection. The results further strengthen the academic literature by supporting the relevance of several established theories, including the Unified Theory of Acceptance and Use of Technology, Technological Change Theory, Systems Theory, Diffusion of Innovation Theory, and Technological Determinism. These theories collectively highlight the importance of technological advancements in driving improvements in customs revenue collection.

5.4.2 Implication for Policy Makers

Based on the results, findings, and conclusions, the study formulated several key recommendations. The findings revealed a statistically significant relationship between the Regional Electronic Cargo Tracking System, Integrated Customs Management System, scanning technology, and Duty Computation System in enhancing customs revenue collection at the Namanga border in Kenya. In light of these findings, the study recommends that the Kenya Revenue Authority (KRA) should develop and implement comprehensive policies that regulate customs revenue collection and tax administration more broadly. These policies should aim to enhance the efficiency and effectiveness of the systems involved in the customs process, ensuring greater compliance and revenue generation.

5.5 Suggestions for Further Research

The current study aimed to assess the influence of automated systems on customs revenue collection in Kenya, specifically focusing on the Namanga Border. The study's specific objectives were to determine the impact of the Regional Electronic Cargo Tracking System, Integrated Customs Management System, scanning technology, and Duty Computation System on customs revenue collection at the Namanga border. For future research, it is

recommended to explore additional factors not covered in this study, such as the impact of compliance costs on customs revenue collection. This would provide a more comprehensive understanding of the dynamics influencing revenue generation in the customs sector.

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APPENDICES

Appendix I: Consent Form

Proposal title: **INFLUENCE OF AUTOMATED SYSTEMS ON CUSTOMS REVENUE COLLECTION IN KENYA: CASE OF NAMANGA BORDER**.

I'm a student at Mount Kenya University pursuing a **MASTER OF BUSINESS ADMINISTRATION (ACCOUNTING OPTION OF MOUNT KENYA UNIVERSITY)**

As part of my study requirements, I'm conducting research in Namanga border. The research is intended to investigate automated systems on customs revenue collection. A questionnaire will be used to collect data which will be treated with utmost confidentiality and only used for the purposes of the research. Data collected will be stored securely and will be destroyed once the research is completed. Your responses will be made anonymous and no part of the findings of this research will be linked to you but will be used strictly for the purposes of the Researcher's project. You have a right to/not to respond to any questions asked. Your participation in this research is voluntary and you may pull out at any time without reason, simply inform the Researcher. If you have questions pertaining to the research or its findings, contact the Researcher through vinkitazi@gmail.com.

Consent I have read, I understand the above information and have had the opportunity to ask questions. I understand that my participation is voluntary and that I am free to withdraw at any time, without giving a reason. I voluntarily agree to take part in this study.

Participant's signature _____ Date _____

Researcher's signature _____ Date _____

Appendix II: Questionnaire

This questionnaire is designed to collect information on **INFLUENCE OF AUTOMATED**

SYSTEMS ON CUSTOMS REVENUE COLLECTION IN KENYA: CASE OF NAMANGA BORDER Kindly answer the following questions honestly and accurately as possible. The information given will be treated with a lot of confidentiality. Please do not write your name anywhere on this questionnaire.

Section A: Demographic Information

1. Gender

Female [ ]

Male [ ]

2. Indicate where you fall among the following age brackets (years)

Below 25 [ ]
26-35 [ ]

36-45 [ ]

46-55 [ ]
Above 55 [ ]

3. Level of education

Primary [ ]

Secondary Certificate [ ]

Diploma level [ ]

Degree level [ ]

Others [ ]

REGIONAL ELECTRONIC CARGO TRACKING SYSTEM

Using the following scale, state your opinion by ticking on the space

On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

	5	4	3	2	1
RECTS has reduced cases of loss of cargo by putting tracking measures during cargo transport					
RECTS has facilitated the tracking of Transit vehicles and Cargo					
RECTS has helped in the Transit tamper detection					
RECTS has reduced labor time incurred previously during tracking of transit goods					
Tracking of cargo in transit using the RECTS system ensures Rapid Response Unit immediate and fast response to alerts within their jurisdiction					

INTEGRATED CUSTOMS MANAGEMENT SYSTEM,

Using the following scale, state your opinion by ticking on the space

On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

	5	4	3	2	1
ICMS is critical in streamlining customs procedures.					
ICMS Training is available to all stakeholders					
Containerized cargo theft has reduced since incorporation of cargo tracking system					
The use of ICMS has reduced risks associated with clearance of products					
Using ICMS decentralizes customs operations affecting time costs.					

SCANNING TECHNOLOGY

Using the following scale, state your opinion by ticking on the space

On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

	5	4	3	2	1
Scanners affect accountability and efficiency of customs officers and cargo owners.					
Exposure of goods to high energy X-ray affects full implementation.					
Access controls affected the quality of service and clearance time at the Namanga border					
Costs implications affect revenue authorities' investment in Scanner Technology.					
Human labour will soon be rendered obsolete by the use of scanners.					

DUTY COMPUTATION SYSTEM

Using the following scale, state your opinion by ticking on the space

On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

	5	4	3	2	1
We can make more clearances on products due to use of duty computation system resulting to more taxes to the KRA					
The owners of the goods can pay their duties at the comfort of their homes/offices electronically					
Confirmation of duties paid is confirmed instantly due to the use of duty computation system					

CUSTOMS REVENUE COLLECTION

Using the following scale, state your opinion by ticking on the space

On a scale of 1-5 where 1=strongly disagree, 2= disagree, 3= Neutral, 4= agree and 5=strongly agree

	5	4	3	2	1
System automation has enhanced tax revenue collection					
Customs Revenue collection in terms of volume has increased tremendously					
All taxpayers have reported satisfaction with the revenue system					
KRA has offered an enabling environment for tax filing					
Time taken to declare goods to Customs has reduced significantly					

Appendix III: Data Collection Letter

Mount Kenya University

DIRECTORATE OF GRADUATE STUDIES

MBA/58299/2022

23rd October, 2024

National Commission for Science Technology & Innovation (NACOSTI)
Off Waiyaki Way, Upper Kabete,
P.O Box 30623- 00100
NAIROBI, KENYA

Dear Sir/Madam,

RE: VINCENT MUGADIA KITAZI – REGISTRATION NO. MBA/58299/2022

The purpose of this letter is to introduce the above named student who is pursuing **Master of Business Administration** in the department of **Accounting and Finance** in the school of **Business and Economics.**

The title of the research is **"Influence of Automated Systems on Customs Revenue Collection in Kenya: A Case of Namanga Boarder in Kajiado County, Kenya."** It has been cleared by the University's Ethics Review Committee (Certificate attached) and now has to proceed to the field to collect data between **October, 2024 and December, 2024.**

Any assistance accorded to the student will be highly appreciated.

Thank you.

Mount Kenya University
P. O. Box 342 - 01000, THIKA
Office of the Director,
Graduate Studies

Dr. Samuel M. Karenga, PhD
Director, Graduate Studies
Enc.

Appendix IV: NACOSTI

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: **339653**

Date of Issue: **28/October/2024**

RESEARCH LICENSE

This is to Certify that Mr.. VINCENT MUGADIA KITAZI of Mount Kenya University, has been licensed to conduct research as per the provision of the Science, Technology and Innovation Act, 2013 (Rev.2014) in Kajiado on the topic: INFLUENCE OF AUTOMATED SYSTEMS ON CUSTOMS REVENUE COLLECTION IN KENYA: A CASE OF NAMANGA BORDER IN KAJIADO COUNTY, KENYA for the period ending : 28/October/2025.

License No: **NACOSTI/P/24/41603**

339653

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

See overleaf for conditions

Appendix V: ERC Letter

Mount Kenya University

REF: **MKU/ISERC/4497** Date: 18 October 2024
TO: **VINCENT MUGADIA KITAZI**
REG: **MBA/58299/2022**

Dear Sir/Madam,

RE: INFLUENCE OF AUTOMATED SYSTEMS ON CUSTOMS REVENUE COLLECTION IN KENYA: A CASE OF NAMANGA BORDER IN KAJIADO COUNTY, KENYA

This is to inform you that **Mount Kenya University** has reviewed and approved your above research proposal. Your application approval number is **3219.** The approval period is **18/10/2024 - 17/10/2025.**

This approval is subject to compliance with the following requirements;

i. Only approved documents including informed consents, study instruments, MTA will be used
ii. All changes including amendments, deviations and violations are submitted for review and approval by **Mount Kenya University**
iii. Death and life-threatening problems and serious adverse events or unexpected adverse events whether related or unrelated to the study must be reported to **Mount Kenya University** within 72 hours of notification
iv. Any changes, anticipated or otherwise that may increase the risks or affect the safety or welfare of study participants and others or affect the integrity of the research must be reported to **Mount Kenya University** within 72 hours
v. Clearance for export of biological specimens must be obtained from relevant institutions
vi. Submission of a request for renewal of approval at least 60 days prior to expiry of the approval period. Attach a comprehensive progress report to support the renewal
vii. Submission of an executive summary report within 90 days upon completion of the study to **Mount Kenya University**

Prior to commencing your study, you will be expected to obtain a research license from National Commission for Science, Technology and Innovation (NACOSTI) https://research-portal.nacosti.go.ke and also obtain other clearances needed.

Yours sincerely,

Dr. Alfred Owino, PhD
Chairman, Mount Kenya University ISERC

MOUNT KENYA UNIVERSITY
ETHICS REVIEW COMMITTEE
P. O. Box 342 - 01000,
THIKA

Main Campus, General Kago Road, P.O. Box 342-01000 Thika.
Cell: +254 709 153 000 / +254 709 153 200
Email: info@mku.ac.ke, Web: www.mku.ac.ke

Appendix VI: KRA Letter

KENYA REVENUE AUTHORITY
ISO 9001:2015 CERTIFIED

CONFIDENTIAL

KRA/SIRM/CDO/043/009

29th October 2024

DATA COLLECTION AUTHORIZATION FOR VINCENT MUGADIA KITAZI ADM NO: MBA/58299/2022

To Whom It May Concern,

I, the undersigned, in my capacity as the Data Protection Officer at the Kenya Revenue Authority (KRA), hereby authorize Vincent Mugadia Kitazi, a student at Mount Kenya University, of admission number MBA/58299/2022, to collect data within Namanga Border for research purposes. This authorization is granted per KRA's guidelines and regulations and is strictly for academic research.

Please note that the data collection is limited to a questionnaire that does not involve collecting any Personally Identifiable Information (PII).

This authorization is effective from the date of this letter and will remain valid for one (1) month.

For any further clarification or required documentation, please contact me via 0709017166 or email at dc.cdo@kra.go.ke.

Joseph Tonui
Deputy Commissioner-Corporate Data Office

cc. Station Manager-Namanga Border

KENYA REVENUE AUTHORITY
CORPORATE DATA OFFICE
DEPUTY COMMISSIONER
30 OCT 2024
APPROVED
Sign:.....

Tulipe Ushuru, Tujitegemee!