EFFECT OF FINANCIAL INFORMATION SYSTEMS ON THE RELATIONSHIP BETWEEN CONTROL ACTIVITIES, RISK ASSESSMENT, AND REVENUE COLLECTION IN LAKE REGION ECONOMIC BLOC COUNTIES IN KENYA

BY

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DECLARATION

By Candidate

The research thesis is my original work and has not been presented in any other university or college for the conferment of a degree, award of a diploma, or certificate.

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DEDICATION

This Thesis is dedicated to my parents Mr. & Mrs. Okise and my mentors Dr. Richard Lesiyampe and Prof. Peter Anyang Nyang'o who have worked closely with me to actualize this dream. Thanks for your great support

ABSTRACT

Revenue collection is vital for financing public services and driving sustainable development. Advanced economies like the United States, China, and India have recorded notable gains, with the U.S. tax-to-GDP ratio rising from 25.8% in 2020 to 26.6% in 2021, China from 20.1% to 21.0%, and India posting a 34% revenue increase in 2021/2022.In contrast, Nigeria's ratio fell from 6.0% in 2019 to 5.5% in 2020, while Kenya's dropped from 15.8% to 15.2% between 2020 and 2021. The Lake Region Economic Bloc (LREB) performed worse, with its ratio stagnating at 4% (2019–2022) before declining to 3% in 2023–2024, resulting in only 65–72% revenue realization and a 30.8% funding gap, forcing reliance on costly borrowing. Existing studies affirm the importance of internal controls and financial systems but reveal gaps: focus on private sector contexts, limited exploration of FIS as a moderator, reliance on cross-sectional or perception-based data, and lack of robust diagnostic testing. This study examined the effect of Financial Information Systems (FIS) on the relationship between control activities, risk assessment and revenue collection in the Lake Region Economic Bloc (LREB) counties in Kenya. Objectives include assessing the effects of control activities and risk assessment, as well as the moderating role of FIS in strengthening these relationships. Grounded in Contingency, Agency, and Task-Technology Fit theories, the study adopted a correlational panel design using secondary data from all 14 LREB counties (2015–2024), applying panel regression to evaluate these relationships. The regression analysis reveals that both internal control activities (ICA) and financial information systems (FIS) are positively and highly significant predictors of revenue collection, with a % increase in ICA corresponding to a 5.8% increase in revenue collection ($z = 7.71$, $p < 0.001$) and a % increase in FIS associated with a 6.7% increase in revenue collection ($z = 8.60$, $p < 0.001$). Critically, a significant synergistic interaction exists between ICA and FIS ($\beta = 0.016$, $z = 3.33$, $p = 0.001$), indicating that their combined effect on revenue performance is greater than the sum of their individual impacts. While the Annual Risk Index Score itself showed a negative but marginally non-significant effect in the fixed-effects model ($\beta = –0.013$, $t = –1.80$, $p = 0.096$), FIS significantly moderates this relationship, with the interaction term (Risk × FIS) being positive and significant ($\beta = 0.009$, $t = 2.18$, $p = 0.049$), demonstrating that robust financial systems mitigate the adverse effects of risk. The model explains substantial variance in revenue collection, with an overall R^2 of 64.5% and a within-county R^2 of 71.7%. The study conclusively establishes that internal control activities (ICA) and financial information systems (FIS) are fundamental drivers of revenue collection efficiency in the Lake Region Economic Bloc counties, with a significant synergistic interaction underscoring the necessity of integrating these systems for superior outcomes. Furthermore, FIS serves a critical risk-mitigation role, counteracting the negative effects of annual risk on revenue performance, while persistent unobserved county-specific factors also substantially influence revenue capacity. Based on these findings, recommendations include prioritizing the concurrent strengthening of ICA and FIS to leverage their synergy, deploying FIS strategically for risk mitigation, adapting policies to county-specific contexts due to significant between-county variation ($\rho = 0.620$), and investigating specific county-level factors such as governance structures and institutional capacity to inform targeted policy design. Policy should focus on capacity-building for finance staff and extending digital revenue platforms to grass-roots micro-traders ("Mama Mboga") to promote equity and compliance.

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LIST OF ABBREVIATIONS

CBK	Central Bank of Kenya
ICS	Internal Control Systems
KRA	Kenya Revenue Authority
VAT	Value Added Tax
LREB	Lake Region Economic Bloc
SA	System Automation
IFMIS	Integrated Financial Management Information System
FIS	Financial Information System
CRA	County Revenue Act
REBS	Regional Economic Blocks
ECR	Electronic Cash Registers
POS	Point of Sale
ICT	Information and Communication Technology

OPERATIONAL DEFINITION OF TERMS

Control Activities: These encompass the implementation of policies, processes, and mechanisms to effectively execute management's directions.

Financial Information System: It is a system designed to gather, store, structure, and manage financial information for effective use.

Revenue Collection: The process by which a government entity invoices individuals or the general public for penalties, taxes, or other fees.

Internal Controls: The methods implemented by a company to enable it to meet its mission and goals.

Risk Assessment Index: Possible occurrences or uncertainties that may hinder the organization from accomplishing its goals.

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CHAPTER ONE
INTRODUCTION

1.1 Background of the Study

Revenue is the financial gain a firm obtains through an increase in its asset value, resulting from production activities (Pandey, 2010). Selling goods and services is a good example of production activities that help generate revenues. (Rittenberg and Schwieger, 2005)Define revenue as the increase in a company's assets or the settlement of its debts resulting from the manufacturing or delivery of goods, services, and core operations of the company. Advanced and developing economies' governments need finances to fund their expenditures, comprising both non-tax and tax sources. Revenue collection is the cornerstone of government functionality. It provides the essential funds necessary for implementing public policies, delivering services, and driving sustainable development. Historically, both developed and developing countries have used taxation and related non-tax revenues as the primary instruments for raising public income. However, the extent to which governments succeed in mobilizing domestic resources largely depends on the strength of their public financial management systems, the effectiveness of internal control frameworks, and the deployment of technological tools such as Financial Information Systems (FIS)

Taxes are imposed on individuals' earnings or on the purchase of goods and services that are taxable. Non-tax revenue includes foreign aid, revenues from state-run businesses, fines, charges for permits, along with other government services, and other kinds of income (Cobham, 2005). Companies aiming to achieve efficient collection operations implement contemporary technologies to gather data at reduced costs for every dollar generated, resulting in increased revenues without the need for additional personnel (Mutisya Mathew, 2014). State-of-the-art techniques and tools are being implemented in various domains, including decision analytics, data collection, automated involuntary enforcement, and online assistance and communication management. The numerous data sources possessed by the bulk of government agencies can be utilized to improve information-gathering activities. This encompasses data obtained from previous checks, fees for licenses, as well as electricity and water bills, and bank account details from electronic transactions. The government gains a more comprehensive comprehension of debtors by creating a centralized repository for data collected from many entities (Hamilton, 2013).

Globally, countries have made varying strides in improving revenue collection systems. OECD reports that member countries, including the USA and EU, have consistently maintained high tax-to-GDP ratios. For instance, the U.S. tax-to-GDP ratio rose from 25.8% in 2020 to 26.6% in 2021. China's ratio increased from 16.9% in 2007 to 21.0% in 2021, indicating a gradual but consistent improvement in domestic revenue mobilization. India recorded a 34% increase in revenue collection in the fiscal year 2021–2022, surpassing its budget target by over Rs. 5 lakh

crores. This was attributed to policy reforms, expanded tax bases, and improved compliance enforcement. According to the yearly Revenue Statistics report by the OECD, the proportion of taxes to GDP in the US rose by 0.8 percentage points, reaching 26.6% in 2021 compared to 25.8% in 2020. The average for the OECD climbed from 33.6% in 2020 to 34.1% in 2021.

The ratio of taxes to GDP in the US has declined from 28.3% to 26.6% in 2000 - 2021. In 2021, the average for the OECD was higher than in 2000, with a rate of 34.1% compared to 32.9%. In the United States, for example, the ratio of taxes to gross domestic product (GDP) reached its peak at 28.3% in 2000, while its lowest point was 22.9% in 2009. In China, the proportion of taxes to GDP had a 1.0 percentage point increase, rising to 21.0% in 2021 from the 20.1% value in 2020. Between 2007 and 2021, China's tax-to-GDP ratio had a 4.1 percentage point increase, rising from 16.9 percent to 21.0 percent. In 2019, the proportion of taxes to GDP reached its peak at 22.1%, while in 2007, it hit its lowest point at 16.9%. Furthermore, India recorded Rs. 27.07 lakh crore in revenue collection (according to the preliminary statistics) for the fiscal year 2021 and 2022. The amount exceeds the forecasts of the Union's Budget for that year by over Rs. 5 lakh crores, with the budget initially set at Rs. 22.17 lakh crores. The revenue collection for this year has increased by 34% compared to last year's, which was Rs. 20.27 lakh crore. This rise is primarily driven by a 49% and 20% increase in direct and indirect taxes, respectively.

For instance, in Africa, the tax rate compared to the GDP of Nigeria had a decline of 0.4 percentage points, dropping from 6.0% (2019) to 5.5% (2020). By contrast, the mean value for the 31 countries mentioned in the 2022 publication has declined by 0.2% in the timeframe mentioned, reaching 16.0% in 2020. From 2010 to 2020, there has been a 1.6% increase in the average for the 31 African nations, rising to 16.0% from 14.4%. In this very time frame, Nigeria's proportion of taxes to GDP has declined by 1.7%, down to 5.5% from 7.3%. In 2011, Nigeria had a proportion of taxes to GDP of 9.6%, which was the highest recorded. In contrast, the lowest ratio of taxes to GDP of 5.3% was observed in 2016. In addition, collecting taxes has been robust in the previous year, despite an inconsistent recovery in the economy. The projected tax income for the fiscal year 2022/23 is anticipated to amount to R1.69 trillion, which represents an increase of R10.3 billion compared to the projection provided in the 2022 Medium Term Budget Policy Statement (MTBPS). The ratio of taxes to gross domestic product is steadily increasing after reaching its lowest point due to the impact of COVID-19, and it is expected to rise to 25.4% in the fiscal year 2022/23. Income and earnings have demonstrated greater durability than expected one year ago. The corporate tax revenues from mining continue to be substantial as compared to previous data, mostly because of high commodity prices that, although decreasing, remain significant. The services sector's increased profits have bolstered the collection of corporate and dividend taxes. The payment of personal income tax has been boosted by a resurgence in earnings and a positive trend in employment rates. The significant increase in import prices led to substantial revenue from import value-added tax (VAT) and customs fees.

The VAT refund payments surpassed the 2022 threshold. Anticipated budget projections resulting from the rise in exports that are exempt from taxes by manufacturing companies.

The Kenya Revenue Authority (KRA) has consistently increased its collection, achieving a growth rate of 6.7% in the fiscal year 2022/2023. There has been a steady rise in revenue collection over the past five years, from KShs. 1.58 trillion in the financial year 2018/2019 to KShs. 2.166T in the 2022/23 financial year, indicating a gain of 37% (equivalent to KShs 586.259 billion) throughout this period. Despite a global economic downturn, KRA managed to collect KShs 2.166T from July 2022 to June 2023, which is higher than the KShs. 2.031T in the previous financial year. The collection for the fiscal year 2022/2023 exceeded that for the fiscal year 2021/2022 by KShs135 B.

The revenue output was impacted by the deceleration of local economic growth during 2022, which decreased from 7.6 % in 2021 to 4.8%. The growth in global real GDP rate declined from 6.0% in 2021 to 3.4% in 2022, reflecting a deceleration. The slowdown in the nation's economic expansion can be attributed to the detrimental effects of several shocks that impacted the economy, such as overseas conflicts that interrupted the supply chain, and other factors. The revenue collection demonstrates an achievement rate of 95.3% of the set aim. KRA has exceeded the two trillion 6954 thresholds for the second consecutive year. The revenue of the exchequer increased by 6.9%. Following the prior fiscal year, the Kenya Revenue Authority (KRA) has collected a total of KShs. 2.030 trillion, which is an increase from the KShs. 1.900 trillion received previously. This corresponds to an achievement rate of 95.1 percent of the set objective. Tax revenue encompasses the primary sources of government income, including taxes on global trade and transactions, income taxes, excise duties, profits, and gains from investments, taxes on property, and VAT. Additionally, KRA is responsible for the collection of income on behalf of several government departments, mostly at the ports of entry. These charges encompass Air Passenger Service Charges, Petroleum Development Fund, Road Maintenance Levy, Aviation Revenue, and others. In the fiscal year that ended June 30th, 2023, the Kenya Revenue Authority collected a total of KShs. 136.390 billion for various agencies. This amount represents a gain of 3.7 percent from the previous fiscal year. Facilitated increased revenue generation throughout the economic recovery time frame.

In Kenya, the proportion of taxes to GDP had declined by 0.6 percentage points, dropping from 15.8 percent to 15.2 percent in 2020-2021. By contrast, the mean value for the 33 African nations included in the Revenue Statistics in Africa 2023 report has stayed constant during the same year, standing at 15.6% in 2021. From 2010 to 2021, the mean percentage for the 33 countries in Africa has gone up by 1.5 points, increasing from 14.1% to 15.6%. During the same time frame, Kenya's ratio of taxes to GDP has declined by 0.7 percentage points, going from 15.9% to 15.2%.

In 2017, Kenya reported the highest proportion of taxes to GDP of 17.5% since 2000, while the lowest ratio of 12.5% was recorded in 2002.

The computerization of mandatory collection activities is crucial due to the arduous nature of charging and seizing money from debtors, which poses challenges for organizations, despite their authority to collect debts from debtors. Tax collection agencies access the data on the debtor's financial transactions through several means, including former payments that the debtor makes or receives, previous tax filings, and data matches with banks. Employment data is obtained through the sharing of employee information between an employer and various government agencies. Such collaboration is crucial for automating mandatory processes (London & Hamilton, 2013).

The collection of public income plays a crucial role in informing fiscal policies and a nation's economy (Cakmak et al., 2011). The revenue management should adhere to the principles of justice, where taxes are distributed fairly; payment ability, where individuals contribute based on their financial capacity; economic efficiency, where taxes are collected in a way that minimizes waste and maximizes productivity; convenience, where the process of paying taxes is easy and accessible; and certainty, where taxpayers have a clear understanding of their obligations. These principles are by policy on taxes and public revenue as stated by (Fioretti and Visser, 2005). There are various methods of collecting income, which can be classified into two main systems: manual or automated systems for revenue collection. Nevertheless, the revenue systems adopted by African countries, including Kenya, predominantly continue to be manual or a combination of manual and automated (Bahiigwa et al., 2005). (Gidisu, 2012) agree that in Ghana, several components of local revenue collection rely on manual methods. While some systems are automated, others have a combination of functions. However, manual-based systems of revenue collection are associated with challenges in detecting and preventing fraudulent activities. According to (Prichard, 2010), manual systems can also delay customer service.

In 1980, computerized tax collection systems were implemented for the first time in the United States and thereafter extended to other advanced and developing nations (Unctad and GDS, 2008). Automated platforms provide the capability and adaptability to enhance the amount of revenue collected (Zhou and Chilunjika, 2013). Computerization of revenue administration guarantees a shorter clearance time, prevents tax evasion, and increases the efficiency of the collection process (Haughton and Desmeules, 2001). (Wulf et al., 2005). When problems like non-collection, failure to remit taxes, and limited cooperation between the payers and collecting agencies arise, system automation can be strategically employed to establish efficient revenue-collecting structures (Githinji et al., 2014). This is due to the fact that Electronic Cash Registers (ECR) and Point of Sale (POS) systems create an audit trail that is easy to trace The system's efficient financial transaction tracking and appropriate controls prevent unethical behavior, which

boosts returns and produces safe reports in real time that guarantee prompt action is done in order to avoid losses and waste.

To illustrate the effectiveness of automating revenue collection, Kinyanjui and Mwaura (2013) analyzed mobile-based parking systems, linking the use of mobile devices to the collection of parking fees in Singapore and Germany. They found that the use of automated systems improved parking fee collection. According to (Otiso et al., 2013), 86% of small and medium-sized in Bungoma County preferred using mobile phones for financial transactions, compared to 14% who used conventional banking halls and other transfer facilities. This difference in preference for mobile phones may account for the SMEs' increased income collection. According to (Mutisya Mathew, 2014), automating the collection of revenue is the best approach to close the large income gap in the counties between their sources and government-allocated revenue. He goes on to advise increasing funding for contemporary technology in order to improve information sharing and compatibility for efficacy and efficiency.

An information and communication technology (ICT) transition plan was implemented by Kiambu County in 2014-2017. The goal of the initiative was to use technology to enhance the delivery of public services, boost efficiency, and increase the level of revenue collection (Ambali, 2009). (Gidisu, 2012) contends that the amount of revenue generated is determined by the kind of revenue-collecting mechanisms in place. Current efforts are being made to replace the long-standing traditional systems with computerized versions. Finding out how much the new automated systems are worth in comparison to the older manual methods would be helpful. This is because industrialized economies, where computerized systems are well-established, and emerging economies, where the technology is relatively new, have very different contextual backgrounds. According to the majority of existing literature, internal controls have an impact on revenue management.

According to (Reffett, 2007), solid internal controls are the measures taken by the company to guarantee that its missions, aims, and objectives are met. To ensure that operations are conducted such that theft and misuse of company resources are prevented, they also relate to the policies and processes that a company has in place (Schroth and Shah, 2000) Although internal controls within a company offer a fair degree of assurance, they cannot provide total assurance that the aims, missions, organization goals were fulfilled (Zigurs and Buckland, 1998).

Conversely, internal controls are a set of procedures and guidelines that businesses implement to help achieve their objectives. These include preserving the integrity of their assets, adhering to management guidelines, and spotting and stopping fraud and errors (Hayes et al., n.d.). Businesses implement internal control systems to meet organizational performance targets and goals, prevent resource loss, guarantee legal and regulatory compliance, and generate trustworthy

reports. According to (Zigurs and Buckland, 1998), the systems play a role in detecting, preventing, or correcting activities that may lead to losses. According to (Singleton et al., 2006), Preventive controls assist in anticipating possible errors, malfunctions, or intentional acts of omission and preventing them from happening, whereas detective controls assist in identifying and reporting faults or vicious acts of omission when they do. They also make it possible to make changes in advance of the event. Conversely, corrective controls aid in lessening the impact of a threat, make it possible to identify the root of the issue, and provide the means of fixing any mistakes brought about by the threat. He recognizes control and oversight activities as some of the internal control systems.

An Internal Control System refers to an independent assessment carried out within an organization to evaluate the effectiveness of its controls and overall productivity (Millichamp, 2000). These controls ensure compliance with organizational policies, protect assets, and uphold the accuracy and reliability of records to the greatest extent possible. According to Jamshidi and Arad (Philee, 2010), the Internal Control Structure is a systematic integration of processes and functions established by management to improve operational efficiency. Similarly, Chen and Shi (2012) liken the Internal Control Structure to the human nervous system, with its complex network spread throughout the organization, enabling the transmission of instructions and feedback between management and staff. It is directly linked to the administrative framework and aligns with the company's overarching policies.

(Wakida, 2015) acknowledges that the ICIF catalogs five aspects of internal controls: control environment, risk assessment, control actions, ICT, and monitoring. The control environment has a considerable influence on the level of success achieved by the other four aspects. Controlling the environment encompasses the regulation of employee behavior and ethics, maintaining professionalism, fostering participation, managing organizational structure, implementing management styles, authorizing decisions, and establishing human resources policy. (Kakucha, 2009) concurs that in the absence of a robust control setting, the efficacy of the remaining elements of internal controls is compromised.

Information Systems (IS) is a tool that facilitates the gathering, retention, arrangement, and utilization of information by individuals. As stated by (Duffy and Assad, 1980), an IS a comprehensive combination of individuals, protocols, a database, and occasionally hardware and software. Its purpose is to gather, process, store, and transmit data for operational processing of transactions and to provide information for decision-making by managers, as highlighted by (Bowrin, 2004). The primary objective of an IS is to facilitate the extraction of specific value from the data held, irrespective of the nature of the data or the required value (Norton, 2006). Thus, it enhances the organization's earnings.

Local authorities, such as municipalities, are increasingly important to the citizens of any nation. They are seen as the driving force behind economic progress and the focal points of development in such nations (Romney and Steinbart, 2014). The (Marriott and Marriott, 2000) study indicates that they offer a range of services, including cultural, educational, managerial, political, and business services. In addition, they provide employment opportunities, high-quality healthcare facilities, and contribute to the growth of the domestic economy (UN-HABITAT, 2009). The study by (Mauldin and Ruchala, 1999)Financial information and tax collection reveal that the County government of Nairobi contributes over 50% to the GDP of Kenya. The local government authorities enable the progress and advancement of a nation.

An effectual internal control structure potentially enhances efficiency as it is an integral component of the administration process, encompassing organizing, preparing, monitoring, and directing. Internal controls direct organizational activities to achieve set objectives and minimize the likelihood of failure. Internal control procedures make operations achieve high efficiency and effectiveness, assure organizational compliance with laws and regulations, and mitigate the risks of asset loss. Amudo and Inanga (2009) evaluated internal controls within the African Development Bank Group's (AFDB) Regional Member Countries (RMCs) using regression analysis, and their findings indicated that these controls did not enhance effectiveness. The report suggests enhancing the current internal control procedures, with a specific focus on banks within the government environment. In an investigation examining the link between internal control and a bank's ability to detect fraudulent activities among employees, Ewa and Udoayang (2012) utilized multiple regressions to validate their hypotheses. The impact of the internal control structure on employee attitudes toward fraudulent acts was determined. They additionally asserted that an effective internal control framework deters being fraudulent, whereas a feeble one leaves the system vulnerable to fraud. This study presents valuable information but lacks a clear explanation of the consequences of not implementing an internal control system.

Internal controls play a critical role in safeguarding public resources and ensuring accountability in revenue administration. These controls, encompassing control activities, risk assessments, and monitoring mechanisms, form the backbone of any sound financial management system. However, in the absence of a robust supporting framework, particularly a Financial Information System, these controls may be rendered ineffective. Financial Information Systems enhance transparency, reduce human error, automate compliance checks, and provide real-time data analytics that are essential for informed decision-making.

The relationship between internal controls and revenue performance is extensively discussed in both theoretical and empirical literature. Agency Theory suggests that in a principal–agent relationship, such as between the government and its revenue officers, information asymmetry may create inefficiencies and moral hazard. Internal controls address this challenge by

introducing checks and balances that align the agent's actions with the principal's interests. Contingency Theory further highlights that the effectiveness of control systems depends on their alignment with contextual factors, including organizational size, structure, and technological capacity. Similarly, the Task-Technology Fit (TTF) Theory argues that performance is maximized when technology appropriately supports and complements the tasks it is intended to facilitate.

In the context of Kenya's devolved government structure, these theoretical perspectives underscore the importance of integrating technology with internal control mechanisms. Counties with functional FIS platforms can more effectively manage revenue flows, enforce accountability, and respond to emerging risks. FIS facilitates seamless data sharing across departments, automatic reconciliation of accounts, real-time reporting, and the generation of audit trails. These capabilities are particularly crucial in Counties where human capacity is limited and governance challenges are prevalent.

This study is guided by three core theoretical frameworks: Agency Theory, Contingency Theory, and Task-Technology Fit (TTF) Theory. These theories underpin the relationships being examined and provide conceptual clarity for interpreting the role of internal controls and Financial Information Systems in public revenue collection. Agency Theory explains the importance of control mechanisms in aligning the behavior of agents (county officials) with the interests of principals (the public and policymakers). Contingency Theory highlights the necessity of tailoring internal controls to the operational environment of each County, particularly in response to changing technological and governance landscapes. TTF Theory emphasizes that technology (such as FIS) must be well-suited to the tasks it supports to improve organizational performance. These theoretical foundations not only justify the study's analytical approach but also guide its interpretation of empirical findings.

Empirical studies support these assertions. For instance, a study by Gathogo and Ragui (2014) found that counties in Kenya that had adopted integrated financial systems saw an average increase of 24% in revenue collection over five years. In Rwanda, the use of e-tax systems has reduced compliance costs and increased tax filing by over 40% (World Bank, 2018). However, the effectiveness of FIS in enhancing revenue outcomes is not uniform and depends on factors such as system design, user training, political will, and interoperability with other government platforms like the Integrated Financial Management Information System (IFMIS).

Despite these contributions, notable gaps persist in both literature and practice. Existing studies have largely focused on the direct influence of internal controls and Financial Information Systems (FIS) on organizational performance, while giving limited attention to the moderating role of FIS in the relationship between internal controls and revenue collection particularly within public sector settings. Moreover, the limited research that has explored these dynamics often

depends on cross-sectional designs, perception-based surveys, or case study methodologies, all of which constrain generalizability and weaken causal inference.

This study seeks to fill these gaps by adopting a panel design and employing robust econometric analysis to explore the effect of FIS on the relationship between internal controls and revenue collection in LREB counties. By analyzing secondary data from 2015 to 2024 across all 14 counties, the study provides longitudinal insights that capture temporal dynamics, policy changes, and system upgrades. The significance of this study is threefold. First, it advances academic discourse in public financial management by incorporating Financial Information Systems (FIS) as a moderating variable in the relationship between internal controls and revenue performance. Second, it generates practical insights for county governments, policymakers, and development partners on strengthening revenue systems through technology integration and governance reforms. Third, it offers empirical evidence to guide the formulation of fiscal decentralization policies, not only in Kenya but also in other developing countries with comparable administrative frameworks.

The impact of control mechanisms on audit results was examined by Abbott et al. (2012). The data that was collected was examined using regression analysis. According to Simangunsong (2014), companies with independent directors and minimal operational activities are unlikely to have fraudulent financial records. Simangunsong carried out research in Indonesia to assess the impact of internal controls and audits on the effectiveness of local government. The findings from the regression analysis indicated that robust internal audit and internal control practices contribute to improved performance in local government operations.

Sarens and De Beelde (2006) investigated the role of control procedures within organizations using regression analysis. Their findings revealed a strong association between control mechanisms, the objectives of internal auditing, and the detection of fraudulent activities. Similarly, McCraw et al. (1990) examined control activities and highlighted how internal controls influence employees' propensity to engage in fraudulent behavior. The study analyzed data using regression analysis and found that the inclusion of control functions and the implementation of separation of roles are linked to an increase in the cost of perpetrating fraud. Therefore, in a context where internal control operations are present, the advantages of engaging in fraudulent behavior must be greater than the associated costs. The literature mentioned above utilized SPSS for data analysis, but this research employed EViews to analyze the data gathered.

A study conducted by (Kumuthinidevi, 2016)Privately owned financial institutions in Sri Lanka revealed that implementing control procedures as part of internal controls significantly improved the collections. Aikins (2011) examined the influence of internal control practices on revenue collection and emphasized that the accurate documentation of policies and procedures is critical to the effective implementation of control operations. He argues that it is important to have an

awareness of the influence of IT on operations related to planning and subsequently influences revenue creation. (Hussain, n.d.) examined the impact of control measures, specifically process assessment, on commercial banks' profitability. The study revealed that certain institutions perceive control procedures as either general controls or application controls. Application controls are used to oversee the management of individual applications, ensuring that authorized activities are properly documented and processed. These controls include checks on input data, verification of numerical sequences, and manual review of exception reports. (Ndunda et al., 2015)

A study regarding the profitability of Kenyan academic institutions, it was discovered that specific control processes, such as reconciliation documentation and assessment, positively impact performance improvement. In his study on the business performance of Kenyan financial institutions, (Muthusi, 2017) discovered that internal controls significantly reduce the incidence of fraud and safeguard company assets, thereby improving income creation. In Sub-Saharan Africa, (Ibrahim & Alagidede, 2017)Assessed Financial Development, Growth, Volatility, and Information Asymmetry contend that control measures can be customized to efficiently enforce various management rules and regulations. This can assist organizations in ensuring that measures have been implemented to minimize losses while achieving set objectives. This demonstrates the practice of management empowering lower-level employees with the authority to take part in solving problems and making decisions. It aligns with the concept of integrating different functions within a company, ultimately improving performance. The aforementioned studies mostly concentrated on the financial and education sectors, offering a comprehensive analysis of control operations about the reporting systems of government organizations. Additionally, they prioritize the overall profitability of the companies being studied rather than focusing particularly on revenue generation.

The literature summaries indicate that (Abbott et al., 2012) and (Simangunsong, 2014) discovered that successful internal audits and internal control procedures enhance performance. In a study conducted by (Sarens and De Beelde, 2006) and (McCraw et al., 1990), the significance of control measures in an organization was examined. The data was analysed using regression analysis, and it was found that the features of control systems are strongly associated with fraudulent activity detection and internal audit purposes.

Similarly, (Kumuthinidevi, 2016), Aikins (2013), and (Hussain, n.d.) evaluated how control operations influence the amount of revenue generated and discovered that the implementation of policies and processes to ensure the effective execution of management directives resulted in subsequent revenue growth. In addition, (Ndunda et al., 2015) and (Muthusi, 2017) studied how control measures affect profitability. They used regression analysis to analyse the data and concluded that internal controls significantly reduce the likelihood of fraud and safeguard the

assets of the organization, ultimately leading to increased revenue. Furthermore, according to (Ibrahim & Alagidede, 2017), control operations are specifically designed to efficiently enforce various managerial rules and regulations. These activities can assist organizations in ensuring that measures have been implemented to reduce losses, determined by the attainment of set objectives.

Prior research has demonstrated a varied relationship between control measures, with the majority of studies indicating that the structure of internal controls has an impact on organizational performance. They confirm that control actions establish power and accountability by merging functions and features of departments, ultimately resulting in positive organizational performance. Although numerous studies have been conducted on control operations, it is clear that the majority of these investigations have primarily examined the impact of control actions on overall organizational performance. Only one reviewed study specifically investigated the influence of control efforts on revenue generation. Furthermore, it is apparent that the majority of the studies that were evaluated mostly concentrated on state-run enterprises, educational institutions, and organizations, rather than examining the specific setting of local governments. Furthermore, the majority of the inquiries utilized cross-sectional surveys and descriptive research styles. However, much of the existing literature emphasizes overall corporate profitability rather than specifically addressing revenue generation. This study, therefore, focuses on examining the effect of internal control measures on revenue collection within the counties of the Lake Region Bloc in Kenya.

Hillman and Dalziel (2003) define monitoring as the process of evaluating the effectiveness of internal control systems over time. Since internal oversight encompasses critical processes, it must be adequately regulated to assess both system effectiveness and performance quality in the long run. Njagi and Mwangi (2019) investigated the role of internal control procedures particularly monitoring on revenue collection in Kiambu County hospitals and found a significant positive relationship through multiple regression analysis. Similarly, Sigilai and Njiru (2016) examined the effect of monitoring on revenue collection in Nakuru hospitals, revealing that the absence of such internal control measures leads to revenue leakage, embezzlement, and collusion in fraudulent practices. While these studies provide valuable insights, they did not propose actionable recommendations for future research or practical implementation by the institutions under review..

Although Karagiorgos et al. (2011) did not specifically analyze audit elements in relation to revenue collection, their review of literature on internal controls established that monitoring—particularly when combined with audits—significantly enhances revenue performance. Building on this foundation, the present study seeks to further explore monitoring components and their practical application in strengthening revenue collection. Similarly, Sigilai and Njiru (2016)

examined the influence of internal controls on revenue collection at Nakuru Level Five Hospital and found that effective monitoring ensures the smooth functioning of the internal control framework. Monitoring can be achieved through consistent oversight and management of organizational operations, including tracking customer complaints and feedback as well as conducting regular internal audits.

In addition, the study conducted by (Kalunda Muema et al., 2014) on the use of the Mobile Parking Management System in Nairobi County found that monitoring is carried out using continuous assessments and separate assessments. These reviews determine whether other elements of internal control are still operating as designed and aim to enhance firms' income generation. The assessment enables the detection of internal control flaws and effectively informs the appropriate people responsible for implementing corrective measures. The Republic of Kenya (RoK), in 2013, emphasized the importance of a monitoring procedure that can adapt to evolving threats and make necessary revisions to control designs. This is crucial for guaranteeing that operations are both effective and efficient. Continuous surveillance involves evaluating risks associated with accomplishing organizational goals. The aforementioned studies acknowledge the significant impact of monitoring on improving revenue generation in companies. Nonetheless, the focus of these studies primarily lies on healthcare organizations and other companies within the counties of the Lake region bloc. Additionally, none of them were based on the Technology fit hypothesis, which the present research aims to employ.

Monitoring is defined as the process of assessing the effectiveness of an internal control system over time (Hillman & Dalziel, 2003). Njagi and Mwangi (2019) and Sigilai (2017) examined the effect of internal control measures particularly monitoring on revenue collection using multiple regression analysis and found a strong positive correlation. Similarly, Sigilai and Njiru (2016) and Karagiorgos et al. (2011) reviewed the literature on internal controls and concluded that monitoring, including audits, enhances revenue collection. In the same vein, Kalunda Muema et al. (2014) and the Republic of Kenya (RoK, 2013) also reported that monitoring revenue is positively and strongly associated with improved revenue collection.

Existing studies show the broad association between the collection of revenue and monitoring, as a significant number of them affirm that internal controls play an integral part in terms of improving revenue collections in various organizations. However, there is limited literature on monitoring and how it affects revenue. The majority of reviewed literature were organizations and hospitals, which have distinct organizational cultures compared to the context of county governments as a whole. However, this study focused on revenue collection as a performance indicator, Further, the cause and effect on the result among the variables from the previously reviewed studies is not clear, which this study seeks to establish. In addition, the reviewed studies show inconsistencies in data collection tools, research designs, and data analysis methods.

Furthermore, several of the reviewed studies focused on the direct influence of Financial Information Systems (FIS) on revenue collection, without considering their potential moderating role. To address this gap, the present study examines the effect of monitoring on revenue collection in counties within the Lake Region Economic Bloc in Kenya.

The Information System (IS) department has growing demands and duties, requiring it to meet several expectations in a dynamic and evolving environment, as outlined by (Doll et al., 2004). The authors moreover asserted that, as a result, enhancing services, not just resources, was of utmost importance. To improve performance, the IS organisation should consider making its system delivery, maintenance, and integration more efficient and effective. Additionally, improved management and control of other Information System activities could also be pursued. In their study, (Stephen and Plowman, 2014) looked at how information systems affect revenue collection. They discovered that IS improves the ability to anticipate and fix any major aberrations, ultimately resulting in increased revenue generation. They additionally contended that the efficacy of the control mechanism relies on its ability to effectively aid the attainment of organisational goals.

According to (Ciborra and Navarra, 2005), the implementation of ICT and electronic government in the government and bureaucratic systems led to innovations and improvements. These reforms were deemed vital for aid and global development policies, as they facilitated economic growth through enhanced revenue generation (UNDP, 2014). Maina et al. (2016) investigated the impact of information systems on financial management in Nyamira County, Kenya, employing an explanatory survey design and incorporating secondary data from the county government's website. Their study revealed that information systems significantly influence the financial health of county governments. They further concluded that effective information systems safeguard resources and ensure their proper allocation to designated projects.

The research conducted by (Njiru and Bunyasi, 2016) to evaluate how information systems influence the financial state of the Tana Water Services Board. The inquiry included a total of 22 participants from four different groups: finance managers, audit board members, top-level accounting officers, and auditors who were employed by the company in 2014. The investigators employed a purposive selection strategy to choose the research sample. The scholars also utilised a descriptive survey and administered questionnaires to gather data. Through their investigation, they determined that reconciliation of transactions, inventory audits, duty segregation, and management of costs significantly influence company profitability. The study found a significant correlation between the profitability of water corporations and the implementation of an IS. Water firms were advised to implement efficient methods, including internal IS controls, to improve organizational performance.

Njiru and Bunyasi, (2016) examined the influence of IS on the amount of income collected at Level Five Nakuru Hospital. Njiru and Bunyasi used questionnaires to gather data from 40 individuals and later utilized descriptive statistics for analysis. The investigation determined that the employment of IS does not have a major impact on the amount of revenue generated by Nakuru Level Five Hospital. The ministry/hospital administration was advised to establish practical and attainable goals for revenue collection to improve income generation.

A study conducted by (Ndungu, 2013) at UNES Limited examined the correlation between IS and revenue collection. The research focused on the staff of UNES. The investigation confirmed that UNES has implemented processes and regulations to govern the organization's actions, thereby improving communication, monitoring, and oversight efficiency and effectiveness. The study determined that the IS has a significant impact on the efficacy and quality of a company's operation. The study proposal suggested that UNES should consistently monitor feedback from customers and conduct regular internal audits.

Gitaru (2017a) examined the impact of the Kenya Revenue Authority's (KRA) automation system on revenue collection. The study utilized secondary data from KRA Customs records covering the period July 2007 to June 2016, focusing on the Simba System. Findings revealed a substantial increase in transaction volumes following the system's implementation, as a larger share of imported goods was categorized and processed through automation. The study further showed that revenue collection improved significantly over time after the system was adopted.

Research on the impact of IS on revenue management was done by (Stephen and Plowman, 2014) and (Doll et al., 2004). Their outcomes show that IS contributes to the generation of income. (Ciborra and Navarra, 2005) and (Maina et al., 2016) conducted studies on the impact of information systems on financial status. The researchers also utilized secondary data and determined that IS had a great influence on the fiscal health of the county administration. This aligns with the findings of (Njiru and Bunyasi, 2016). A descriptive survey research approach was used to determine the impact of cash reconciliation, separation of duties, inventory checks, cost management, and information systems on company performance. In a study conducted by (Sigilai and Njiru, 2016), descriptive statistics was used in the analysis, revealing a considerable impact of IS on the amount of revenue collection. In addition, the study conducted by (Ndungu, 2013) determined that information systems significantly impacted a firm's performance. Additionally, (Gitaru, 2017b) conducted data analysis using Gretl and witnessed an increase in transaction volume after the implementation of the method.

Previous studies reveal broad relationships between financial information systems (FIS) and revenue collection in diverse dimensions and proportions as most of them reveal that FIS has a strong association and positively affects revenue collection, however, the reviewed studies show

inconsistencies in data collection tools, research designs, and data analysis methods.In addition, information impact of FIS on the collection of revenue in the context of Lake Region Economic Bloc Counties is still limited as most of the reviewed studies focused on the impact of financial information on the financial status of business organisations. Therefore, the present inquiry aimed to explore the effect of FIS on Revenue Collection in Counties within the Lake Region Economic Bloc in Kenya

Revenue derived from taxes, duties on goods, customs, and license fees, facilitates the efficient implementation of government activities (Fisman and Gatti, 2002). While taxation is a significant source of revenue for governments globally, it is argued that advanced nations have more sophisticated and effective tax policies that improve the collection of revenue. This is in contrast with less developed economies, which usually have ineffective tax systems that hinder their efforts to collect taxes (Kayaga, 2007). According to him, the higher budget deficits of nations located south of the Sahara Desert indicate a lack of major progress in increasing domestic revenue through various reforms, which has had a negative impact on GDP. In order to achieve effective tax collection and revenue identification, the implementation of technological innovation based on Information Technology (IT) has become crucial. This is because IT platforms can adapt and respond to developments in the current fiscal systems, making them a key driver for success (Sigilai, 2017). The introduction of innovative tools, including automation systems, has a significant impact on the process of tax and collection of revenue, enabling firms to operate more effectively.

The implementation of automated revenue collection methods and structures is crucial for enhancing and streamlining the management of taxation by using contemporary tools such as ICT. According to (Sohne, 2008)Automated systems have demonstrated the ability to significantly improve corporate processes, leading to more income. He asserts that utilizing technical solutions to achieve government objectives is a crucial step in turning the public sector into an organization that can effectively meet the demands, necessities, and expectations of the contemporary world. The main objective of computerized collection of revenue is to enhance cash revenues, ensuring the utility's sustainability, and achieving a satisfactory return on the investments associated with the system. The occurrence of leakages resulting from premature collection, fraudulent activity, and under-collection can be mitigated by optimizing and streamlining the revenue collection process. According to (Kamolo, 2014)Automation can be used to generate daily reports of cash receipts and automatically generate a list of payments that are required to be collected. In addition, system automation, as stated by BahwanCyberTek (2013), enables companies to computerize new platforms for their revenue-collecting systems, thereby maximizing their advantages.

The research conducted by (Gidisu, 2012) examined the automated technique of the Ghana Revenue Authority and assessed the efficacy of revenue management, specifically focusing on customs. Research confirms that the adoption of automation systems positively influences tax management costs and enhances the efficiency of revenue administration. In line with this, Mitullah et al. (2005) surveyed 175 Kenyan local authorities to evaluate the effectiveness of information systems (IS). They found that local authorities face numerous challenges in delivering services and infrastructure, largely due to weak management structures. Their study concluded that IS particularly the Integrated Financial Management Information System (IFMIS) plays a critical role in strengthening resource management at the local government level. Similarly, Kibbe et al. (2011) demonstrated that implementing IFMIS improves fiscal oversight processes, thereby enhancing local governments' capacity to generate higher revenues.

Reviewed past studies show; (Fisman and Gatti, 2002), (Kayaga, 2007) and (Sigilai, 2017) investigated the influence of financial information on business performance and found that new instruments such as automation and IFMIS that increase efficiency affect tax collection. (Goodhew et al., 1996) on their study of the impact of automated systems on the amount of revenue collected found that computerization enables companies to adopt automated revenue management systems to maximize their advantages. (Mitullah, 2015) investigated the effectiveness of IS and found out that IFMIS can help the local governments to collect more money through taxes by improving their fiscal oversight processes.

The above kinds of literature show a correlation between Internal Controls System, FIS, and Collection of Revenue as most of them affirm that internal controls and FIS play an important part in terms of improving revenue collections in various organization's however, most of the reviewed studies focused on organizations, local authorities and states and not in the context of county governments. Furthermore, most of the reviewed studies did not provide limitations of the studies and the cost-benefit analysis outcome of considering FIS, which this study seeks to achieve. Subsequently, no known study has investigated the controlling effect of financial information on the relation between revenue management and internal controls. Therefore, this inquiry aimed to determine the moderating effect of the FIS on the association relationship between Internal Controls and Revenue collection in the Lake Region Bloc Counties in Kenya

1.1.1 Regional Economic Blocs (REBs) in Kenya

Regional economic blocs (REBs) are coalitions of countries within certain areas that have united to oversee and advance trade endeavours in the area. The regional financial agreements were influenced by the Council of Governments (COG), which is a non-radical organization established by Section 19 of the Intergovernmental Relations Act (IGRA 2012). REBs facilitate the interchange and development of goods and services among people, as they are more effectively managed compared to non-individual entities. They provide resources to address

common challenges that affect them. The formation of Economic Blocs in Kenya has been determined by the regional leaders who rely on local economic activities and pooled resources to promote growth. The Constitution does not provide specific guidelines for REBs, and existing legislation, such as the County Governments Act, the Inter-Governmental Relations Act, and the Public Finance Management Act, indicates the absence of legislation or policy framework to govern these coalitions. However, reports indicate that governors are making efforts to establish legal foundations for regional alliances through regional assemblies.

There are six REBs in Kenya, formed by County Governments. The coalitions are formed based on goals, for example, marketing, agricultural produce, tourism destinations, as well as trade and investment that span across the regions. The blocs include the Lake Region Economic Bloc (LREB), consisting of 14 counties, the North Rift Economic Bloc (NREB) is composed of 7 counties, the Frontier Counties Development Council (FCDC) is formed by 7 counties, Jumuiaya Kaunti za Pwani comprises 6 counties, the Central Economic Bloc (CEB) involves 10 counties, and the South Eastern Kenya Economic Bloc (SEKEB) is made up of 3 separate regions. The County Governments in Kenya, which established the REBs, received an allocation of about Kshs 302 billion in the fiscal year 2015/16 and Kshs 334.7 billion for 2016/2017. These funds were intended for recurring and development expenses, with a requirement that at least 30% of the spending be allocated to development initiatives, as mandated by the CRA and County Government Act of 2015. LREB, which encompasses the Lake Victoria Region, was granted roughly Kshs 92.6 billion for the fiscal year 2016/2017. The majority of the money, around Kshs 37 million, was allocated to the development expenditure, and the remaining portion was designated for regular expenses (KNBS, 2017).

The current inquiry will specifically examine LREB due to its established governance and financial systems. The bloc has established a local bank with the primary goal of bringing together resources from its member countries to finance important developments in the area, in line with the vision of achieving the goals set for the year 2030. Achieving those goals requires members to enhance their tax-collecting efforts. However, this is presently not happening, which is why the study is necessary. In 2018, the proportion of taxes to GDP by counties in Kenya was 4%, and this stayed the same in 2019 and 2020. However, it decreased to 3% in 2021 and 2022, which is lower than the overall ratio of taxes to GDP ratio for the nation, which is 15.2 percent.

1.1.2 Revenue Collection in the Lake Region Economic Counties

The Lake Region economic bloc blueprint document highlights that the majority of counties lack a computerized revenue collection instrument and instead rely on outdated council systems for revenue collection. This implies that the sources of lost revenue are difficult to identify or eradicate. Implementing a revenue-collecting system will enhance the ability of counties to generate additional revenue. The system must be integrated with the National Government FMIS

system to facilitate the accounting of tax collection and the distribution of county money. Several county governments have already implemented automated programs for collecting revenue, which have proven to be beneficial. The Blueprint suggests implementing a digital system in the region, enabling taxpayers to make direct payments to their local governments via mobile apps such as M-Pesa.

Available evidence reveals that the County governments within the Lake Regional Economic Bloc could not meet their annual revenue target from 2017 to 2022, the available data reveal that the percentage of the actual revenue collected to the targeted revenue for the counties within the Lake Region Economic Blocfrom 2017 to 2022 were as follows FY 2017/2018 65%, 2018/2019 67% 2019/2020 71% 2020/2021 71% and 2021/2022 72% which are below the specific county's set targets 100 % leaving the counties to resort to expensive loans for financing deficits caused by unrealized revenue targets of an average of 30.8%. The average tax-to-GDP contribution ratio by LREB counties in Kenya remained constant in 2018 at 3% 2019 3% and 2020 3% but reduced to 2% in 2021 and 2% in 2022 2022 compared to all counties in the remain 5 regional blocks in Kenya which is 2018 at 4% 2019 and 2020 4% but reduced to 3% in 2021 and 3% in 2022 which is below the Kenya tax -to -GDP which is 15.2%. This means that all the counties in Kenya, more specifically in the LREB, have not been able to maximize revenue collection, more so from the potential sources, according to the published CRA report in 2023.

1.2 Statement of the Problem

Revenue collection by the county governments is crucial in enabling them tooffer social services and fund their expenses using internally produced revenues. Available evidence reveals that County governments within the Lake Region Economic Bloc have been unable to collect sufficient revenue as the average tax-to-GDP contribution ratio by counties in Kenya remained constant in 2018 at 4% 2019 and 2020 4% but reduced to 3% in 2021 and 3% in 2022 which is below the Kenya tax -to -GDP which is 15.2% leaving the counties to resort to expensive loans to fund the deficits caused by unrealised revenue of an average of 30.8%. Additionally, available literature on financial information systems and revenue collection generally examines the private sector enterprise setting with limited orientation on public entities. Previous studies reveal broad relationships between financial information systems and revenue collection in diverse dimensions and proportions, as most of them show that financial information system has a strong association and positively affect revenue collection, however, the reviewed studies disclose inconsistencies in data collection tools, research designs, and data analysis methods. Further, no known studies have investigated the controlling impact on the association between Revenue Collection and Internal Control Structure. Subsequently, some of the investigations on control activities and their effect on revenue collection do not reveal their effect on revenue management in the context of county governments. Similarly, studies on the effect of monitoring on Revenue Collection show broad relationships, as most of them affirm that monitoring and risk assessment play an integral

part in terms of improving revenue collection in various organizations. Despite extensive automation through IFMIS and e-revenue systems, counties continue to experience leakages, weak compliance, and under-performance. Prior research presents inconsistent results on the influence of internal controls on revenue, suggesting the possible effect of a moderating factor such as FIS. However, the role of FIS in enhancing the internal control–revenue nexus remains empirically unclear within the LREB counties.There is limited information and policies in the context of the Lake Region Economic Bloc, as most of the reviewed studies focus only on organizations rather than entire County governments' revenue operations. This therefore requires the investigation of the moderation effect of the Financial Information System on the relationship of Internal Control and Revenue Collection in the Lake Region Economic Bloc Counties in Kenya.

1.3 Research Objectives

The main objective of this study was to establish the effect of the Financial Information System on the relationship between Control Activities, Risk Assessment and Revenue Collection in the Lake Region Economic Bloc (LREB) Counties in Kenya

1.3.1 Specific Objectives

i. To analyze the impact of control activities on the collection of revenue in the LREB Counties in Kenya
ii. To determine the impact of Risk Assessment on Revenue Collection in the LREB Counties in Kenya
iii. To establish the moderating effect of the Financial Information System on the link between Control Activities and Revenue Collection in the LREB Counties in Kenya
iv. To establish the moderating effect of the Financial Information System on the link between Risk Assessment and Revenue Collection in the LREB Counties in Kenya

1.4 Research hypothesis

i. H_{01}: There is no effect of control activities on Revenue Collection in the Lake Victoria Regional Bloc Counties in Kenya
ii. H_{02}: There is no effect of Risk assessment on Revenue Collection in the Lake Victoria Regional Bloc Counties in Kenya
iii. H_{03}: There is no moderating effect of Financial Information Systems on the relationship between Control Activities and Revenue Collection in the Lake Victoria Regional Bloc Counties in Kenya
iv. H_{04}: There is no moderating effect of Financial Information Systems on the relationship between Risk Assessment and Revenue Collection in the Lake Victoria Regional Bloc Counties in Kenya

1.5 Scope of the Study

The current research was analysed in terms of its subject matter, geographical coverage, and temporal breadth. The study focused on the wide topic of accounting and financial management, as well as the related fields that pertain to financial performance. Establishing efficient public financial management (PFM) systems in all levels of government is crucial in achieving overall fiscal control, strategic allocation of resources, and effective utilization of resources for service delivery. The 2010 Constitution of Kenya outlines the underlying principles and structure for the allocation and supervision of public funds in Chapter 12. Further proper financial management by the counties assists in ascertaining the correct amount of revenue collected and sealing loopholes.

The second part of the scope in this inquiry is the geographical scope, which includes all member counties of LREB. LREB is made up of the following 14 counties: Bomet, Bungoma, Busia, Homabay, Kakamega, Kericho, Kisii, Kisumu, Migori, Nandi, Nyamira, Siaya, Transnzoia, and Vihiga. Similar to other Regional Economic Blocs REBs in the nation, LREB was founded with the understanding that, even while the decentralized form of government appears to alleviate persistent political issues with democratic governance, the local governments might be too small to take advantage of economies of scale. The 2010 Kenyan Constitution established a decentralized form of government that puts the people closer to the institutions and procedures that make decisions and opens up new possibilities for local development and growth. This entails a greater level of public involvement in the formulation and execution of county-specific development strategies. The blocs are based on the knowledge that strategically linking countries with similar priorities can be a useful way to maximize or generate noteworthy development prospects and effects across many countries.

Utilizing economies of scale and pooled resources to boost the region's economy and raise people's standard of living is the Bloc's overarching goal. This entails creating policies and initiatives targeted at expanding and improving, for their common advantage, collaboration between the members in the domains of economics, industry, society, technology, and research. The values and principles outlined in Kenya's constitution and laws, including trust, equality, political will, equal allocation of the costs and rewards of working together for mutual benefit, peaceful coexistence and good neighbourliness, peaceful dispute resolution, and compliance with the principles of devolved government laid out in Article 175 of the Kenyan Constitution, help the bloc achieve its goal.

In terms of time scope, the study revolves from 2015 to 2024. This period is important because of the period when theCOVID-19 pandemic when several counties faced a lot of challenges regarding revenue collection enabling observation of both policy and economic shocks. This is also the period where the government and many organizations started embracing financial systems and therefore covering this period will help county governments predict and know what

to expect during the pandemic periods. The period was chosen because it covers pre-COVID, during-COVID, and post-COVID-19effects, and therefore data during this period was vital in giving real figures during certainties and uncertainties which is important for decision-making. In addition, several organisations including county government started embracing the use of technology hence justifying the use of financial information systems as a moderator.

1.6 Justification of the Study

The current study was important because previous studies failed to address the impact of financial information systems on the relationship between Revenue Collection and Internal Controls in the Lake Regional Bloc Counties in Kenya. There are no documented studies on the effect of Financial Information Systems on the relationship between Internal Controls and Revenue Collection in the Lake Region Bloc Counties in Kenya.

Lake region economic block is unique compared to other regions because of its potentiality in terms of natural resources such as freshwater lakes, tourist attraction sites, strategic position in East Africa, and good governance. In addition, LREB is the most active bloc compared to other blocs in terms of the number of conferences held since the creation and publication of the reports. So far, 11 conferences have been held according to the Council of Governors' published reports.

The results and recommendations from this study will enhance the system control mechanism, which may contribute more revenue to the region, hence facilitating financing of development and recurrent activities from own source revenue.

Knowledge acquired from the present study can be valuable to county government officials and stakeholders within the Lake Region Economic Bloc in making decisions that may improve the collection of revenue. Own source revenues are used by the devolved units to run operational and development costs, which eventually leads to economic growth in the counties. Therefore, the results and recommendations from this may be resourceful for the county government officials in making candid and economic decisions.

This study also contributes to the academia by adding insight into the Contingency theory, Agency theory and Institutional Task-Technology Fit theory in two ways: first, by exploring the impact of control activities on Revenue Collection in the Lake Regional Bloc Counties in Kenya, and second, by providing new first-hand evidence on the impact of financial information system on the link between Internal Control structures and Revenue Collection outcomes in the Lake Victoria Regional Bloc Counties in Kenya. The study builds on the previous studies and benefits researchers interested in investigating related topics.

Policymakers may also benefit from this study in terms of coming up with policies that may contribute to the area of financial management, accounting procedures, and developing internal

control mechanisms to enhance better performance of both county and national governments. Computerized accounting systems are also taking shape in most organisations and governments, and therefore policy makers may use the results and recommendations be drawn from this study to develop policies around computerized accounting systems.

The LREB counties contribute substantially to Kenya's GDP yet record persistent shortfalls in local revenue mobilisation. The study's findings will help policymakers refine automation strategies and strengthen control frameworks.

1.7 Conceptual framework on the Effect of Financial Information Systems on the Relationship between Controls Activities, Risk Assessment and Revenue Collection

The conceptual framework centers on Revenue Collection, using the Tax-to-GDP ratio as a pivotal performance indicator. It comprises three core components: Internal Controls (independent variables), Risk Assessment (independent variable), and Financial Information System (moderator variables), with Revenue Collection Automation (%) serving as the dependent variable. The Internal Controls component focuses on operational and monitoring mechanisms, including the annual number of internal/external audits, evaluations, reports, system users, and system audits all aimed at ensuring transparency and accountability. The Risk Assessment component measures systemic vulnerabilities through an annual Risk Index, where a lower score reflects effective risk mitigation. The Finance

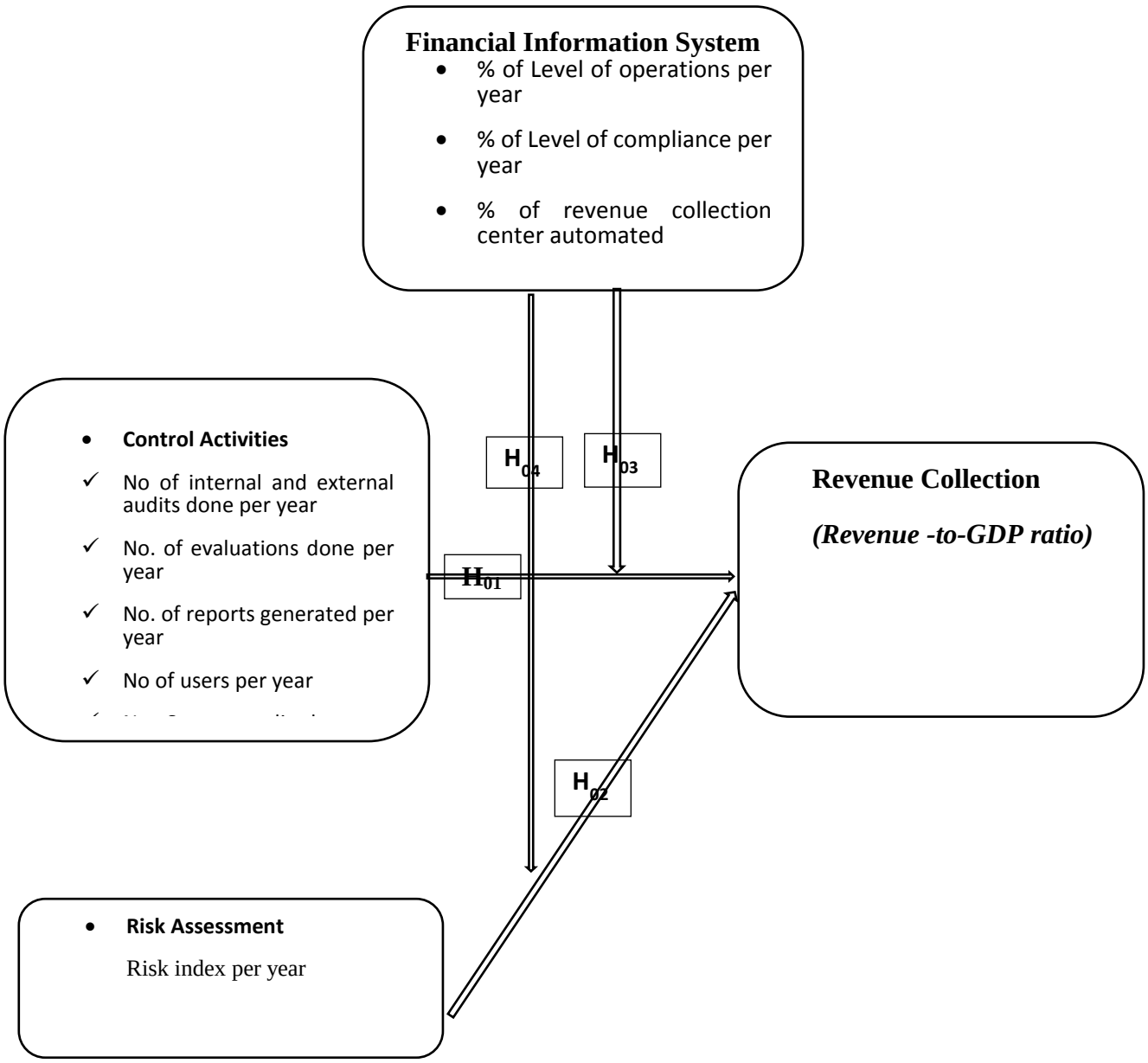


Figure 1.1: Conceptual Framework
Source Adapted from (Mitullah et al., 2005)

The conceptual framework presented in figure 1 centers on Revenue Collection, with the revenue-to-GDP ratio serving as a key performance indicator. Grounded in foundational organizational and management theories Contingency Theory, Agency Theory, and Task-Technology Fit Theory the framework examines the interplay between governance structures, technological systems, and operational efficiency in revenue administration.

Contingency Theory explains the adaptive nature of the framework, suggesting that internal controls and risk assessment mechanisms must align with the dynamic external environment,

such as regulatory changes or economic fluctuations. For instance, the number of audits, evaluations, and system audits (under Control Activities) may vary depending on contextual demands, ensuring flexibility in governance. Agency Theory underpins the need for robust monitoring mechanisms such as internal/external audits and compliance reports to mitigate information asymmetry and align the interests of revenue administrators (agents) with policymakers (principals).

Meanwhile, Task-Technology Fit (TTF) theory provides a strong justification for the selection and measurement of Financial Information System (FIS) metrics, such as automation levels, operational efficiency, and compliance rates. According to TTF, technology contributes to performance improvements only when its capabilities align closely with the tasks it is intended to support. In the context of revenue collection, this means that features like automated transaction processing, real-time reporting, integration with internal control mechanisms, and audit trail functionalities must be tailored to the specific requirements of revenue management, monitoring, and compliance enforcement. For example, high automation levels enhance the efficiency of routine revenue processing tasks, reduce errors, and free staff to focus on analytical and oversight responsibilities. Similarly, operational efficiency metrics capture how well the system supports timely processing, reconciliation, and reporting, while compliance rate indicators reflect the system's effectiveness in enforcing regulatory and procedural standards. By measuring these dimensions, the study ensures that the FIS evaluation is grounded in the TTF principle: technological solutions improve revenue collection performance only when they fit the specific operational, monitoring, and control tasks they are designed to facilitate. This alignment underscores why counties with well-integrated FIS achieve superior revenue outcomes compared to those where technology is poorly matched to task requirements.

Together, these theories support a framework where Internal Controls (e.g., audits, user activity tracking) and Risk Assessment (e.g., annual risk indices) ensure accountability and adaptability, while the Financial Information System metrics evaluate how well technology enables core functions. By integrating these dimensions, the framework not only measures efficiency but also addresses governance challenges, technological adequacy, and environmental contingencies in revenue collection systems.

CHAPTER TWO
LITERATURE REVIEW

2.1 Introduction

This chapter reviews theoretical and empirical literature relevant to the effect of Financial Information Systems (FIS) on the relationship between control activities, risk assessment and revenue collection in the Lake Region Economic Bloc (LREB) counties of Kenya. It begins with the theoretical review, followed by conceptual and empirical literature, and ends with a summary highlighting the research gaps.

2.2 Theoretical Review

The theoretical framework is a pre-established system of theories that has been tested and serves as a blueprint for a study. The issue under inquiry comprises concepts, theories, results from studies, and generalizations(Serkin, 2011). The research will be based on the following conceptual frameworks: Institutional theory, Control theory, and Task-Technology Fit Theory.

2.2.1 Task-Technology Fit (TTF) theory

Task-Technology Fit (TTF) theory, developed by Goodhue and Thompson (1995), posits that the performance benefits of a technology depend on how well its capabilities align with the tasks it is designed to support. The theory emphasizes that technology alone does not automatically improve performance; rather, optimal outcomes arise when there is a strong fit between the technology and the specific task requirements. TTF identifies three key dimensions: task characteristics, technology characteristics, and task-technology fit. Task characteristics refer to the nature of the work or responsibilities being performed, which, in the context of public finance, include revenue collection, financial reporting, risk assessment, and compliance monitoring. Technology characteristics pertain to the features and functionalities of the system, such as automation, real-time reporting, audit trails, integration with internal controls, and user accessibility. Task-technology fit captures the degree to which the technology supports, complements, or enhances task performance, thereby improving outcomes. TTF has been widely applied in accounting, information systems, and organizational management research to explain variations in productivity, efficiency, and effectiveness attributable to technology adoption.

In the context of this study, TTF provides a theoretical framework for understanding how Financial Information Systems (FIS) moderate the relationship between Internal Control Activities (ICA), risk assessment, and revenue collection in the counties of the Lake Region Economic Bloc (LREB). Internal control activities, including segregation of duties, reconciliation of accounts, audit trails, and monitoring of revenue streams, constitute critical governance tasks that ensure compliance, prevent fraud, and enhance revenue collection. According to TTF, the effectiveness of these tasks depends on the quality and suitability of the supporting technology; even well-designed control mechanisms may underperform without a system that accurately

captures, processes, and reports financial data. Financial Information Systems, with features such as automation, real-time monitoring, integration with risk management, and reporting capabilities, represent the technological support necessary for effective internal control. When FIS functionalities are closely aligned with internal control tasks—for example, automated reconciliation supporting segregation of duties—the system amplifies the impact of ICA on revenue outcomes.

The moderating role of FIS in this study is confirmed by the significant positive interaction between ICA and FIS in the moderation model, consistent with the TTF proposition that performance improvements occur when tasks are matched with suitable technology. FIS does not merely contribute value independently; it enhances the effectiveness of internal control tasks by providing timely information, enabling oversight, and supporting risk mitigation. Similarly, risk assessment tasks, which involve identifying, analyzing, and mitigating potential threats to revenue collection, are facilitated by FIS through data analytics, anomaly detection, and reporting dashboards. In line with TTF, the fit between risk assessment tasks and FIS functionality determines how risk management activities translate into improved revenue performance, highlighting the importance of aligning technology with both operational and strategic public finance tasks.

2.2.2 Contingency Theory

This theoretical framework was formulated by (Drazin and de Ven, 1985). The idea posits that the most effective organisational structure for a business is determined by the specific characteristics of the setting where the organisation works. Adherents of the theory maintain that it rests upon two underlying assumptions. The theory assumes that no single strategy is universally superior, nor is there one optimal way to structure an organization (Donaldson, 2006). Instead, it posits that the choice of strategy, structure, or control system depends on specific contingencies such as context, risk characteristics, organizational plans, size, structural design, and the nature of the activities being undertaken (Whittington, 2003).The contingency theory asserts that organisations cannot be built in isolation from their surrounding features and the impact these factors have on the business (Jokipii, 2006). To enhance and sustain performance, companies should consistently evaluate the potential risks associated with their connection with the external environment. This includes analysing the many processes involved and the company's dedication to addressing such unforeseen circumstances. This implies that internal controls, when considered as a component of organisational layout, is not fixed or unchanging. (Erikssont et al., 2011) argue that their theory challenges the notion that the sole optimal method to structure a corporation is by prioritising the goals of shareholders, as proposed by the agency theory.

Contingency Theory asserts that no single system of control or organizational structure is universally applicable; rather, the most effective framework depends on both internal and external factors (Donaldson, 2001). Within the context of revenue collection, this implies that internal controls should be tailored to county-specific risks, institutional capacity, and available infrastructure. Recent studies (e.g., Chenhall, 2007; Otley, 2016) further highlight the importance of aligning technological capabilities with the design of internal control mechanisms to enhance effectiveness. Counties with limited human capital may benefit more from automated controls than labor-intensive systems.According to (Donaldson, 2006), firms can improve their performance by increasing the adoption of internal control measures and reviewing them more frequently, which reduces the discrepancy between the desired controls and the actual controls. This theory provides comprehensive insights into the internal controls that is pertinent to the investigation. The primary purpose of this investigation is to examine two specific elements of the internal control structure: control activities and monitoring. These aspects play a crucial role in ensuring effective revenue collection. The concept supports this purpose by offering a theoretical framework on managerial structures and their ability to improve business productivity.

2.2.3 Agency Theory

Agency theory is about the relationship between two or more individuals that is based on a contract. The concept of an agency relationship, as defined by (Jensen and Meckling, 1976) refers to a contractual arrangement in which individual(s) (known as principals) hire another individual (referred to as the agent) to carry out certain tasks on their part. This arrangement involves granting the agent certain authority to make decisions. Jensen and Meckling define managers as agents hired to maximize returns for investors, who assume the position of principals. Jensen and Meckling believe that since agents lack ownership of a company's assets, they may engage in risky behaviours, such as neglecting their responsibilities to pursue leisure or concealing inefficiencies to avoid losing awards, to increase their income at the expense of their principals. To mitigate the possibility of such conflicts of interest, (Jensen, 1983) identifies two crucial measures. 1- The monitoring of the risk-bearing structure between the two parties is essential by considering the relationship between the organization and contracted individuals. The initial phase, formal agency literature, analyses the allocation of risk between the parties involved to determine the corresponding benefits for both sides. The principal is required to delegate specific privileges to the agent, who is then obligated to agree to fulfill the responsibilities associated with those powers. The second stage, as identified by (Jensen, 1983)Elucidates the positive agency theory, which explains how firms employ legal monitoring and cooperation to influence the structure established in the initial phase and generate possible resolutions to agency difficulties. Agency costs refer to the unavoidable decrease in the value of a company due to issues related to agency issues, as well as the expenses associated with overseeing and ensuring compliance with contracts (Jensen and Meckling, 1976).

The principal-agent dilemma is also a fundamental aspect of the unfinished agreements perspective of the company, articulated by (Coase, 1937;Jensen and Meckling, 1976;Jensen, 1983;Williamson, 1975;Aghion and Bolton, 1992; Hart, 1995). The scholars base their argument on the belief that the principal-agent dilemma would not come up if it were feasible to write comprehensive contracts. In this instance, the shareholders and the management people would simply create a contract specifying ex-ante what they do with the money. Simply put, investors could utilize a contract to achieve a complete alignment of the goals and desires of managers with their own objectives. Nevertheless, full contracts are impossible because it is difficult to anticipate or express all future situations. Incomplete contracts mean that managers and shareholders will have to assign latent power in some form, wherein latent control powers are the authority to make choices in unanticipated events or in conditions not addressed in the contract.

Agency theory has several flaws, as pointed out by (Eisenhardt, 1989). The theoretical framework operates under the assumption of comprehensive contracts, which encompass all potential scenarios, including inconsistencies in language, inadvertent actions, unanticipated events, and disagreements. Due to limited reasoning, it is not possible to create contracts that are both comprehensive and effective. Information inconsistencies, the cost of transactions, and fraud pose significant challenges to achieving effective contracting. Agency theory posits that the implementation of contracts can effectively mitigate the costs associated with agency problems. The numerous flaws in marketplaces suggest that this premise is invalid. The impacts of third parties are not acknowledged. Third parties refer to individuals or entities who are impacted by the deal, but are not directly involved in the contract itself. Several boards are aware of the impacts on external parties and take on both social and financial duties. While the theory may potentially lead to maximum profitability, it does not necessarily result in the greatest social benefit. Investors are presumed to have a sole focus on the company's financial results. The executives and directors are expected to fulfil their obligation to the investors. Corporations are legally obligated to perform this task. Boards fulfil several functions. While agency theory is applicable in explaining the monitoring function of boards about management, it fails to explain the other responsibilities and duties that boards have. The theoretical framework does not provide useful information regarding the finances, services, and strategic roles of directors. A significant portion of studies on corporate governance is framed in terms of mechanisms that discourage managers from pursuing their self-interest. The concept regards administrators as opportunistic individuals who are driven exclusively by personal gain. Some may contend that this idea fails to encompass individuals who display loyalty towards their organizations. Agency theory fails to consider competence. Therefore, even if executives who lack skills or abilities are transparent (or are compelled to be truthful by board oversight), they continue to encounter constraints in their capacity to achieve shareholder goals. To ensure successful completion of a work, it is

insufficient to just motivate individuals; they must also possess the necessary capability to effectively execute the obligation (Hillman and Dalziel, 2003).

Studies conducted by (Berle and Means, 1934), as well as Lorsch and MacIver in 1989, demonstrate the widespread occurrence of this division in companies worldwide. In theory, both parties in the contractual relationship are presumed to be driven exclusively by personal gain. Consequently, when the principal assigns the power to make decisions to the agents, the agents frequently use this ability to advance their welfare by selecting acts that might or might not be consistent with the greatest good of the principal (Barnea, 1986). According to (Barnea et al., 1985)In an agency arrangement, it is believed that both parties are rational financial individuals who can create impartial judgments about the effects of agency issues and the potential worth of their wealth. (Davis et al., 1997) expressed their criticism towards the theory due to its reliance on individualistic methods, oversimplification of complex issues, limited scope of the motivational model, defensive approach to governance, and incorrect ideological underpinning. Agency theory posits that people are rational actors who adhere to the economic model of human behaviour. Nevertheless, it is important to note that individual activities cannot be regarded as synonymous with organizational operations. Furthermore, the core principles of agency theory encompass the dispersion of information and the divergence in attitudes toward risks and objectives. This theory applies to the study as it explores the correlation between collectors, administrators, and the potential occurrence of the agency problem. The inquiry focuses on the outcome variable of revenue collection. For income to be created, there is a need for a contractual relationship between collectors and controllers. Agency theory offers insights into the establishment and maintenance of the connection between the principal (supervisors) and agent (revenue collectors), as well as the potential conflicts that may arise between the two parties. It also explores strategies for resolving these conflicts, which ultimately contribute to revenue production.

2.3 Conceptual Review

Internal control systems comprise control activities, risk assessment, information and communication, monitoring, and control environment (COSO, 2013). This study focuses on two major components control activities and risk assessment because they directly affect revenue mobilization. FIS moderates their effect by automating data processing and enforcing procedural compliance through IFMIS modules.

2.3.1 Internal Control Activities and Revenue Collection

Internal control, as defined by Statements of Standard Auditing Practices No. 6 (SAP 6), refers to "the plan of organization and all the methods and procedures adopted by the management of an entity to assist in achieving management objectives of ensuring as far as practicable, the orderly and efficient conduct of its business, including adherence to management policies, the

safeguarding of assets, prevention and detection of fraud and error, the accuracy and completeness of accounting records and the timely preparation of reliable financial information" (Gupta, 2001). The above information highlights the importance of well-structured systems for internal control. These structures ensure that the operations conducted by an organization are accurately recorded, the assets are protected against fraudulent activities, the financial statements reflect transactions at the correct values, all assets mentioned in accounting records exist and can be retrieved, and the company's transactions are reported following the relevant reporting framework (ACCA, 2010). Internal controls refer to the measures taken by the administration to ensure that a company achieves its goals in the areas of operational effectiveness and efficiency, accuracy of financial information, and adherence to relevant laws and regulations (Committee of Sponsoring Organization (COSO), 1992). According to (Verschoor, 1999)Internal controls play a dual role in enhancing managerial effectiveness and fulfilling the responsibilities of the board of directors.

Control activities refer to the set of policies, processes, and strategies that are implemented to make sure that the directives set by management are effectively executed (Aikins, 2011) and(Rezaee et al., 2018). Thoroughly documenting policies and procedures in these areas is important for understanding control activities and for providing sufficient data for auditors to assess the effectiveness of the control structure in financial management practices (Aikins, 2011). Control procedures guarantee that all essential measures are implemented to mitigate risks and accomplish organizational objectives. These measures include task segregation, timely depositing of cash receipts, regular bank reconciliations, and restricted access to check stock.

Karagiorgos et al. (2011) emphasize the importance of effective communication across organizational departments, noting that much of the contemporary literature on internal control systems highlights communication and information sharing as critical components. This emphasis arises from their central role in shaping organizational dynamics at all levels (Amudo & Inanga, 2009). Accordingly, it is vital to disseminate knowledge throughout the organization to enable employees to meet their objectives. Monitoring is also widely recognized as an essential practice for assessing the quality and effectiveness of internal controls over time. It ensures that the outcomes of audits and reviews are promptly addressed (Karagiorgos et al., 2011) and supports the efficient functioning of control systems (Amudo & Inanga, 2009). In this context, monitoring refers to evaluating whether employees are properly implementing the policies and procedures established by management.

2.3.2 Financial Information and Revenue Collection

An Information System (IS) is an infrastructure designed to facilitate the collection, storage, organization, and utilization of information by individuals. As stated by (Duffy and Assad, 1980)It is a comprehensive combination of people, a database, protocols, hardware, and software.

Its purpose is to gather, process, store, and transmit data for operational transaction processing and to provide information to aid in decision-making by managers. The primary objective of an IS is to facilitate users in extracting specific value from the stored information, irrespective of the nature of the information or the intended value (Norton, 2006). Local authorities, such as cities and municipalities, play a crucial role in serving the citizens. They serve as the catalysts for economic expansion and hubs for progress. They offer a range of services, including those that promote culture, education, management, research, commerce, and politics. In addition, they provide employment opportunities, excellent healthcare facilities, and contribute to the growth of the country's economy (UN-HABITAT, 2009). As an example, the City Council of Nairobi, which is the largest municipality in Kenya, generates over 50% of the country's GDP. Local Governments play a crucial role in the progress and advancement of a nation. Kenya has 175 Local Authorities, which are classified as City councils, Municipal councils, Town councils, or County councils. These authorities are all supervised by the Central Government through the Ministry of Local Government, which oversees and regulates their activities.

IFMIS is a tool that monitors and consolidates financial occurrences and summarizes financial information (Dener et al., 2011). It facilitates effective management disclosure, policy decision-making, fiduciary obligations, and the creation of transparent financial statements. IFMIS, in its fundamental state, is essentially an accounting system that is customized to function based on the requirements and specifications of the specific setting in which it is implemented (Rodin-Brown, 2008). IFMIS refers to the automation of the entire process of managing public funds. This includes budget development, budget execution, and accounting. It also involves an utterly unified platform for financial management across various government departments and agencies. (Diamond and Khemani, 2005). IFMIS, in the context of Government operations, refers to the digitization of public funds management procedures. This includes the preparation of budgets, implementation, accounting, and disclosure, all facilitated by IFMIS (Lianzuala and Khawlhring, 2008). In 1996, the Government of Kenya (GOK) conducted a thorough examination of the financial management information system and produced a plan to solve financial administration issues in the country, as recommended by the Accountant General. The identified concerns include inadequate record keeping, delayed financial reporting, insufficient accountability, absence of a proper audit track, the need for better oversight and openness, and the requirement for enhanced effectiveness. In 1997, IFMIS began conducting evaluations to identify issues related to finance and accounting within the Government of Kenya (GOK).

The evaluation was conducted in two stages spanning from 1997 to 2000. A thorough project structure was established and implemented in two stages to enhance the accounting and financial activities of the Government of Kenya (GOK) in 2015. The initial launch of IFMIS in Kenya took place in 2003, and its execution began in that year. However, the initial modules were inadequate and did not include all the procedures. This required the implementation of a re-engineering

project, resulting in the development of a strategic plan (2011-2013). The scheme was officially introduced by the Minister for Finance on February 28th, 2011 (Kenya, 2015). IFMIS, from a global standpoint, has posed intricate obstacles during its implementation. Nevertheless, it is progressively emerging as a crucial catalyst for changes in the public sector, encompassing developing as well as developed nations. IFMIS, since its implementation, has had a favourable impact on the management of finances in Kenya, however, it has achieved limited success in certain targeted sectors. The implementation has not yet been extended to all Government agencies, Parastatals, and Organizations. As (USAID, 2022) adds, the IFMIS performs several services such as auditing, bookkeeping, human resource management, disclosure, and asset management.

Devolution was implemented in Kenya in 2013, resulting in the establishment of County Governments by the 2010 constitution. Financial control is carried out using the IFMIS. Currently, County governments utilize IFMIS to plan, budget, audit, and report their spending activities (Miheso, 2013). The system is an integral component of an organization's management process (Amoako et al., 2013). Additionally, they assert that it is linked to the acquisition of funds and their effective allocation to accomplish the company's goals. Financial management services (FMS) refer to the operational activities in business that involve acquiring money required for successful operation and ensuring its efficient utilization (Brealey et al., 2008). According to Howard and Upton (1953), FMS is the integration of managerial concepts to the process of making financial decisions. Moreover, financial decision-making involves many financial management systems. IFMIS consolidates many financial management systems into a unified and comprehensive solution. The elements of IFMIS include business process evaluation, planning and budgeting, procurement and payment, revenue recording and reporting, and ICT (Kenya, 2015). The aspects mentioned are fundamental to the objectives of IFMIS, which aim to greatly enhance the effectiveness and fairness of Government operations while also providing many opportunities for increased engagement, transparency, and responsibility (World Bank, 2017).

Similarly, the purpose of IFMIS in any entity is to ensure that users can easily obtain trustworthy financial information, enhance financial oversight, enhance service provision, and promote openness and accountability, as stated by (Peterson et al., 1995). According to (Hendriks, 2012), a well-built IFMIS can provide certain capabilities that can assist in identifying and preventing excessive payments, fraudulent activity, and theft. Public finance is an economic discipline that focuses on the management of a government's income and spending (Smith, 2007). The National Treasury Ministry led the implementation of the changes in the administration of public finances. The ministry has a department named the IFMIS Department that is responsible for handling financial systems at all government levels (Mambo, 2015). The technology was designed by this specific department in 1998 and was tested on 10 ministries in 2003. Following a success with

the trial, the central government implemented the internal controls and began deploying them to counties in 2012, shortly after the new constitution was promulgated. However, the adoption was sluggish as just nineteen out of the total number of counties in Kenya were utilizing the technology by the year 2013 (Kwena, 2013). Presently, the majority of the devolved units are utilizing it to oversee and control county financial operations.

IFMIS provides a platform for more effective recording of government transactions. This enables rapid access to sound financial insights whenever necessary. In addition, it enhances the accountability and transparency of the official towards the general public, parliament, and other agencies. Furthermore, IFMIS plays a significant role in enhancing financial controls and providing an up-to-date and comprehensive view of revenues and expenditures regularly(Kasumba, 2009). The framework may oversee all aspects of the transaction process, including expenditure releases, taxation, purchases, payment requests, bank statements reconciliation, and accounting for expenses. This enables a comprehensive overview of expenditure implementation and, ultimately, provides data that enhances the efficiency and effectiveness of government financial management. The increased availability of detailed financial information drawing on both historical performance and current status greatly supports financial control while strengthening forecasting, planning, and budgeting processes (Kwena, 2013). Despite the system's benefits, its implementation has encountered ongoing obstacles. According to (Rodin-Brown, 2008)The implementation of IFMIS has faced various difficulties, including disorganized decision-making, a lack of support from senior management, technical ability issues, increased procurement misconduct, and complexity in the interface of the system. The majority of employees report that IFMIS is highly technical, costly, and complex to run. Additional difficulties linked to the system include modifications in the layout of the system's papers and inadequately synchronized training. Consequently, due to low acceptance, inadequate management of public resources persists in both the central and local administrations.

2.3.3 Internal Controls and Revenue Collection

Organizations face the challenge of having limited and restricted resources, especially in terms of financing. Hence, anybody participating in any capacity in managing them is inherently focused on efficiently utilizing the funds and assets at their disposal to carry out the business operations they are accountable for. This is achieved by a robust internal control that guarantees the achievement of the intended outcomes. The internal controls play a crucial role in distributing and utilizing funds. Therefore, managers must create, maintain, and oversee the execution of internal controls to effectively allocate and utilize resources.(Mohammed, 2014) highlighted the importance of controls, particularly in today's highly competitive environment where quality customer services, cash conservation, capital asset realization, personnel utilization, and cost reduction are highly valued

2.3.4 Risk Assessment and Revenue Collection

Risk assessment entails evaluating elements that may impede the achievement of organizational goals (Saarens and de Beelde, 2006). Organizations must do a risk assessment to systematically investigate all the pertinent risks that they are facing (Karagiorgos et al., 2011). The administration of most local governments is entrusted with the obligation of ensuring that only reasonable hazards are faced by the government in terms of income loss. County governments should expand their revenue stream to enhance the amount of revenue they collect and satisfy their budget forecasts (Bowrin, 2004). The management is responsible for designing internal control measures that will make the revenue collection process more effective and efficient.

In the period 1998 - 2004, Brazil focused on developing a proficient system for collecting money. Additionally, the country adopted a digitized data system to ensure that revenue collection information is current (Miller, 2005). The sustainable generation of revenue in Brazil is a result of the enhancement of internal control structures (Briciu, Dănescu, Dănescu, and Prozan, 2014). The Brazilian government was able to generate R$ 1.342 trillion in revenue for the fiscal year 2017/2018, representing a 0.59% gain compared to the preceding fiscal year (FRAB, 2018). For the first time in four years, revenue collection has grown at a rate higher than inflation. Therefore, the maintenance of an updated information and communication system, which is a component of an internal control framework, has a beneficial impact on the consistent collection of revenue in Brazil.

India's budget deficit estimates for the financial year 2018/2019 were 4.7 percent lower than originally expected. However, the Indian government is already falling behind on its tax collection objective in the current fiscal year (CEIC, 2019). The initial budget allocation was 17.3 trillion rupees, however, only 10.8 trillion rupees were collected in the first three quarters of the year (Beniwal, 2019). India has taken a proactive approach from the fiscal year 2016/17 to enhance its revenue collection procedures and promote conformity. This involves using enforcement measures to combat tax evasion and expand the number of taxpayers. However, in India, the rates of violations are elevated because the internal systems are not strong enough to identify the numerous vulnerabilities that have resulted in a decrease in revenue (Tandon and Rao, 2017). In 2017, Indonesia experienced a significant rise in income tax from gas and oil companies, with a growth rate of 20.3 percent, resulting in a total of 88.7 trillion. Additionally, there was an 18.4% rise in VAT, reaching a total of 67 trillion (IRCA, 2018). According to Yuniati and Ladewi (2017), the risk assessment initiatives undertaken by the Indonesian government resulted in improved tax collection. The enhanced tax collection was a direct consequence of heightened tax adherence following the conclusion of Indonesia's prosperous tax amnesty initiative. The sustainability of revenue collection in the financial year 2017/2018 is dependent on several factors, including the honesty and ethical principles of the staff responsible

for designing, managing, and monitoring the controls, as well as the dedication and expertise of the revenue collectors (Arsal, 2018).

World Bank (2015) initiated the inaugural issue of a series of publications called the Somalia Economic Update. Consequently, our study has shown that Somalia has made significant improvements in its fiscal situation since the end of the civil war. The Federal Government of Somalia generated $30 million in domestic revenue, which accounted for 0.9% of the country's gross domestic product in 2012. However, the government's domestic revenue rose to $84.3 million, covering 56 percent of the annual expenses. During the period from 2012 to 2014, tax revenue accounted for 70 percent of the total revenue. The government's primary source of money in 2012 - 2014 was the tax on exported goods from Mogadishu's port and airport, which accounted for 91 percent of the domestic revenue.

Despite a significant effort in the collection of revenue, Somalia continues to face challenging conditions, such as a lack of capability in collecting revenue and a lack of legal systems. These issues are linked to inadequate internal controls, resulting in the issue of insufficient revenue collection. This significantly threatens the delivery of social amenities to the public in Somalia. By November, the South African revenue agency had gathered a total of 699 billion in tax income, which accounted for 56.2% of the expected 1.265 trillion stated in the 2017/18 national budget. Out of the total amount of 482 billion, 282 billion had been gathered from people by November 2018, which is an increase compared to the 262 billion received during the same time in 2016/2017. By November, the amount of corporate income taxes received was 98.3 billion, which fell short of the objective of 219 billion. This is in comparison to the 95 billion generated during that same period the previous year. By November 2018, a sum of 186.5 billion had been accumulated in VAT, which falls short of the budgeted amount of 312 billion. This is in comparison to the 180.8 billion gathered in 2017, as reported by the SRA in 2018. The government of South Africa has comprehensively revamped the internal controls. This has resulted in the achievement of consistent revenue collection.

2.4 Empirical Review

This section encompasses a review of studies, concepts, theses, and publications by various scholars across multiple fields. It provides an in-depth synthesis of findings and recommendations while identifying gaps for future research. Specifically, this study will examine prior literature in relation to three key objectives: (i) the impact of control measures on revenue collection, (ii) the effect of monitoring revenue on revenue collection, and (iii) the moderating role of financial information systems in the relationship between internal control systems and revenue collection.

2.4.1 Effect of Control Activities on Revenue Collection

Control activities form the cornerstone of internal control systems and directly influence the efficiency and effectiveness of revenue collection. These activities encompass policies, procedures, and mechanisms put in place to ensure directives from management are executed properly. According to COSO (2013), control activities include approvals, authorizations, verifications, reconciliations, and reviews of operating performance. Amudo and Inanga (2009) emphasize that robust control mechanisms reduce the risk of errors, fraud, and loss, thus promoting accurate financial reporting and accountability.

In the context of public sector entities, particularly in decentralized systems like county governments, control activities become even more critical. Otley and Van der Stede (2004) argue that where governance structures are devolved, control activities must adapt to localized needs while maintaining overall alignment with national objectives. Studies in Nigeria by Okwoli (2004) and Abiola and Asiweh (2012) established that control activities like segregation of duties and budgetary controls significantly enhance public sector revenue performance.

In Kenya, studies by Wanjiru (2015) and Mwangi and Ngugi (2014) indicated that counties with formalized and institutionalized control activities collect higher own-source revenues compared to counties with weak oversight mechanisms. They cite internal audits, periodic reconciliations, and managerial reviews as critical success factors. However, Wanyama (2021) notes that inconsistencies in implementation, capacity gaps, and lack of automation dilute the effectiveness of control measures across many counties.

A study conducted by (Attah-Botchwey, 2018)The Accra Metropolitan Assembly in Ghana examined the role of internal controls in facilitating efficient revenue mobilization management. The findings revealed that different elements of the internal control structure, including information communication, risk evaluation, control operations, and monitoring, significantly impact the successful handling of revenue mobilization. He determines that every aspect of the control structure has a favorable and significant impact on revenue mobilization. Issues such as inadequate or incorrect evaluation of risks, misallocation of funds, insufficient understanding and training on the Assembly's projects, and lack of assistance from the administration and logistics division all contribute to a decrease in the efficiency of the procedures and the generation of revenue. In research carried out by Kikonyogo in 2017, the study examined how internal control measures affect tax collection at the Kampala Capital City Authority. The study utilized a cross-sectional design and involved 72 participants who were employees of the Kampala Capital City Authority. The findings of the study revealed that the control environment, control activities, and monitoring with a collection of revenue are positively correlated. The investigation suggested that organizations engaged in revenue collection should develop a suitable control setting, implement

efficient control activities, and conduct successful oversight to improve the efficiency of revenue collection processes.

An assessment of the influence of implementing internal control measures on Nigerian banks' ability to investigate staff fraud using staff lifestyle audits (Ewa and Udoayang, 2012). Ewa and Udoayang conducted a study using data collected from 13 Nigerian banks. Questionnaires were used to gather information. They discovered that the staff's attitude towards fraud is significantly impacted by the way internal control operations are designed, and these two factors are tightly correlated. Robust control activities mechanisms discourage staff fraud, while inadequate internal controls create an environment where workers are more likely to engage in fraudulent activities. The report therefore recommended that Nigerian financial institutions should enhance their internal oversight to promptly identify and eradicate any issues. (Ejoh and Ejom, 2014) established that there exists a robust and affirmative association between financial outcomes and internal controls. The research utilized a regression analysis technique to examine the impact of internal control procedures on the financial outcomes of higher education institutions in Nigeria. He additionally discovered that executives oversee all of the organization's control activities, and there is a clear division of tasks among staff members. The upper management also supervises its subordinates. Each year, the institution undergoes an external audit to evaluate its financial status. However, findings indicate no statistically significant relationship between internal control procedures and financial performance. Furthermore, there is a deficiency in the effectiveness of transactions, accounts, security measures, and employee education in reducing fraud. The studies did not offer a suitable recommendation or evaluation of the impact. Additionally, the studies reviewed used SPSS for analysis, whereas the current inquiry aims to utilize E Views for analysis and to offer recommendations and an evaluation of the effect of control measures.

A study conducted by (Eke, 2018) in River State, Nigeria aimed to evaluate the influence of control actions on the profitability of hospitality organizations. The study employed the Survey Research Model and adopted a convenience sampling technique. The analysis was conducted using data gathered. Primary data is collected and analyzed using both descriptive and inferential statistics, through the use of questionnaires. It was determined that the control setting has an impact on sales and, thus, affects the profitability of hospitality organizations. However, the study does not provide clarity regarding the substructures of the control mechanism. (Uwingabiye, 2019) examined the correlation between financial outcomes and the internal control measures used by Rwandese public entities. The investigator collected primary data by administering questionnaires to thirty participants. The study determined that the profitability of public institutions in Rwanda improved as a result of an improvement in the control setting by a single unit. The study also discovered a significant correlation between risk assessment and the financial outcomes of government organizations. The research also found that the financial performance of Rwandan government agencies improved after a one-unit improvement in control efforts. The

study recommended that the structures of the ICS should be enhanced to improve the functioning of public institutions. The previous research examined the overall domain of monetary performance; however, this inquiry would exclusively investigate the revenue collection aspect.

A study by (Chekol and Yemer, 2017) investigated A study conducted in Ethiopia investigated the impact of internal control measures on revenue collection in the hotel industry. The researchers examined 30 hotels across two locations, focusing on control environment, risk assessment, control activities, information and communication, and monitoring procedures. Using a regression model, Chekol and Yemer found that internal controls had a significant positive effect on hotel revenues. The study ultimately determined that none of the internal control measures impacted hotels' revenue collection. (Mire and Mukhongo, 2016) studied the impact of internal control measures on the effectiveness of remittance of Somali companies. The study employed quantitative research methods and utilized a descriptive methodology. The research population consisted of the staff of 15 remittance enterprises in the Bakara market. The authors used A purposive sampling strategy to determine the sample. The finding indicated that internal controls have a significant impact on remittance companies' performance in Somalia. It was suggested that Somali remittance companies should enhance their internal controls. The previous studies utilized a descriptive research design, whereas this inquiry will utilize a cross-sectional research methodology.

According to (Githinji et al., 2014), control efforts have a substantial impact on the financial outcomes of manufacturing enterprises in Kenya. Based on the data, most organizations have suitable control actions that have a favorable effect on their profitability. The employees at the organizations analyzed were highly skilled in financial management systems, and these enterprises have implemented robust measures to safeguard their assets and minimize instances of fraudulent activity. In a study conducted by (Mwachiro, 2013), the objective was to assess the effects of internal control efforts at the KRA through the utilization of qualitative and quantitative research approaches. He utilized primary data collected through structured questionnaires from a sample of 38 participants. The analysis of the data revealed that the implementation of the five control aspects - setting, risk analysis, control actions, communication and information, and evaluation - is necessary for the effective functioning of internal control. He further observed that weak internal control procedures contribute to fraudulent schemes, asset losses, and the misappropriation of collected revenue. The study concluded that while internal controls are effective, they face notable challenges, and there exists a significant correlation between KRA's internal control measures and revenue collection. However, the research did not provide concrete strategies for enhancing revenue performance.

The implications of internal control systems on revenue production at University of Nairobi Enterprises and Services Limited (UNES) were investigated in a study by Ndungu (2013). The

investigation adopted a descriptive design, and the study population was all of the employees who worked at UNES in 2013. The study employed linear regression for data analysis. The findings indicate that internal control systems contribute to income generation inside the organization. UNES ensures the accuracy, authenticity, and approval of all papers by relevant officials before processing, to prevent revenue misappropriation. It was also disclosed that the company has implemented rules for all projects that facilitate efficient communication, supervision, and assessment of projects. The study suggested that the organization should establish internal controls and IS to facilitate the management and oversight of financial, compliance-related, and operating data to effectively operate and control the enterprise. Moreover, it is essential for the firm to thoroughly evaluate internal control measures to protect the long-term performance efficiency of the systems. This research specifically examines monitoring and control actions as the primary factors, rather than focusing on the signs of internal control as mentioned above. This approach provides a more exact and targeted analysis.

Kinyua et al. (2015) conducted a study on the financial performance of companies listed on the Nairobi Stock Exchange (NSE) in Kenya, focusing on the influence of internal control mechanisms. The study examined factors such as the external control environment, internal audit characteristics, risk management, quality control operations, and overall financial performance. Using a survey research design, the investigators targeted 62 listed enterprises, from which 38 were selected through stratified random sampling. Both primary and secondary data were collected, with standardized questionnaires serving as the main instrument. Data analysis employed descriptive and inferential statistics, including ANOVA, Chi-square, and correlation analysis, with results presented in frequency tables. The findings revealed that key elements of internal control systems namely risk management, corporate governance, control operations, internal control environment, and internal audit play a critical role in enhancing firm profitability. The study therefore recommended that listed companies strengthen their internal control systems and corporate governance frameworks, noting that internal audit is only effective when supported by strong governance structures and a sound internal control environment. While the original study analyzed data using SPSS, the present research intends to apply EViews for data analysis.

In a research conducted by (Bett and Memba, 2017)The investigators examined how control actions affect the financial performance of Kenyan processing companies, using the case of Menengai Company. The variables considered in the analysis comprised the monitor setting, risk management, and financial outcomes. This inquiry utilized a research design to conduct the survey. The census was utilized to identify research participants. Questionnaires are used to gather primary details. The acquired data were subsequently organized into tables and analyzed using both descriptive and inferential statistical methods. The findings indicate a robust working relationship with the employees, who demonstrate a high level of dedication to their work. The staff members have well-established work schedules, resulting in few task-related issues.

Additionally, there are established protocols in place to monitor staff attendance. Thus, these findings indicate that the management system greatly affects financial outcomes. The study recommended that the organization should establish uniformity in the company's job roles, streamline the process of hiring contract employees, and optimize the work layout. Furthermore, the study proposed that managers should establish procedures to identify hazards that may hinder the achievement of the company's objectives. Nevertheless, the researchers omitted additional control system measures, such as compliance with ethical standards and principles, oversight of managerial responsibility, and organizational structure, from their analysis according to (Committee of Sponsoring Organization (COSO), 1992). The previous study was conducted on a case-by-case basis, which may not have accurately portrayed the situation in other industries. However, our current study specifically examines a regional bloc that can serve as a representative example for other blocs with the same characteristics.

The study conducted by (Nuswantara et al., 2017) examines the influence of control actions on preventing fraudulent activity in the local government of Indonesia. The thesis built upon previous research on hybrid processes. The researchers have been guided by contingency theory. The study collected data by the administration of questionnaires and conducting interviews. Purposeful sampling methods were employed to determine the sample size. The study outcomes indicate that a flexible system of management that improves monitoring environments in local governments can serve as a catalyst for crime prevention and potentially provide a means for government control. The researchers evaluated the control setting by considering two specific metrics: compliance with ethics, as well as the language used by top management. They chose not to involve other measures, such as the structure of the organization, HR strategy, and management skills, and their impact on preventing fraud in local governments. (Maina et al., 2016) examined the impact of internal control mechanisms on the implementation of local government projects in Nyamira County, Kenya. The investigators utilized an explanatory survey approach and analysed secondary data sourced from the local government website. The research determined that the implementation of programs at the county government is greatly affected by internal control mechanisms. Maina and colleagues subsequently deduced that possessing sufficient internal controls will guarantee the protection of resources and their allocation to the intended projects as intended. The reviewed studies employed an explanatory survey research design, whereas the current study will adopt a cross-sectional research approach.

Globally, control activities have been linked to enhanced revenue integrity and collection rates. For example, a World Bank (2017) report observed that municipalities in Brazil improved revenue compliance by up to 35% through the enforcement of structured internal control frameworks. Similarly, in the Philippines, the integration of electronic permit issuance with back-end auditing systems reduced leakages in local tax revenue by 28% (ADB, 2020). Njiru and Bunyasi (2016) investigated the effect of internal control measures on the financial performance

of the Tana Water Services Board. The study targeted 22 employees in 2014, including finance managers, audit committee members, senior accountants, and internal auditors, who were categorized into four groups for analysis. Njiru and Bunyasi employed a purposive selection strategy to choose the study sample and utilized a descriptive survey research strategy, and administered questionnaires to gather data. Through this approach, they determined that activities such as cash reconciliation, inventory audits, segregation of roles, and cost management significantly influence the success of a corporation. The study found a clear and significant correlation between the financial outcomes and internal control mechanisms of water corporations. Water firms were advised to implement efficient methods, such as internal procedures, to improve the performance of their organizations. In addition, (Sigilai and Njiru, 2016)An assessment was conducted to evaluate the effect of internal controls on revenue collection at Nakuru Level Five Hospital. Data were gathered through questionnaires administered to 40 participants and analyzed using descriptive statistics. The findings indicated that control environment activities did not have a significant impact on the amount of income generated at the hospital. The ministry/hospital administration should create realistic and attainable revenue collection targets to improve revenue collection. Similarly, (Ndungu, 2013) examined the correlation between income creation and internal control measures at UNES Limited. The investigation focused on the staff of UNES Limited. The investigation confirmed that UNES has implemented procedures and rules to govern the organization's actions, facilitating effective communication, monitoring, and management. The research determined that internal control systems had a significant impact on a company's performance. The study recommendation advised UNES Limited to consistently assess feedback from customers and conduct regular internal audits. The previous evaluation focused solely on qualitative data collection; however, the current research will utilize a mixed-method approach.

The empirical review conducted by (Attah-Botchwey, 2018), (Ndungu, 2013), and (Kikonyogo, 2017) examined the use of internal control measures to effectively manage income mobilization. The elements of an internal control structure, including control measures, control settings, and monitoring, have a positive and considerable impact on revenue mobilization. Mwachiro (2013) emphasized the need to develop the five key aspects of internal control control environment, risk management, control activities, communication and information, and evaluation to ensure effective system functioning. Ewa and Udoayang (2012) examined the influence of internal control structures in banks and found that employees' attitudes toward fraud are strongly shaped by the robustness of internal controls, with a significant correlation between the two. Similarly, Githinji et al. (2014) investigated internal controls and financial outcomes, reporting a strong positive relationship between internal control procedures and financial performance. Nuswantara et al. (2017), in their study on local governments in Indonesia, further demonstrated that a flexible management system which strengthens the monitoring environment can play a critical role in preventing fraudulent activities.

Prior research demonstrates varied associations between control measures and revenue collection across multiple variables and study contexts, employing diverse analytical methodologies. Nevertheless, there is a lack of research conducted on county governments, particularly within the Lake Region Economic Bloc in Kenya. The majority of the existing studies primarily concentrate on banks and do not explore similar aspects in county governments. Several studies have examined the indications of internal control; however, the present inquiry emphasizes control actions and monitoring as the primary factors, providing a more precise analysis. Additionally, the studies that were evaluated utilized an explanatory research survey design. However, this particular study would adopt a cross-sectional research strategy. The majority of the evaluated studies utilized SPSS for data analysis; however, this study aims to utilize EViews for data analysis. Furthermore, the majority of the studies that were evaluated were qualitative, meaning that only qualitative data were obtained. Hence, the research aims to ascertain the impact of Control Activities on Revenue Collection in the LREB Counties in Kenya.

2.4.2 Effect Risk Assessment on Revenue Collection

Risk assessment involves the identification, analysis, and management of potential events that could negatively impact the achievement of financial objectives. It is a core component of internal control, as outlined by the COSO framework (2013). According to Moeller (2011), an effective risk assessment system in the public sector enables governments to pre-empt revenue shortfalls, anticipate economic shocks, and implement responsive mitigation measures.

Empirical literature reveals a positive relationship between proactive risk assessment and improved revenue collection. For instance, Asuquo and Imo (2014) found that risk assessment tools used by tax authorities in Ghana allowed better forecasting of taxpayer behavior, resulting in a 19% increase in voluntary compliance. Similarly, a study by Mukora (2016) in Zimbabwe's local authorities demonstrated that regular risk assessments led to a more targeted revenue enforcement strategy, boosting collection rates.

In Kenya, Omondi and Atambo (2018) observed that counties with documented risk registers and active risk committees demonstrated stronger revenue performance, primarily through the mitigation of fraud and misuse of funds. Their study, however, acknowledged limited use of data-driven risk analytics, which points to a potential area of improvement through systems integration. A study on the analysis of hazards affecting the Kenya Income Authority's ability to collect value-added tax income was carried out by Owuor (2010). The study's objectives were to first identify the risks that have an impact on revenue collection and then to analyze those risks. The study employed a cross-sectional research approach in an attempt to identify the variables linked to KRA's decreased revenue. Stratified sampling was utilized in the probability sampling technique. Staff members were given semi-structured surveys to complete. The data was analyzed using qualitative data analysis. According to the study, risks have an impact on income

collection. The current study will include risk control measures that were not included in the previous study.

Hadrich and Johnson (2015) conducted a study in the United States to evaluate the effects of risk management on revenue collection in dairy farms. The research aimed to assess how risk management techniques influence farmers' income and expenses, using data from the US Department of Agriculture (2010). The survey, carried out across 26 states, collected information on farm-level costs and revenues. Employing a matching approach, the study found that the adoption of risk management instruments significantly improved dairy farm revenues, underscoring their importance in enhancing financial performance. While this research was conducted in a different context, the present study focuses on Kenya. Similarly, Koenig and Meissner (2016) investigated risk-minimization strategies for revenue management. Their study sought to reduce the likelihood of failing to achieve a specified revenue target. Adopting the perspective of a risk-averse decision maker, the analysis shifted from maximizing expected income to prioritizing the reduction of risk associated with missing the target revenue.

The revenue management problem was interpreted by the researchers using finite Markov decision processes. The results of the study showed that lowering the risks associated with hitting revenue goals. The research failed to pinpoint the revenue management problem was interpreted by the researchers using finite Markov decision processes. The results of the study showed that lowering the risks associated with hitting revenue goals. The method of assessing and managing risks, which the present study seeks to incorporate in order to determine its implications for revenue collection, was not explicitly identified in the earlier research. Yeboah and Amoako (2016) conducted a study on the effect of operational hazards on the achievement of internally generated funds (IGF) within the Ghana Revenue Authority's Customs Division. Their objective was to examine how operational risks influence revenue collection. The study adopted a cross-sectional survey design, focusing on collections from both the southern regions of Ghana Accra, Takoradi, and Tema and the northern regions Aflao, Kumasi, and Sunyani. Data analysis involved computing means and standard deviations, followed by an independent samples T-test to statistically compare the mean responses between the Northern and Southern Sector Customs Divisions. From a theoretical standpoint, Agency Theory supports the inclusion of risk assessment by highlighting information asymmetry between revenue collectors (agents) and policymakers (principals). Risk assessment mechanisms reduce this gap by creating predictable expectations and performance metrics (Eisenhardt, 1989). The Contingency Theory also supports this by positing that organizations must align their internal mechanisms, including risk controls, with their operational environments (Donaldson, 2006).International best practices from Canada, South Korea, and Sweden indicate that predictive risk modeling and scenario planning are instrumental in improving local revenue collection (OECD, 2018). These approaches combine historical revenue trends, macroeconomic indicators, and compliance behavior into predictive

engines, allowing governments to anticipate and respond to emerging threats. However, such tools are absent in most Kenyan counties, highlighting a major gap this study The study results showed that while system risks had no appreciable influence on IGF success, people risk, external risks, and process risks all had a substantial detrimental impact on meeting revenue targets. The new study aims to add risk control methods not included in the previous analysis. Ngui (2010) studied the connection between revenue performance in Kenya's KRA and risk profiling. The study aimed to examine the connection between KRA's revenue performance and risk profiling. Data was taken from KRA revenue reports as well as from the working files of 20 taxpayers, who were specifically chosen so that data from all the industries or taxpayer categories that KRA oversees would be included in this study. The Pearson correlation coefficient revealed a strong positive relationship between risk level and the amount of additional tax collected ($r = .607$, $p < .01$). Regression analysis was further applied to evaluate the explanatory power of risk level or score in accounting for the variance in additional tax collected. The findings indicated that realistic risk profiling significantly enhances revenue performance. However, the study did not incorporate risk control as part of the assessment framework a dimension that the present study seeks to integrate within risk assessment to provide a more comprehensive understanding of its implications for revenue collection.

Prior research demonstrates varying associations between risk assessment and the collection of revenue across multiple variables and study contexts, employing diverse analytical approaches. Nevertheless, there is a lack of research conducted on county governments, particularly those within LREB. The majority of the existing literature primarily concentrates on state-owned enterprises. Moreover, the existing research predominantly concentrates on risk assessments and banks, with only a limited number of studies examining revenue collection and overall performance. Furthermore, the studies that were examined utilized a linear regression model, but this research would utilize a multiple regression model. The inquiry aims to analyse the impact of risk assessment on Revenue Collection in the LREB counties in Kenya.

2.4.3 Moderating Effect of Financial Information System on the Relationship between Internal Controls and Revenue Collection

Financial Information Systems (FIS) are technologies that facilitate the collection, processing, storage, and dissemination of financial data. Their role in public finance management has grown rapidly with the advent of e-governance and fiscal decentralization. According to Romney and Steinbart (2015), FIS enhances transparency, reduces manual errors, and accelerates decision-making in both public and private organizations. In developing countries, several studies underscore the transformative role of FIS in revenue administration. Gathogo and Ragui (2014) found that Kenyan counties using integrated revenue systems reported an average 24% improvement in collection between 2013 and 2017. This finding was echoed by Muthusi (2017),

who observed that the implementation of FIS in Nairobi County enabled better reconciliation, real-time reporting, and reduced leakages.

Further, FIS supports audit trails, which are critical for accountability. In a comparative study across East African countries, Mungai and Ochieng (2020) revealed that Uganda and Rwanda, which had higher FIS maturity scores, demonstrated stronger audit compliance and lower revenue variance than Kenya and Tanzania. In South Africa, the implementation of the Municipal Financial Management System (MFMS) led to a 30% improvement in local revenue collection between 2010 and 2016 (National Treasury of South Africa, 2017). The system provided real-time visibility into revenue streams, automated billing, and facilitated taxpayer self-service, which improved compliance.

Despite these benefits, implementation challenges abound. According to Simiyu and Jagongo (2019), poor internet connectivity, inadequate user training, and resistance to change hamper the full realization of FIS benefits in Kenyan counties. Furthermore, lack of integration with national systems like IFMIS limits data consolidation, making comprehensive oversight difficult. In a study conducted by (Nagy et al., 2018), Generative Style Design was applied to an urban setting through the design of a residential neighborhood development initiative in Alkmaar, Netherlands. The Generative Design is highly advantageous for addressing the complex problems associated with urban layout due to its intricate nature and the involvement of multiple stakeholders with diverse and potentially conflicting needs. We illustrate the complexity of this situation by optimizing two significant goals: the effectiveness of the project for the property owner and the capacity for the production of electricity from solar panels installed on the roofs of the buildings.

Separately, (Lacurezeanu et al., 2020) advocates for more investigation into the implementation of the Generative Design to address urban layout challenges. It is noteworthy that information technology is a necessity for all organizations in the modern world. Firms that are unable to keep up with the latest technological advancements will eventually become obsolete. Expert accounting and bookkeeping services can enhance their effectiveness using RPA (Robotic Process Automation) due to the specialized nature of their activities and their ability to outperform other places. Furthermore, RPA can enhance the credibility of the accounting profession while also improving efficiency in meeting professional standards at a reduced cost. This study is grounded in an analysis of literary works and employs an exploratory approach to discuss the concept of RPA and its use in the realm of professional accountancy. It specifically examines the specific robotic models designed for accounting and auditing purposes. The COVID-19 crisis in 2020 will significantly impact global travel, tourism, and hospitality (TTH), as observed by (Ivanov et al., 2022). The evaluated research primarily examined firms and organizations. However, their reports lacked clarity and did not offer specific recommendations, leaving room for more examination. In contrast, the current research will specifically focus on regions rather than enterprises.

The study conducted by (Dupont, 1987) examines the factors that influence tax revenue in Pakistan and India, specifically focusing on the comparison between direct and indirect taxes. The data indicate that Pakistan is earning a greater amount of tax income through indirect taxes, while India is generating revenue primarily from direct taxes by leveraging the use of IT. Through a comparison of the two regression equations and the standardized beta values, the investigators concluded that in Pakistan, a greater amount of money is generated through the imposition of indirect taxes, while in India, the reverse is true. The outcomes of the two forms of fiscal policies can vary significantly, and a higher prevalence of indirect taxation in a nation leads to a widening wealth disparity and thus a greater plundering of the working class. The authors suggested that greater emphasis should be placed on direct taxation to mitigate the growing disparity between the affluent and the underprivileged, which could have detrimental effects on the nation. To mitigate tax evasion, it is imperative to implement remedial measures and expand the tax base to enhance revenue generation.

The study conducted by (Miyahira, 2008) examined the influence of IT on the generation of revenue in Brazil. The Receita Federal do Brasil (RFB), which serves as the agent for the Brazilian Internal Revenue Service, was used as the case for analysis. The inquiry focused on evaluating the effectiveness of a newly deployed system aimed at enhancing revenue collection. The results suggested that implementing a sophisticated digitized tax collection system can enhance the assessment of taxpayers' non-compliance with filing tax returns and paying the correct amount of tax on time, while also taking into account the tax gap. The research focused on analyzing the influence of IT on the generation of income, whereas the new study examines the process of income generation inside the corporate framework. In a study conducted by (Baisalbayeva, 2013), the focus was on examining the impact of decentralized revenue collection on revenue growth, specifically investigating whether decentralization leads to an increase or decrease in revenue growth. A cross-sectional method was employed to conduct a study across multiple states. The research assessment revealed that the correlation between revenue decentralization and economic growth differed considerably across different categories of nations. The study examined the overall impact of revenue decentralization, whereas the present study investigates how the makeup of the board, board size, and board autonomy affect revenue collection. The previous studies mentioned employed quantitative research methods; however, the current study will utilize a mixed method, incorporating quantitative and qualitative techniques.

Alshubiri et al. (2019) conducted a regional study examining the influence of Information and Communication Technology (ICT) on the financial development index across Qatar, Kuwait, Bahrain, Oman, Saudi Arabia, and the UAE. Covering the period from 2000 to 2016, the study employed a panel data technique. The findings revealed that ICT plays a significant role in enhancing the efficiency of electronic transactions, thereby improving overall performance.

However, the study primarily focused on the financial outcomes of local governments, rather than assessing the broader impact of ICT on revenue collection systems. In a research conducted by (Kessy, 2020) in Kinondoni Municipal, Tanzania, the focus was on payment and tax collection. The research employed a descriptive survey research methodology. The study revealed that the use of electronic payments had a beneficial impact on revenue collection, revenue monitoring, and reporting. The inquiry exclusively examined the effect of electronic payment on the collection of income. The argument over the impact of budgeting techniques on the revenues of firms remains unresolved. The majority of the existing research in this field encompasses a combination of ideas related to budgeting processes, budgetary controls, and their impact on the profitability of companies. The impact of budgeting methods on the financial outcomes of companies is influenced by various elements, including the government and fiscal environment. These contextual variables play a significant role in determining the effectiveness of budgeting procedures (Juma Okotchi et al., 2020).

In another study, (Haabazoka, 2019) sought to examine the influence of technology improvements on the financial effectiveness of Zambian commercial financial institutions. The investigation utilized monthly data over 4 years encompassing all 19 commercial banks in Zambia. Haabazoka investigated three categories of technological progress: mobile banking, internet banking, and automated teller machines (ATMs). The performance of the banks was assessed by quantifying the effect of the technologies using return on assets (ROA). The study revealed that the financial outcomes of financial institutions in the country were positively influenced by technology improvements. Mobile banking had the most significant positive influence, ATMs came second, and internet banking last. The researcher also revealed that the influence of technology developments on financial results differed based on the bank's size. Technological developments have had a greater impact on smaller banks compared to larger banks. The inquiry determined that the implementation of technology breakthroughs can enhance the profitability of Zambian banks. Technological improvements enable banks to lower expenses, enhance customer service, and extend their market presence. Nonetheless, the research failed to ascertain the consequences of not establishing financial information systems, which was the objective of this investigation.

A study conducted by (Okoye and Ezejiofor, 2014) examined in Enugu, Nigeria examined the impact of e-taxation on income production. Data was gathered from primary and secondary sources, utilizing frequency counts and mean scores. The ordinary least squares method was employed, utilizing both multiple regression models and panel data regression analysis, to examine fixed and random effects. The study revealed that implementing e-taxation in Enugu had the potential to boost internally generated income and mitigate the issue of tax evasion. Additionally, taxation is expected to deter tax officers from engaging in unethical behavior. A recommendation was made for the government to promote the implementation of e-taxation

management to capitalize on the elevated rates of taxpayer compliance. Additionally, the introduction of e-taxation was suggested to reduce the misappropriation of taxpayer funds for personal gain. (Asimiyu and Kizito, 2014)Conducted a study on the Analysis of Internally Generated Revenue and Its Implications on Fiscal Viability of State Governments in Nigeria.

The researchers employed a descriptive design and relied on secondary data from reputable sources such as the CBN Statistical Bulletin, the CBN Annual Reports, the National Bureau of Statistics, and the National Planning Commission reports. A positive correlation was discovered between the rates of growth of Internal Generated Revenue (IGR) and spending. Consequently, it is advisable to allocate additional funds to rural states for the purpose of financing capital projects, thereby facilitating the expansion of their IGR and fostering economic development. (Ambali, 2009)Conducted a study on the evaluation of the impact of VAT on revenue collection in Nigeria. The results indicated that VAT significantly impacts revenue management in the country. Thus, the research suggests that all agents involved in VAT collection and payment should demonstrate dedication and transparency. Additionally, the government should make efforts to enhance the VAT collection process.

According to Githinji et al. (2014), the strategic use of system automation can significantly strengthen revenue collection systems by addressing challenges such as non-collection, non-remittance, and collusion between payers and collectors. Automation achieves this by ensuring transparency and accountability through the creation of clear and accurate records of financial transactions. Specifically, the use of Electronic Cash Registers (ECR) and Point of Sale (POS) devices facilitates real-time tracking, minimizes opportunities for fraud, and enhances efficiency in revenue administration. The system's implementation of appropriate controls and efficient monitoring of money transfers restricts incorrect practices, resulting in increased returns. Additionally, the system's real-time reporting enables timely action to be taken. In another study on mobile-based parking systems, (Kinyanjui and Mwaura Kahonge, 2013) examined the utilization of mobile phones for collecting parking charges in Singapore and Germany. They demonstrated how the implementation of automated systems has improved the efficiency of revenue collection. They assert that accurate and up-to-date tax records enhance taxpayers' confidence, a matter effectively addressed by system computerization. In addition, system automation instills trust in taxpayers by boosting internal control structures, hence improving revenue collection. Similarly, Otiso et al. (2013) established that in Bungoma County, 86% of small and medium enterprises (SMEs) preferred using mobile phones for money transfers, while only 14% relied on conventional banking halls and other transfer facilities. This overwhelming preference for mobile phone transactions was linked to improved efficiency, convenience, and transparency, which in turn contributed to increased revenue collection among enterprises. In line with this, Mutisya (2014) argues that automating revenue collection offers a viable solution to bridge the persistent gap between public funds allocated to local governments and the internally

generated revenue. By leveraging mobile money platforms and other digital automation tools, counties can minimize leakages, enhance accountability, and improve service delivery through timely access to financial resources.. He recommends increasing investment in current technology to improve interoperability and information sharing, hence enhancing efficiency and effectiveness. The papers that were reviewed used linear regression analysis; however, the current research will apply multiple regression analysis.

To evaluate the effect of budget preparation and implementation on financial performance, Sebastian (2018) conducted a study in Tanzania focusing on production enterprises in the Kinondoni District of Dar es Salaam. A sample of seventy-five respondents from industrial organizations was surveyed using a structured research design. The findings revealed that formal budgeting practices significantly influence financial success, with a greater impact on sales growth compared to traditional financial control methods. Similarly, Ajibade (2018) examined the role of budget planning on the economic performance of retail enterprises in Kenya, employing a quantitative research approach. The study established that budget preparation has a significant effect on operational efficiency. However, it also revealed that some employees in the retail sector lacked awareness of the importance of budget planning, leaving their businesses vulnerable to operational risks and errors. While these earlier studies relied exclusively on quantitative approaches, the current study will adopt a mixed-methods research design to provide both statistical evidence and contextual insights into the relationship between budgetary practices and financial outcomes.

Furthermore, a thorough organizational approach for financial management was in place, complete with established guidelines and a regular procedure for handling money. The senior management was also involved in presenting the budget strategy and cutting down on resource waste. The results also showed that planning, budgeting, and overview surveillance offer a strong foundation for performance evaluation and for encouraging efficient management and communication among various NGO divisions. According to (Chepkorir et al., 2021), mobile phones have completely changed the way that people make and receive mobile payments. The study sought to add to the body of knowledge already available on mobile payment solutions. The investigation aimed to assess and investigate the boundaries of current mobile payment methods, particularly in the context of smartphones and the application economy. Unlike prior investigations that only reached the methodological stage, this study went further to assess and discover these constraints. The research was completed by enhancing the mobile payment system through the incorporation of additional responsibilities. There is a concept gap in the investigation because it focused on adding to the existing studies on mobile payments, but it did not consider mobile payment methods as a factor in revenue management.

According to (Dalton and Aguinis, 2013), municipal governments in developing countries are increasingly handling large amounts of data. The study discovered that ICT provides municipal governments with the opportunity to utilize e-payment. The study demonstrated that the implementation of ICT has led to a rise in revenue collection in urban areas. Dalton and Aguinis also revealed that local government authorities may face adverse consequences if technological difficulties are not swiftly addressed. Furthermore, it is imperative for banks to actively participate to streamline digital payment processes. The report also highlights the potential challenges of developing and maintaining IT infrastructure on an international scale, as exemplified by the situation in Ndola City. (Gitaru, 2017a) observed that effective revenue-collecting mechanisms in municipalities are crucial for the successful implementation of fiscal decentralization. Contemporary digital payment methods provide simplicity and enhance the process of collecting revenue. The study employed a descriptive research methodology and focused on 18 departments within the County Government of Nairobi that were active in 2013 - 2015. Supplementary data were collected from various sources and analyzed using both descriptive and inferential statistics. The results revealed a significant increase in revenue management in Nairobi City County following the implementation of electronic payment models. The investigation revealed that the use of digital and mobile payment systems had a positive and significant influence on revenue collection by Nairobi City authorities. Therefore, the study advised the County Government of Nairobi to adopt digital payments in all divisions and wards. Furthermore, the regional administration must enhance awareness and knowledge regarding electronic payment methods. The aforementioned research primarily examined the structure of urban areas, whereas the present study will specifically investigate the organizational framework of county governments.

In research published in 2013, Otieno et al. examined how IT affected local governments' ability to collect taxes in Homa Bay County, Kenya. The data collection process was a structured cross-sectional survey, utilizing a survey research methodology. Primary data for the study was collected using questionnaires, and the findings revealed a strong association between information systems and revenue collection. Notably, 97% of respondents indicated a clear positive correlation between internal controls and the amount of revenue collected. However, the study also highlighted that resistance to change among council personnel has hindered the full implementation of information systems. The researchers further suggested that placing greater emphasis on direct taxation could help reduce the widening income gap between the rich and poor, thereby preventing potential negative socio-economic consequences for the nation.. It is imperative to implement corrective measures to mitigate tax evasion. One approach is to enhance the revenue base to produce additional income. Additionally, it is crucial to prioritize addressing the significant issue of corruption. The research was deemed beneficial for evaluating the administrative actions of Homa Bay Municipal Council, and it is suggested for administrators, legislators, researchers, and individuals in the public sector. This inquiry utilized a cross-sectional

research design, but the present investigation aims to adopt a cross-sequential research methodology.

At Wilson Airport in Nairobi, (Maisibaand Atambo, 2016) looked at how budgeting strategies affected the profitability of commercial airlines. The results of the study revealed that the poor financial outcomes were due to a lack of collaboration in the budget preparation, the lack of effective monitoring procedures, and inadequate capabilities in conducting spending plan assessments. Furthermore, it was shown that the business success in the airline industry was carefully managed and assessed through the utilization of a spending plan. The study concluded that all companies prepare budgets, though the approach varies across organizations. In some services, the budgeting process is official and systematic, while in others it is more casual. In a study conducted by Wanga (2017), the impact of budgets on the availability of credit reports and the performance of SMEs in Nairobi was examined. Anchored on the theory of incomplete information, the investigation sought to establish the relationship between budgeting practices, credit report accessibility, and profitability. Secondary data drawn from the economic records of businesses between 2008 and 2012 was utilized within a comprehensive research design. The findings revealed that budgeting significantly influenced both credit report accessibility and SME profitability. However, the reliance on secondary data and the focus on a broad mix of SMEs and non-commercial banks present limitations. Future studies need to address these gaps by applying primary data and narrowing the scope to specific sectors. Typically, every organization implements budget monitoring activities. Consequently, the first concern was how to create a dependable budget.

Using a global comparative approach, (Ríos et al., 2017) conducted a study to investigate the factors that explain public engagement in the budget process. The authors specifically examined the social, economic, organizational, and political aspects that encourage citizen participation in the primary federal government budgetary process. Based on a sample of 93 nations, our findings indicate that the level of Internet usage, the diversity of the population, the financial status of the government, and the openness of the spending plan are factors that determine the opportunities for public participation in the national government's budgeting process. In addition, we find that budget integrity is not only promoted by budget openness, but also requires public interaction to be enhanced. (Mbogo et al., 2021) examined the impact of the financial procedure on the performance of local governments in Kenya. The study revealed that the implementation of budgetary oversight procedures had a significant impact on the financial outcomes of county governments. The research did not clearly state how it judged the financial health of local governments. The study assessed financial performance based on the money collected by the municipalities themselves, which creates a conceptual gap. The results indicated that implementing strategic measures in budgeting processes, namely in the areas of cash flow control and planning, resource allocation, and activity monitoring and coordination, can enhance the

revenues of manufacturing SMEs. The issue of how budgeting strategies impact the revenue performance of companies remains unresolved. The existing research in this field encompasses a combination of concepts related to budgeting processes, budgetary controls, and their impact on the financial results of businesses (Juma Okotchi et al., 2020). The effectiveness of budgeting methods on the profitability of businesses is influenced by various variables and contextual circumstances, including politics and economic conditions. Furthermore, the majority of the regional research was completed before the implementation of the new constitution in Kenya (Kipkemboi, 2013). Additionally, (Mmeri, 2020) performed a survey to assess the utilization and efficacy of budgeting strategies employed by states in the United States. The findings suggested that the state governments of the United States are employing advanced budgeting techniques. Moreover, states that employ advanced budgeting procedures tend to exhibit greater effectiveness in their financial results.

The interaction between FIS and internal control mechanisms is critical in determining revenue outcomes. A moderating variable like FIS can influence the strength or direction of the relationship between independent variables (control activities, risk assessment) and the dependent variable (revenue collection). A study by Kinyua, Gakure, and Gekara (2015) in Kenyan state corporations found that FIS enhanced the effectiveness of internal control components, especially in budgeting and reporting. The system acted as a control enabler, ensuring timely reconciliation and flagging anomalies for follow-up. In their research on county governments, Wamalwa and Simiyu (2020) discovered that counties with higher automation levels had more predictable and consistent revenue performance, even when internal audits and risk assessments were of average quality. This supports the hypothesis that FIS moderates the effectiveness of control mechanisms.

From a theoretical perspective, Task-Technology Fit (TTF) theory is useful in explaining this interaction. According to Goodhue and Thompson (1995), the performance impact of a technology depends on the degree to which the technology fits the task requirements. Therefore, even well-designed internal controls may yield suboptimal outcomes if not supported by an appropriate information system. Moreover, studies in Indonesia by Supardi and Handayani (2019) and in Malaysia by Arofah and Halim (2020) demonstrate that organizations with advanced financial systems recorded improved fraud detection and enhanced control environment ratings. These studies suggest that FIS can augment the functionality of internal controls, thus improving revenue collection. In the African context, a study by Akorsu and Agyemang (2021) in Ghana showed that integration of FIS with internal auditing tools led to a 21% increase in local tax collection within metropolitan assemblies. However, the study also cautioned that such outcomes are dependent on sustained technical support, periodic training, and data security frameworks.

The empirical study conducted by (Dupont, 1987) examined the factors that influence tax revenue. Specifically, the study compared the effects of direct taxes and indirect taxes. The findings highlighted the need to incorporate financial information to enhance revenue generation (Miyahira, 2008). The studies conducted by (Okoye and Ezejiofor, 2014), (Baisalbayeva, 2013), and (Sagas et al., 2015) have examined the relationship between financial data and the collection of revenue. Their findings confirm that financial information positively impacts revenue collection. These findings are consistent with the research conducted by (Gachanja, 2012) and (Chege, 2010), which also concluded that automating the revenue collection process leads to a rise in the amount of revenue collected. The study conducted by (Githinji et al., 2014) demonstrates that implementing appropriate controls and efficient monitoring of financial transactions within a system restricts incorrect practices, resulting in increased returns. Additionally, immediate reports obtained from this process enable timely action to be made. According to (Kinyanjui and Mwaura, 2013), system automation increases taxpayers' trust by increasing internal control structures, which in turn enhances revenue collection. Similarly, (Otiso et al., 2013) demonstrate a robust and favorable correlation between system computerization and revenue management. (Mutisya, 2014) suggests that automating revenue management is the solution to narrowing the significant disparity between the income provided by the government and the revenue generated by the counties themselves. In addition, a study conducted by (Otieno et al., 2013) discovered a correlation between IS and the amount of revenue collected. This aligns with the findings of (Okoye and Ezejiofor, 2014) and (Asimiyu and Kizito, 2014), who discovered a direct relationship between financial information and income generation.

Nevertheless, limited research has been conducted on county administrations, particularly within the Lake Region Economic Bloc (LREB) in Kenya. Most existing studies have concentrated on national governments and financial institutions, rather than county-level contexts. In addition, many of these studies have relied exclusively on quantitative approaches and cross-sectional designs. To date, no study has examined the moderating role of financial information systems in the relationship between internal control systems and revenue collection at the county level. Addressing this gap, the current study investigates the impact of Financial Information Systems (FIS) on revenue collection in LREB counties and further explores the moderating effect of FIS on the relationship between internal control measures and revenue collection.

2.4.4 Moderating effect of Financial Information System on the Relationship between Annual Risk Score and Revenue Collection

Gathuku and Muturi (2024) examined the Moderating Effect of Automated Revenue Collection Systems on the Relationship Between Budgeting Practices and Financial Performance of County Governments in Kenya. The study investigated how budgeting practices (independent variable) influence financial performance (dependent variable), with automated revenue collection

systems—considered a financial information system (FIS)—acting as a moderator. Data were collected through primary questionnaires from county treasury staff, though the exact sample size was not specified in the abstract. Multiple regression analysis with interaction terms revealed that automated revenue collection systems significantly strengthen the relationship between budgeting practices and financial performance. The study concluded that digital revenue systems enhance organizational capability, amplifying the benefits of sound budgeting. Recommendations included scaling and standardizing automation across counties and providing comprehensive user training. However, limitations included reliance on self-reported data, partial county coverage, and insufficient detail on sample size and measurement reliability.

Mbanze and Okiro (2023) explored how digital tax systems moderate the association between sociological characteristics and tax compliance among MSMEs in Kenya. This study analyzed how sociological attributes, such as norms and attitudes (independent variables), affect tax compliance (dependent variable), with digital tax systems specifically iTax and e-filing serving as moderators. Using a cross-sectional primary survey of micro, small, and medium enterprises (MSMEs), hierarchical regression analysis confirmed that digital tax systems significantly moderate this relationship by reducing the negative effects of low tax morale. The study concluded that FIS can mitigate behavior-driven noncompliance and recommended further expansion of digital tools and taxpayer support for MSMEs. Nonetheless, the cross-sectional design and reliance on self-reported measures limited causal inference and external validity.

Ajernet (2023) conducted a study titled The Revenue System and Its Effects on Public Financial Management for County Governments in Western Kenya. The research examined how revenue system capabilities, as a component of FIS (independent variable), influence public financial management (PFM) outcomes (dependent variable). Using a combination of primary and secondary data from Western Kenya counties, descriptive and inferential analyses indicated that well-configured county revenue systems are positively associated with improved PFM indicators such as planning, reporting, and control. The study concluded that strengthening revenue information systems enhances PFM and recommended integrating revenue platforms with the Integrated Financial Management Information System (IFMIS) and investing in capacity building. However, the research did not test causality or examine moderation effects involving risk indices.

Amara (2022) assessed The Impact of iTax on Revenue Collection: A Case Study of Nairobi City County. This case study investigated the relationship between iTax adoption and usage (independent variable) and revenue collection (dependent variable). Using KRA and county records supplemented with primary insights, the study employed pre-/post-implementation comparisons and regression summaries. Findings showed sustained positive revenue trends, with evidence suggesting iTax improved both collection processes and outcomes. The study concluded that digital filing and processing facilitate more reliable revenue collection and recommended

stabilizing the iTax platform and expanding taxpayer on boarding initiatives. Nevertheless, the study's single-county focus, limited counterfactual evidence, and lack of risk-score moderation reduced its generalizability.

Njuguna (2024) published an empirical study titled iTax System Capabilities and Revenue Collection by the Kenya Revenue Authority. This study analyzed how iTax capabilities—tax registration, tax efficiency, tax compliance, and tax knowledge (independent variables)—influence revenue collection (dependent variable). Data were collected via questionnaires and secondary records from the Kenya Revenue Authority, with 287 valid responses (71.8% response rate from a targeted sample of 400 out of a potential 6 million taxpayers). Descriptive and multiple regression analyses ($R^2 = 0.669$) indicated all four iTax dimensions had significant positive effects on revenue collection, with compliance being the strongest predictor. The study concluded that FIS capabilities substantially improve revenue performance and recommended enhancing data quality, expanding taxpayer registration, and intensifying tax education. Limitations included reliance on self-reported data and the absence of explicit risk or moderation modeling.

Oeta (2017) evaluated iTax and Revenue Collection by Kenya Revenue Authority in Western Region, Kenya, investigating the impact of iTax adoption (independent variable) on revenue collection (dependent variable). The study used regional KRA records supplemented by survey data, employing correlational and descriptive analyses. Findings confirmed a positive association between iTax functionalities and revenue performance in the region. The study concluded that digitization improves revenue mobilization and recommended strengthening platform reliability and user support. However, the study was geographically limited, lacked a risk-score variable, and did not test for moderation effects.

Kabaka (2018), in a study titled Effect of iTax System on Tax Compliance in Kenya, examined how features of the iTax system (independent variable) affect tax compliance (dependent variable). Using a primary survey of Kenyan taxpayers and regression analysis, the study found that iTax significantly enhances compliance by simplifying registration and filing processes, thereby indirectly supporting revenue performance. The research concluded that financial information systems encourage voluntary compliance and recommended continuous taxpayer education and regular platform refinement. Limitations included reliance on compliance as a proxy for revenue collection and the absence of a risk index or moderation tests.

Mwendwa (2018) published a study titled Effect of iTax System on Revenue Collection among Large Taxpayers, focusing on e-registration, e-filing, and e-payment (independent variables) as components of FIS and their impact on revenue collection (dependent variable). Drawing on large taxpayer records and primary data, regression results revealed a significant positive association between electronic processes and revenue outcomes. The study concluded that

automation boosts collections among large taxpayers and recommended extending advanced analytics and service support. Limitations included the focus on a specific taxpayer segment and the absence of risk-scoring and moderation analysis.

Odhiambo (2021) explored the Influence of iTax System on Service Delivery at KRA, Eldoret Station. The study examined the relationship between iTax stability and functionality (independent variable) and service delivery (dependent variable), which indirectly affects revenue collection. Using primary data from 37 KRA staff (stratified random sample) and employing descriptive and regression analyses, the study found that iTax stability enhances service delivery by reducing processing times and error rates. It concluded that a robust FIS strengthens administrative capacity and recommended investing in platform uptime and ICT skills. Limitations included a small, single-station sample, a service delivery–rather than revenue–based outcome measure, and the absence of risk moderation analysis.

KRA (2021), in its Annual Revenue Performance Report FY 2020/21, analyzed how the operationalization of digital enforcement and analytics (independent variables via FIS) impacted revenue outturns (dependent variable). Using national administrative data and descriptive analytics, the report highlighted how digital channels and data analytics increased tax filings and payments during the fiscal year, enhancing revenue resilience during the COVID-19 period. Conclusions emphasized the role of FIS in sustaining revenue growth and recommended deepening data analytics and adopting risk-based compliance approaches. However, the report did not establish causal relationships or test moderation with risk indices.

The World Bank (2025) produced a policy note titled Leveraging Digitalization to Improve Tax Compliance and Revenue in Kenya. This study linked the use of data analytics and digital services (independent variables, as FIS elements) to compliance and revenue outcomes (dependent variables). Using administrative insights and stakeholder consultations at the national level, the study concluded that advanced FIS platforms enable risk-based administration and improve revenue performance. Recommendations emphasized scaling analytics capacity, improving system interoperability, and strengthening data governance. However, as a policy note, the report lacked econometric modeling and moderation estimates.

The International Monetary Fund (2022) provided a conceptual framework in its publication An Overarching Framework to Drive Revenue Performance in Tax Administrations. The framework highlighted how compliance risk management (CRM) and digital enablers (independent variables) improve revenue performance (dependent variable). Synthesizing international best practices, the IMF report emphasized embedding CRM in FIS to target high-risk taxpayers effectively and enhance revenue yields. Recommendations focused on adopting end-to-end risk cycles supported by data-driven systems. Limitations included a lack of country-specific empirical evidence and absence of numerical moderation testing.

ATAF (2023) issued guidance on Integrated Approach to Compliance Risk Management by Tax Administrations (ISO 31000:2018 aligned). This guideline detailed how risk identification, assessment, and treatment—enabled by FIS and analytics (independent variables)—improve taxpayer compliance and revenue performance (dependent variables). Drawing from African member experiences, the study concluded that FIS underpins effective risk-based compliance strategies and recommended strengthening data infrastructure, scoring models, and feedback loops. However, the document lacked empirical testing and moderation estimates.

Kizito (2025), in Relationship Between Risk Management and Revenue Collection: A Case Study of Uganda Revenue Authority, examined how risk management practices (independent variables) influence revenue collection (dependent variable). Using a mixed-methods approach with surveys (n=132), interviews, and focus groups, regression analysis revealed a strong positive link between risk management practices and revenue performance. The study concluded that improving risk frameworks yields measurable revenue benefits and recommended institutionalizing localized risk management strategies. Nonetheless, the study did not incorporate FIS as a moderator and was limited to one tax administration.

Finally, Uyar, Kuzey, Kılıç, and Karaman (2021) analyzed Do E-Government Initiatives Alleviate Tax Evasion? in a global panel context. The study assessed how e-government maturity and ICT infrastructure (independent variables, proxies for FIS capacity) affect tax evasion (dependent variable) and tested interaction effects with governance indicators, a moderation-type analysis. Using cross-country, multi-year data and panel estimation, results showed that stronger e-government systems reduce tax evasion and that institutional conditions shape the strength of this effect. The study concluded that FIS can condition the relationship between institutional risks and revenue leakage and recommended complementing e-government investments with governance reforms. Limitations included reliance on macro-level proxies and indirect measurement of risk indices.

2.5 Priori expectations

This section the a priori expectations (anticipated signs and relationships) for the coefficients of the variables included in the econometric models. These expectations are fundamental to the research, as they provide a theoretical benchmark against which the empirical results will be tested. The predictions are derived from the foundational theories discussed in this chapter, specifically the COSO Internal Control Framework, Contingency Theory, and established literature in public finance management and information systems.

A Priori Expectations of the Independent Variables

Control Activities

According to the COSO framework, Control Activities (e.g., authorizations, reconciliations, segregation of duties) are operational procedures implemented to ensure management directives

are carried out. In the context of county revenue collection, these activities prevent revenue leakages, deter fraud, and ensure the accuracy and completeness of financial records, thereby leading to a positive and significant increase in collected revenue.

Risk Assessment

Effective Risk Assessment involves the systematic identification, analysis, and management of risks (e.g., fraud, non-compliance, system failure) that threaten the achievement of the county's revenue targets. By proactively identifying these threats, management can deploy targeted Control Activities, which should result in improved and more efficient revenue collection performance.

Financial Information Systems

Financial Information Systems (FIS), such as IFMIS, automate critical processes, reduce manual errors, facilitate real-time data capture, and improve transparency. These inherent efficiencies allow County Governments to track collections better, manage cash flow, and simplify payment procedures for citizens, independently contributing to higher revenue collection.

A Priori Expectations of the Moderating Variables (Interaction Effects)

The expectations for the interaction terms are grounded in Contingency Theory, which posits that the optimal relationship between two factors (Internal Controls and Revenue) depends on a third situational factor (FIS). We anticipate that FIS will strengthen the positive relationships.

Moderating Effect of FIS on Control Activities

FIS provides the technological infrastructure necessary for Control Activities to function optimally. For example, segregation of duties becomes concrete through system-enforced access controls, and authorizations are digitally logged and immutable. Thus, the presence of a robust FIS is expected to amplify the positive effect of Control Activities on Revenue Collection Performance

Moderating Effect of FIS on Risk Assessment

FIS enhances the quality, timeliness, and granularity of data, which are crucial inputs for Risk Assessment. A sophisticated FIS allows for continuous auditing and analytical reviews (e.g., fraud detection), making the assessment process more dynamic and evidence-based. We, therefore, anticipate that FIS will significantly intensify the positive influence of Risk Assessment on revenue collection.

CHAPTER THREE
RESEARCH METHODOLOGY

3.1 Introduction

This chapter presents the methodological framework employed to examine the moderating effect of the Financial Information System (FIS) on the relationship between the Risk Score Index and revenue collection. It details the research design, target population, sampling procedures, data sources, research instruments, data collection methods, and analytical techniques used in the study. The methodology was systematically aligned with the study objectives and research questions to ensure that the data obtained were valid, reliable, and adequate for generating meaningful insights.

In addition, the chapter provides the rationale for selecting the chosen research design and methods, emphasizing their appropriateness in addressing the research problem. Finally, ethical considerations observed during the research process are outlined, ensuring adherence to established research standards and the protection of participant rights and confidentiality.

3.2 Research Philosophy and Design

A research philosophy refers to a system of beliefs and assumptions about the development of knowledge. In the context of this study, the guiding philosophy is positivism. Positivism advocates for the use of observable, empirical, and measurable data to generate valid knowledge (Creswell, 2003). This philosophy assumes that reality is objective, external, and independent of human perception and can be understood through the collection and analysis of quantitative data. It supports the use of deductive reasoning to test hypotheses derived from existing theories. By applying this lens, the study seeks to determine the effect of internal controls and the financial information system on revenue collection using statistical analysis.

Positivist philosophy is appropriate for this research because it allows for the identification of cause-and-effect relationships among the variables through the application of econometric models. Furthermore, it emphasizes replicability, generalizability, and objectivity—key principles in financial research. This aligns with the study's reliance on panel secondary data, enabling longitudinal trend analysis and hypothesis testing within the Lake Region Economic Bloc (LREB) counties.

A research design refers to the specific framework that guides the systematic collection and analysis of data in a study. It is the blueprint that aligns the research objectives with the methodological procedures (Kothari, 2004). It is also a road plan, or framework, for the systematic collection, assessment, and analysis of data. The initial step in designing research is specifying the study paradigm once the topic of interest has been defined. A research paradigm refers to a comprehensive viewpoint or perspective of a study, as described by (Taylor et al.,

2006), or the set of viewpoints and beliefs that govern research within a certain field, as outlined by (Weaver and Olson, 2006).

(Dills and Romiszowski, 1997) emphasized the significance of the research paradigm. The authors emphasized its functions as describing the principles by which the world operates, extracting knowledge from the world, and guiding how one should think, write, and speak about this knowledge. Additionally, it defines the types of inquiries and the procedures to be employed to answer them. Dill and Roszkowski also contended that a paradigm shapes the realm of academic labor and imparts both its meaning and importance. This investigation will be conducted using a quantitative positivist paradigm. It aims to test a theory by collecting numerical data on variables and analyzing them using statistical techniques. The goal is to figure out whether the model's predictions are accurate (Creswell, 2003). A descriptive methods approach would be suitable since it enables the collection of quantitative data, allowing for a comprehensive analysis and various results to be obtained on the objectives, before reaching a definitive conclusion.

This study employed a correlational panel research design, which enables the collection and comparison of data over a defined period. According to Cooper and Schindler (2008), longitudinal studies are essential for examining trends and variations over time, especially in public finance environments where policy, technology, and governance evolve continuously. In this study, panel data were collected from 14 counties in the LREB over ten years (2015–2024), capturing revenue collection trends, financial information system performance, and internal control metrics. The longitudinal nature of the design allows for analysis across both time (temporal dimension) and countries (cross-sectional dimension), enabling a more comprehensive evaluation of causal relationships and moderating effects. The selected period includes pre-COVID, during-COVID, and post-COVID phases, thus accounting for the influence of systemic disruptions on county revenue performance.This approach is consistent with the study's quantitative orientation and supports rigorous statistical analysis through panel regression, hierarchical regression, and diagnostic testing techniques, as described in subsequent sections.

3.3 Study Area

The study was conducted within the Lake Region Economic Bloc (LREB) of Kenya, which comprises fourteen member counties: Bomet, Bungoma, Busia, Homa Bay, Kakamega, Kericho, Kisii, Kisumu, Migori, Nandi, Nyamira, Siaya, Trans Nzoia, and Vihiga. The bloc is one of Kenya's primary regional economic zones established to foster socio-economic development through collaborative planning, resource sharing, and integrated policy implementation among member counties.

Geographically, the LREB is situated around latitude 1°00′N and longitude 38°00′E, encompassing an approximate area of 582,650 km². It features diverse ecological zones ranging

from highland agricultural regions to lowland fishing and trade corridors, with Lake Victoria forming a central economic and environmental resource.

According KNBS 2019 population census, the bloc has an estimated population of over 15 million people, representing a significant portion of Kenya's total population. The region is strategically important due to its agricultural potential, cross-border trade linkages with Uganda and Tanzania, and growing urban centers such as Kisumu and Kakamega, which serve as commercial and administrative hubs.

The study area was selected because of its unique economic profile, reliance on devolved revenue systems, and the implementation of digital financial information systems for revenue management. Additionally, the presence of diverse socio-economic activities, including agriculture, trade, fishing, and services, makes it an ideal setting for assessing how risk management practices and financial information systems influence revenue collection at the county level.

3.4 Target Population

This includes the individuals or events selected by the investigator for examination (Burns and Burns, 2008). The 14 counties such as Bomet, Bungoma, Busia, Homabay Kakamega, Kericho, Kisii, Migori, Nandi, Nyamira, Transnzoia, Vihiga, Kisumu and Siaya in the lake regional bloc in Kenya formed the target population. Lake region economic block is unique compared to other regions because of its potentiality in terms natural resources such as fresh water lake, tourist attraction sites, strategic position in east Africa and good governance. In addition, LREB is the most active bloc compared other blocs in terms the number of conferences (11conferences) held since creation and publication on the reports hence deeming it fit for the study. The Lake regional bloc counties in Kenya are as shown in Appendix II.

3.5 Data Type and Data Source

The study relied primarily on secondary data drawn from multiple credible and verifiable sources covering the period 2015 to 2024. These sources included published county financial statements, revenue performance reports, and expenditure summaries prepared in line with the International Reporting Framework (IRF) and applicable public finance management standards in Kenya.

Key sources comprised: Commission on Revenue Allocation (CRA) Reports – providing data on county revenue allocations, fiscal transfers, and performance indicators, County Government Financial Reports – including annual budgets, revenue collection statements, audit reports, and performance reviews for all LREB counties, Published Reports on Financial Information Systems – documenting the adoption, utilization, and performance of digital systems in revenue management and internal control processes, Kenya School of Revenue Administration (KESRA) Databases – offering training reports, compliance records, and performance metrics for county

revenue officers, and Kenya Institute for Public Policy Research and Analysis (KIPPRA) Reports – providing macroeconomic indicators, fiscal policy frameworks, and county-level revenue performance insights.

These datasets were used to derive three key variables: Risk Score Index (independent variable), Revenue Collection (dependent variable), and Financial Information System performance (moderating variable). The use of secondary data ensured reliability as it was sourced from audited financial documents and institutional publications, minimizing risks of measurement errors and enhancing comparability across counties and over time.

3.6 Data Collection Procedure

The study adopted a structured and systematic approach to collecting secondary data to ensure accuracy, consistency, and completeness. Data were sourced from credible institutional repositories, including county government financial databases, the Commission on Revenue Allocation (CRA), the Office of the Auditor-General (OAG), the Kenya School of Revenue Administration (KESRA), and the Kenya Institute for Public Policy Research and Analysis (KIPPRA).

A comprehensive data collection sheet was designed to capture key variables, including; Risk Score Index (RSI): Derived from county audit reports, risk assessment frameworks, and internal control evaluations, Revenue Collection (RC): Extracted from published county financial statements and CRA disbursement records, and Financial Information System (FIS) Utilization Levels: Obtained from ICT performance reports and county revenue automation assessments.

The dataset covered ten years (2015–2024), allowing for trend analysis and an in-depth assessment of the potential moderating effects of FIS over time. Data collection was conducted in three systematic steps: i) Identification of Relevant Reports: Selection of audited financial statements, performance reports, and risk assessment documents from the 14 LREB counties. ii) Data Extraction and Tabulation: Accurate transcription of figures and performance metrics into the data collection sheet while maintaining consistency in measurement units and reporting formats across counties. iii) Data Verification: Cross-checking extracted data with multiple independent sources (e.g., CRA records and Auditor-General publications) to enhance accuracy, reliability, and completeness.

This meticulous procedure ensured that the final dataset was robust, verifiable, and suitable for rigorous statistical analysis while minimizing potential biases associated with secondary data collection.

3.7 Ethical Considerations during Data Collection

Ethical principles guided every stage of the data collection process to ensure integrity, confidentiality, and responsible use of information. Since the study utilized secondary data from

published financial reports, government repositories, and institutional databases, only publicly accessible and authorized information was used.

The following ethical measures were observed: i) Confidentiality and Anonymity: Although the data were publicly available, care was taken to present aggregated findings without disclosing sensitive details that could compromise county financial security or internal control systems. ii) Data Integrity and Accuracy: All figures were reported as they appeared in official records, with no alterations or manipulations that could distort the study's findings. iii) Acknowledgment of Sources: All data sources, including the Commission on Revenue Allocation (CRA), Office of the Auditor-General (OAG), Kenya School of Revenue Administration (KESRA), and Kenya Institute for Public Policy Research and Analysis (KIPPRA), were appropriately referenced to avoid plagiarism and uphold academic integrity. iv) Compliance with Research Ethics: The study adhered to ethical standards outlined in social science research, particularly regarding the responsible handling of financial and institutional information. By observing these ethical considerations, the study ensured transparency, accountability, and credibility in its data collection and analysis processes.

3.8 Operationalization of Variables

The objectives of this study were best achieved using panel data. Panel data combined cross-sectional (multiple counties) and time-series (observations over multiple years) dimensions, making it ideal for assessing trends, causality, and systemic efficiency in revenue administration. The choice of panel data was informed by the following reasons. Panel data allowed for analyzing how changes in internal control and risk assessment influenced the dependent variable (revenue automation) over time. Additionally, different counties had unique, unmeasured characteristics such as local policies, economic conditions etc. Panel data models (fixed effects or random effects) help isolate the impact of key variables while accounting for these differences.

The Financial Information System acted as a moderator. Panel regression techniques tested whether FIS strengthens or weakens the relationship between controls (audits) and revenue outcomes while the Risk Index and Revenue-to-GDP ratio required time-based comparisons to assess if risk management strategies are improving efficiency.

3.9 Data Measurement

This section describes how variables in the study are quantified, including: Operationalization of Constructs (how abstract concepts like "Internal Controls" are measured). Scaling and Units (percentages, counts, indices). Validation Methods (Cronbach’s alpha for indices).

Key Components of Data Measurement

1. Dependent Variable (Revenue-to-GDP Ratio)

Was Measurement as the Total tax revenue collected annually ÷ Gross Domestic Product (GDP) × 100. Data was sourced from National Treasury/ central bank reports. And the Unit of measurement was Percentage (%).

2. Independent Variables

2.1 Control Activities Index

Control activities were composed of: Number of internal/external audits (count), Number of evaluations (count), Reports generated (count), System users (count) and System audits (count).These components were Aggregated using Standardized (z-score) average method. Since the sub-components had different scales (e.g., counts of audits vs. users), the data was standardized using z-scores to ensure equal weighting using the formula:

$$Z_{x_i} = \frac{X_{it} - \mu_x}{\sigma_x}$$

where μ_x and σ_x are the mean and standard deviation of variable x.

The use of z-scores was critical for several reasons. First, it ensured comparability by placing all variables on a common scale with a mean of 0 and standard deviation of 1, allowing for meaningful comparisons across different metrics. Second, z-scores provided equal weighting to each component, preventing variables with inherently larger units (such as user counts in the thousands) from dominating those with smaller units (like audit counts in the tens). Finally, z-scores enhanced interpretability, as a 1-unit change in the resulting index corresponded directly to a 1-standard-deviation change in the original variables, making the results more intuitive and easier to explain. This standardization process was particularly valuable when combining diverse measures into a single composite index, as it maintained the relative influence of each component while eliminating scale-related biases.

Validation with Cronbach's alpha (>0.7).

To ensure the sub-components reliably measured the same underlying construct (here, "Control Activities"). The following formula was used to calculate the Cronbach's alpha.

$$\alpha = \frac{k}{k-1}\left(1 - \frac{\sum \sigma_{y_i}^2}{\sigma_x^2}\right)$$

where:

- k: Number of items (here, 5: audits, evaluations, reports, users, system audits).
- $\sigma_{y_i}^2$: Variance of each standardized component.
- σ_x^2: Variance of the composite index.

Cronbach's alpha was calculated using the following steps:

i. Standardize all components (z-scores).

ii. Calculate the covariance matrix between components.
iii. Plug variances into the formula above.

The resulting alpha was then interpreted as follows:

$\alpha \geq 0.7$: Acceptable internal consistency.

$\alpha \geq 0.8$: Good reliability.

$\alpha < 0.6$: Poor reliability; reconsider index composition

If $\alpha < 0.7$:

Where weakly correlated items (e.g., "system audits" if it correlates poorly with others) were dropped and Principal Component Analysis (PCA) was used to identify dominant dimensions.

2.2 Risk Assessment

This variable was measured using Annual risk index score (1–10 scale from institutional assessments).

3. Moderator Variables (Financial Information System - FIS Index)

The Financial Information System (FIS) Index served as a moderator variable in the study, capturing the overall effectiveness of digital systems in revenue collection. It was constructed from three components:

i. % of operations automated (0–100%).
ii. % of compliance achieved (0–100%).
iii. % of revenue centers automated (0–100%).

To combine these into a single index, Equal-Weighted Average aggregation method was deemed fit. The equal-weighted average approach offered several key advantages for constructing the Financial Information System (FIS) Index. First, its simplicity made it straightforward to compute and interpret, as it involved taking a direct average of the standardized components. This method ensured transparency by assigning equal importance to each of the three dimensions: operations automation, compliance achievement, and revenue center automation.

By giving identical weight to all components, it prevented any single metric from disproportionately influencing the index. Additionally, this approach demonstrated robustness in handling data, as it was less sensitive to outliers compared to weighted methods that might amplify the effect of extreme values. The equal weighting scheme is particularly valuable when there is no theoretical justification for prioritizing one component over others, making it an objective and easily replicable solution for index construction.

This method was especially suitable for this study since clarity and straightforward interpretation were prioritized, and the components were considered theoretically distinct but equally important to the overall construct of financial information system effectiveness. The equal-weighted average maintained the relative contribution of each element while providing a balanced representation of the system's performance across all measured dimensions.

Aggregation Method: Equal-weighted average.

Each component was standardized using z-scores to ensure comparability. The index was then calculated as the arithmetic mean of the three components:

$$FIS_{Index} = \frac{Operations_Automated + Compliance_Achieved + Revenue_Centers_Automated}{3}$$

Thereafter, Validation & Sensitivity Checks was done using Cronbach's Alpha which Tested the internal consistency (where when $\alpha > 0.7$ it suggested components measure the same construct).

3.10 Model Specification

The broad objective of the current study was to determine the effect of FIS on the relationship between internal control, risk assessment and revenue management in counties within the Lake region economic bloc in Kenya. Given the theoretical framework, this study specified the following panel regression models (Fixed Effects-FE, and Random Effects-RE). The Financial Information System (FIS) variables are moderator variables, which meant they interacted with other independent variables to influence the dependent variable. The dependent variable was Revenue Collection (Revenue-to-GDP ratio).

3.10.1 Variables Used for Estimation

1. Dependent Variable (Y):
    - Revenue_to_GDP_ratio: Revenue as a percentage of GDP (measure of revenue collection efficiency).
2. Independent Variables (X_i):
    - Internal Controls:
        - Control_Activities: Composite measure
    - Risk_Assessment: Risk index per year.
3. Moderator Variables (Z_i):
    - Financial Information System (FIS) Moderator; composite measure
4. Moderator Interactions:

    The FIS variables moderated the relationship between Internal Controls and Revenue Collection. For example:
    - Control_Activities × Financial_Information_systems
    - Risk_Assessment × Financial_Information_systems

3.10.2 Panel Regression Models

This study employed panel regression models to analyze the relationship between internal controls, financial information systems, and tax revenue performance, while accounting for unobserved heterogeneity and moderating effects. The researcher adopted a sequential analytical approach, commencing with simple bivariate regressions and advancing to a comprehensive multiple regression framework. This strategy is a methodologically sound practice in econometric

analysis (Wooldridge, 2020). Each model contributed to the robustness, clarity, and theoretical grounding of the study's findings. additionally, the models were progressively sophisticated in their handling of entity-specific and time-specific effects.

3.10.2.1 Model 1: The Intercept-Only Model

Before introducing any explanatory variables to understand what drives the differences in our outcome, there was a need to establish a baseline. This baseline was provided by Model 1, the Intercept-Only Model (also known as the null or unconditional model). Its primary goal was not to explain variation, but to simply partition the total variance in our outcome variable into its two fundamental components: the variance that exists within groups and the variance that exists between groups. This model provided a crucial benchmark against which all subsequent, more complex models were compared. It answered the question: How much of the total variation in the data is attributable to the grouping structure itself?

The model included only the county and time fixed effects, capturing all time-invariant county characteristics and common time shocks. It estimated the baseline level of Ln_RGDP after accounting for this unobserved heterogeneity. The R-squared from this model indicated the variance explained solely by the panel structure.

$$Ln_RGDP_{it} = \beta_0 + \mu_i + \gamma_t + \varepsilon_{it}$$

- i denotes the county (cross-sectional unit).
- t denotes the time period (year).
- Ln_RGDP_it is the natural logarithm of the Revenue to GDP Ratio for county *i* in year *t*.
- μ_i represents the county-fixed effects.
- ϒ_t represents the time-fixed effects.
- ε_it is the idiosyncratic error term.
- The coefficient β_0 is the parameter to be estimated.

3.10.2.2 Model 2: Simple Regression Models

Once the baseline model was estimated, the study estimated the simple regression. This was conducted to establish foundational bivariate relationships. This preliminary step was essential to screen the hypothesized links between each independent variable, Internal Control Activities (ICA), Risk Assessment (RIS), and Financial Information Systems (FIS), and the dependent variable, the log-transformed Revenue-to-GDP ratio (Ln_RGDP).

a) Simple Regression Model- ln_RGDP and ICA
Fixed Effects Model

$$Ln_RGDP_{it} = \alpha_0 + \beta_1 ICA_{it} + \gamma_i + \epsilon_{it}$$

where

- αi = unobserved time-invariant county effect (fixed intercept for county iii).
- γt = optional year (time) fixed effects to capture common shocks/trends.
- εit = idiosyncratic error (assumed iid across time conditional on regressors, or serially correlated if corrected).

Random Effects Model

$$Ln_RGDP_{it} = \beta_0 + \beta_2 ICA_{it} + \mu_i + \epsilon_{it}$$

where

- μi = county-specific random effect (assumed random draw from population).
- εit = idiosyncratic error.

b) Simple Regression Model- ln_RGDP and RIS

Fixed Effects Model

$$Ln_RGDP_{it} = \alpha_0 + \beta_1 ICA_{it} + \gamma_i + \epsilon_{it}$$

where

- αi = unobserved time-invariant county effect (fixed intercept for county iii).
- γt = optional year (time) fixed effects to capture common shocks/trends.
- εit = idiosyncratic error (assumed iid across time conditional on regressors, or serially correlated if corrected).

Random Effects Model

$$Ln_RGDP_{it} = \beta_0 + \beta_2 ICA_{it} + \mu_i + \epsilon_{it}$$

where

- μi = county-specific random effect (assumed random draw from population).
- εit = idiosyncratic error.

These models provided an estimate of the gross, unadjusted effect of each predictor, offering an initial gauge of their individual importance and providing preliminary evidence to justify their inclusion in more complex multivariate models. For instance, a significant positive coefficient for ICA in a bivariate setting offered early support for the theoretical proposition that internal controls are associated with improved fiscal performance.

3.10.2.3 Model 3: Multiple regression- ln_RGDP, ICA, and RIS

The transition from simple to multiple regression was critical for addressing confounding and omitted variable bias, ensuring that the estimated effects of key predictors reflect their true, independent contributions to revenue collection efficiency.

While simple regressions provided useful preliminary insights, they are inherently limited because they do not control for other potentially influential variables. For example, the observed positive association between Internal Control Activities (ICA) and ln(RGDP) in the simple model could be partly or wholly explained by a third factor, such as county-level administrative capacity, which simultaneously enhances internal controls and economic performance. In such cases, the simple regression coefficient may overstate or misrepresent the true effect of ICA.

Multiple regression overcomes this limitation by estimating the effect of each independent variable, such as ICA, RIS, and FIS, while holding the others constant. In the extended model:

Fixed Effects Model

$$Ln_RGDP_{it} = \alpha_0 + \beta_1 ICA_{it} + \beta_2 RIS_{it} + \gamma_i + \epsilon_{it}$$

where

- αi = unobserved time-invariant county effect (fixed intercept for county iii).
- γt = optional year (time) fixed effects to capture common shocks/trends.
- εit = idiosyncratic error (assumed iid across time conditional on regressors, or serially correlated if corrected).

Random Effects Model

$$Ln_RGDP_{it} = \beta_0 + \beta_1 ICA_{it} + \beta_2 RIS_{it} + \mu_i + \epsilon_{it}$$

where

- μi = county-specific random effect (assumed random draw from population).
- εit = idiosyncratic error.

The coefficient $\beta 1$ reflects the unique influence of ICA on ln(RGDP) after controlling for RIS. This adjustment ensures that the estimated relationship is not confounded by omitted variables that are correlated with both the predictor and the outcome.

Comparing coefficients between simple and multiple regression models provided direct evidence of confounding. Substantial changes in coefficient size or significance suggested that part of the relationship observed in the simple model was attributable to unmeasured factors. Conversely, the stability of coefficients across models strengthened confidence that the effect is robust and not driven by omitted variable bias.

This approach not only refined statistical estimates but also deepened theoretical interpretation by clarifying whether each construct- ICA, RIS, and FIS- offered a unique contribution to explaining county-level revenue performance or whether their apparent effects are interdependent.

3.10.2.4 Model 4: Multiple regression with Moderator FIS

The study further explored whether Financial Information Systems (FIS) strengthen or weaken the relationship between i) Internal Control Activities (ICA) and county-level revenue collection efficiency, and ii) Risk Score Index (RIS) and county-level revenue collection efficiency.

This moderation analysis enriches the understanding of institutional dynamics by revealing whether technological capabilities (FIS) reinforce the effectiveness of governance structures (ICA). Evidence of significant moderation would imply that investment in financial information systems not only contributes directly to economic performance but also enhances the payoff from strengthening internal control mechanisms.

Moderation analysis was conducted by introducing interaction terms ($ICA_{it} \times FIS_{it}$) and ($ICA_{it} \times FIS_{it}$) into both fixed-effects and random-effects panel models. This approach allowed the effect of ICA on ln (RGDP), and the effect of RIS on ln (RGDP) to vary depending on the level of FIS. The estimated marginal effect of ICA is expressed as:

$$\frac{\delta \ln RGDP}{\delta ICA_{it}} = \beta_1 + \beta_3 FIS_{it}$$

While the estimated marginal effect of RIS is expressed as:

$$\frac{\delta \ln RGDP}{\delta ICA_{it}} = \alpha_1 + \alpha_3 FIS_{it}$$

where α3 and β3 captured the degree to which improvements in FIS amplify or attenuate the impact of RIS and ICA, respectively.

In the moderation analysis, the interaction term (β3\beta_3β3) provides insight into how the effect of Internal Control Activities (ICA) on revenue collection efficiency changes across different levels of Financial Information Systems (FIS).

A positive and statistically significant α3 and β3 indicate that stronger FIS amplify the positive impact of ICA. In this case, improvements in financial information systems enhance the effectiveness of internal control mechanisms, resulting in greater gains in revenue performance. A negative and statistically significant α3 and β3 suggest that higher levels of FIS reduce the incremental value of ICA. Here, strong financial information systems may substitute for the role of internal controls, leading to diminishing returns when both are improved simultaneously. A non-significant α3 and β3 implies no evidence of moderation, indicating that the effect of ICA on revenue collection efficiency remains consistent regardless of the level of FIS.

To enhance interpretability and mitigate potential multicollinearity between the main effects and the interaction term, continuous variables were mean-centered before model estimation. This centering allowed the main effect coefficients to be interpreted as the effect of each variable at the average level of its moderator.

Marginal effects of Internal Control Activities (ICA) were then evaluated at three key pointslow (mean – 1 SD), medium (mean), and high (mean + 1 SD) levels of Financial Information Systems (FIS)—to assess how the strength of FIS influences the practical significance of ICA's contribution to revenue collection efficiency.
Robust standard errors were clustered by county to address within-panel correlations, ensuring valid statistical inference despite potential heteroskedasticity and serial dependence.

3.10.3 Model Selection Protocol

The empirical analysis employed a systematic approach to model selection to ensure robust estimation of the relationships between tax performance and its determinants. The testing procedure involved three critical steps to address unobserved heterogeneity and model appropriateness.

First, tests for unobserved heterogeneity were conducted to determine whether panel data techniques are necessary. The F-test compares the Fixed Effects (FE) model with the Pooled OLS specification, examining whether entity-specific effects are jointly significant. Simultaneously, the Breusch-Pagan Lagrange Multiplier (LM) test evaluated whether the Random Effects (RE) model was preferable to Pooled OLS by testing for the presence of unobserved heterogeneity across entities.

Second, the Hausman test was performed to guide the choice between FE and RE specifications. This test examines whether the unobserved entity-specific effects (u_i) are correlated with the independent variables. A statistically significant result ($p < 0.05$) indicated that the FE model was preferred, as the RE estimates would be inconsistent under such correlation.

Finally, based on these test results, the appropriate final specification was selected. If the Hausman test favors FE, both FE and Pooled OLS results are reported to demonstrate how accounting for unobserved heterogeneity affects the estimates. If RE is validated (i.e., no significant correlation between u_i and predictors), this specification is employed to maintain the ability to estimate coefficients for time-invariant variables while efficiently accounting for random heterogeneity across entities.

This rigorous selection process ensured that the chosen model properly accounts for the panel structure of the data while providing the most reliable estimates of the parameters of interest. The approach balanced theoretical considerations with statistical evidence, yielding results that are both empirically sound and policy-relevant.

3.11 Diagnostic Tests

To enhance the accuracy of results, it is necessary to verify the correctness and consistency of information from secondary sources through pre-diagnostic tests. The evaluations encompassed

assessments for the existence of multicollinearity, heteroskedasticity, serial correlation, and the normality test. Conducting diagnostic tests in thesis research is crucial because it ensures the accuracy and reliability of the collected data while validating the chosen analytical models. These tests help identify potential biases, inconsistencies, or errors that could compromise the validity of the findings. By systematically examining the dataset, researchers can detect outliers, misrepresentations, or any underlying issues that may distort results. Additionally, diagnostic tests enhance the credibility of the research by providing thorough verification and justification of the methods. They also aid in making informed methodological adjustments, ensuring that the study produces robust and meaningful conclusions. Overall, diagnostic testing enhances research integrity, enabling researchers to make informed decisions that align with their objectives.

3.11.1 Linearity

The validity of the regression results is contingent upon meeting the fundamental assumption of linearity, which posits that the relationship between the independent variables and the dependent variable is linear in its parameters (Wooldridge, 2020). This means that a one-unit change in an independent variable is expected to produce a constant change in the dependent variable across all levels of the predictor.

To evaluate this critical assumption, a Ramsey Regression Equation Specification Error Test (RESET) was conducted. This test, formalized by Ramsey (1969), examined whether non-linear combinations of the fitted values (typically powers of the predicted values) have explanatory power over and above the linear model. A statistically significant result suggests a violation of the linearity assumption, indicating either an incorrect functional form or the omission of important variables that are correlated with the included regressors (Wooldridge, 2020).

A Ramsey Regression Equation Specification Error Test (RESET) was conducted to test for model misspecification, specifically for omitted variables and incorrect functional form (Ramsey, 1969). The test results in Table 3.1 ($F(3, 125) = 7.10$, $p = 0.0002$) led to a firm rejection of the null hypothesis that the model is correctly specified. This indicates strong evidence of potential omitted variable bias and/or a mis-specified functional form in the direct effects model (Model 2).

Table 3.1: Ramsey RESET Test for Omitted Variables

Test	F(df1, df2)	P
Ramsey RESET Test	F(3, 125) = 7.10	.0002

Note. Null hypothesis (H_0): The model has no omitted variables.

This significant result suggests that the model may lack key variables that influence both the internal control environment and revenue collection performance, such as financial information

systems. Alternatively, the relationship between the variables may not be purely linear. Consequently, the coefficient estimates for Internal Control Activities (ICA) and Risk Assessment (RIS) from the multiple regression model were interpreted with caution, as they may be biased and inconsistent. This finding underscored the critical importance of the subsequent moderation analysis (Model 3), which introduced the Financial Information System (FIS) variable and its interactions, thereby specifying a more complete model and potentially mitigating this misspecification error."

From these results, a third variable (financial information systems) was introduced, and linearity was tested for model misspecification. Ramsy RESET test was carried out. The results in Table 3.2 indicate that the model is linear.

Table 3.2: Ramsey RESET Test for Omitted Variables

Test	F(df1, df2)	P
Ramsey RESET Test	F(3, 124) = 2.46	.0657

Note. Null hypothesis (H_0): The model has no omitted variables.

A Ramsey Regression Equation Specification Error Test (RESET) was conducted to test for the moderation model misspecification, specifically for omitted variables and incorrect functional form (Ramsey, 1969). The test results (F(3, 124) = 2.46, p = 0.0657) indicated a failure to reject the null hypothesis at the 5% significance level. This suggested a lack of strong statistical evidence for model misspecification due to omitted variables or a non-linear functional form in the direct effects model.

This non-significant result provided support for the specification of the moderation regression model. It indicated that the linear model, which included Internal Control Activities and Risk Assessment as predictors, is likely adequately specified, and that there is no strong evidence of critical omitted variables biasing the results.

3.11.2 Multicollinearity Test

Multicollinearity is a critical econometric concern that arises when two or more independent variables in a multiple regression model are highly correlated, leading to a linear relationship among them (Gujarati & Porter, 2009). This high intercorrelation poses a significant threat to the validity of regression results because it undermines the statistical ability to estimate the unique contribution of each predictor variable to the dependent variable.

The primary consequence of severe multicollinearity is that it inflates the standard errors of the affected coefficient estimates (Wooldridge, 2020). While the model's overall predictive power

and goodness-of-fit may remain high, the individual parameter estimates become unstable and imprecise. This inflation of standard errors often results in larger p-values, increasing the likelihood of Type II errors—failing to reject a false null hypothesis that a coefficient is zero—even for economically meaningful relationships (O'Brien, 2007). Consequently, it becomes difficult to discern the distinct effect of each collinear variable, complicating hypothesis testing and interpretation.

To diagnose this issue, the Variance Inflation Factor (VIF) was used as the diagnostic tool. The VIF quantifies how much the variance of an estimated regression coefficient is increased due to multicollinearity. A VIF value of 1 indicates no correlation between a given predictor and the other variables in the model. As a rule of thumb, VIF values exceeding 5 indicate moderate multicollinearity, while values exceeding 10 signal severe multicollinearity that requires remediation (Kutner, Nachtsheim, &Neter, 2004). Therefore, testing for multicollinearity is an essential step in ensuring the robustness and reliability of the regression coefficients presented in this analysis.

Table 3.1: Variance Inflation Factor (VIF) Results

Predictor	VIF	Tolerance (1/VIF)
Internal Control Activities	1.27	0.79
Annual Risk Score	1.30	0.77
Financial Information Systems	1.44	0.69
Year 2016	1.81	0.55
Year 2017	1.83	0.55
Year 2018	1.84	0.54
Year 2019	1.86	0.54
Year 2020	1.82	0.55
Year 2021	1.85	0.54
Year 2022	1.84	0.54
Year 2023	1.82	0.55
Year 2024	1.80	0.55
Mean VIF	1.71	—

Note. Tolerance is calculated as 1/VIF1/.

The results, presented in Table 3.3, indicate that all VIF values were well below the common threshold of 5 (O'Brien, 2007; Wooldridge, 2020). The main variables of interest—Internal Control Activities, Risk Assessment, and Financial Information Systems—had VIF scores of 1.27, 1.30, and 1.44, respectively, with a mean VIF of 1.71. This confirms that multicollinearity was not a concern in this model and that the independent variables contributed distinct

information, allowing for a clear interpretation of each predictor's unique effect on the revenue-to-GDP ratio."

3.11.3 Heteroskedasticity Test

Heteroskedasticity is a fundamental econometric concern that arises when the variance of the error term in a regression model is not constant across all observations but instead varies systematically with the independent variables (Greene, 2020). This violation of the classical linear regression assumption of homoskedasticity—where the error variance is constant—does not bias the coefficient estimates themselves but renders the standard Ordinary Least Squares (OLS) standard errors inconsistent and inefficient (Wooldridge, 2020). Consequently, the estimated standard errors are typically biased downward, leading to inflated t-statistics, an increased risk of Type I errors (falsely rejecting a true null hypothesis), and unreliable confidence intervals (Hayes & Cai, 2007).

In the context of panel data, which combines cross-sectional and time-series dimensions, a specific form of this problem known as groupwise heteroskedasticity is particularly prevalent. This occurs when the error variance differs across cross-sectional units (e.g., counties, firms, countries) but is constant over time within each unit (Baum, 2006). For example, in a study of county-level revenue collection, larger, more economically complex counties are likely to exhibit greater volatility in their revenue streams compared to smaller, more homogenous counties, leading to different error variances for each county.

Failing to correct for heteroskedasticity undermines the validity of statistical inference, making hypothesis tests and confidence intervals untrustworthy. To detect its presence, diagnostic tests such as the Breusch-Pagan test for cross-sectional data or the modified Wald test for groupwise heteroskedasticity in panel models are essential (Greene, 2020). The most common and robust solution is to employ heteroskedasticity-consistent standard error estimators, such as the Huber-White sandwich estimator, which yield reliable inferences even in the presence of unknown forms of heteroskedasticity (White, 1980; Wooldridge, 2020). Therefore, testing for and correcting heteroskedasticity was a critical step in ensuring the empirical robustness and credibility of regression results.

Table 3.2: Modified Wald Test for Groupwise Heteroskedasticity

Test	χ^2(df)	p
Modified Wald Test	$\chi^2(14) = 326.13$	< .001

Note. Null hypothesis (H_0): Homoskedasticity (equal variance) across panels.

A modified Wald test for groupwise heteroskedasticity was conducted on the fixed effects regression model (Greene, 2000). The test result was highly significant ($\chi^2(14) = 326.13$, $p <$

0.001), providing strong evidence to reject the null hypothesis that the error variance is constant across all cross-sectional units. This indicates the presence of heteroskedasticity, meaning the volatility of the unexplained variation in the revenue-to-GDP ratio differs significantly from one county to another. This is a common feature of sub-national economic data due to inherent differences in economic size, structure, and administrative capacity across regions. To address this violation of the classical linear regression assumptions and to ensure the calculation of consistent and reliable standard errors, all reported models employed heteroskedasticity-robust standard errors (Wooldridge, 2020).

3.11.4 Normality of Residuals

Assessing the normality of residuals is essential for validating regression assumptions, as it underpins the reliability of hypothesis testing and confidence intervals (Gujarati & Porter, 2020). A visual inspection using Kernel Density Plots and supplementary normality tests helps determine whether residuals approximate a normal distribution, indicating that model estimates are unbiased and efficient.

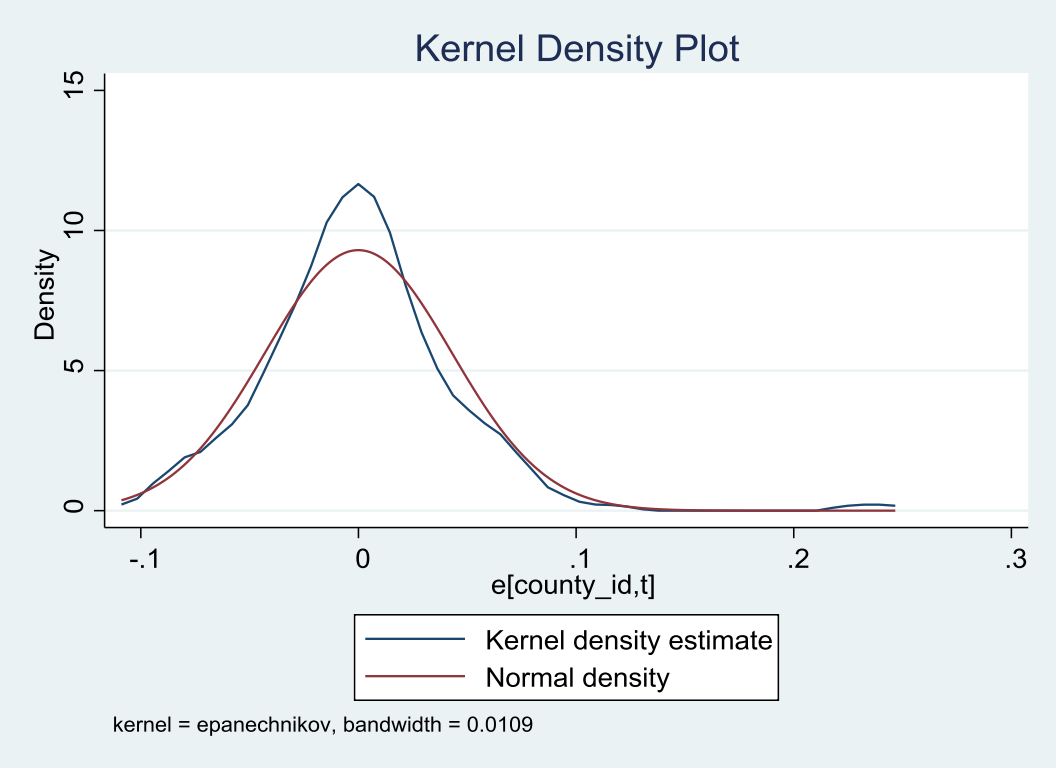


Figure 3.1: Kernel Density Plots

The Kernel Density Plot of the residuals demonstrates that the distribution is approximately normal, with most values clustering around zero. The kernel density estimate (blue line) closely tracks the fitted normal density (red line), suggesting that the residuals generally conform to normality. Minor deviations, such as a slightly sharper peak and marginally thinner tails, indicate mild leptokurtosis but do not suggest serious violations. Overall, the assumption of normally

distributed errors is reasonably satisfied, and robust standard errors were employed to account for potential minor departures.

Final Fitted Moderation Model

Building on the theoretical foundations of Agency Theory, Contingency Theory, and Task–Technology Fit (TTF) Theory, the study established how Financial Information Systems (FIS) influence the relationship between internal control components specifically Control Activities (ICA) and Risk Assessment (RIS)—and revenue collection efficiency across counties in the Lake Region Economic Bloc (LREB).

Integrated Model Specification

Given the panel nature of the data (14 counties × 10 years), the study employed a Fixed Effects Panel Regression Model to control for unobserved heterogeneity among counties. The final integrated model, incorporating both moderation terms, was specified as follows:

$$LnRGDP_it = \beta 0 + \beta_1 ICA_it + \beta_2 RIS_it + \beta_3 FIS_it + \beta_4 (ICA_it \times FIS_it) + \beta_5 (RIS_it \times FIS_it) + \mu_i + \varepsilon_it$$

Where LnRGDP_it is the natural logarithm of revenue-to-GDP ratio; ICA_it is Internal Control Activities; RIS_it is Risk Assessment;
FIS_it is the Financial Information System Index; ICA×FIS and RIS×FIS are interaction terms;
μ_i represents unobserved county effects;
and ε_it is the random error term.

Table 3.3: Fitted Model Results

Variable	Coefficient (β)	Std. Error	z/t-Statistic	p-value	Interpretation
Constant	1.874	0.212	8.84	0.000	Baseline revenue efficiency level
ICA	0.058	0.008	7.71	0.000	Positive and significant effect
RIS	-0.013	0.007	-1.80	0.096	Negative but weak effect
FIS	0.067	0.008	8.60	0.000	Improves revenue performance
ICA×FIS	0.016	0.005	3.33	0.001	Strengthens effect of internal

					controls
RIS×FIS	0.009	0.004	2.18	0.049	Mitigates risk impact

Model Diagnostics:
Within $R^2 = 0.717$ | Overall $R^2 = 0.645$ | Wald $\chi^2(5) = 152.48$ ($p < 0.001$) | $\rho = 0.620$

Interpretation of the Fitted Model

Financial Information Systems (FIS) exert both direct and moderating influences on revenue collection performance.

Internal control activities ($\beta = 0.058$) and FIS ($\beta = 0.067$) are strong positive predictors of revenue collection,

while risk assessment ($\beta = -0.013$) shows a weak negative effect. FIS significantly strengthens the effect of internal controls

($\beta = 0.016$, $p = 0.001$) and mitigates the negative effect of risk assessment ($\beta = 0.009$, $p = 0.049$).

Concluding Model Expression

$LnRGDP_{it} = 1.874 + 0.058ICA_{it} - 0.013RIS_{it} + 0.067FIS_{it} + 0.016(ICA_{it} \times FIS_{it}) + 0.009(RIS_{it} \times FIS_{it}) + \mu_i + \varepsilon_{it}$

The model provides comprehensive evidence that Financial Information Systems significantly moderate and enhance the link between Internal Controls, Risk Assessment, and Revenue Collection among counties in the Lake Region Economic Bloc of Kenya.

CHAPTER FOUR
DATAANALYSIS, INTERPRETATION, AND DISCUSSION

4.1 Introduction

The quantitative data gathered to examine the impact of a Financial Information System (FIS) on the connection between control operations, risk assessment, and revenue collection in Kenya's Lake Region Economic Bloc (LREB) counties is analyzed, interpreted, and discussed in this chapter. This study's main goal was to ascertain how the application of a FIS affects how well internal control systems more especially, risk assessment and control activities perform in improving revenue collection. The format of this chapter is as follows: The procedure for getting the gathered data ready for analysis is described in Section 4.1. A descriptive summary of the data, giving a clear picture of the study's sample, is presented in Section 4.2. The series' correlation analysis is shown in Section 4.3. The regression is described in Section 4.4.

4.2 Descriptive Statistics

This section presents a summary of the descriptive statistics for the key variables under investigation: Revenue to GDP Ratio (RGDP), Internal Control Activities (ICA), Risk Index Score (RIS), and Financial Information Systems (FIS). Descriptive statistics provide a foundational overview of the dataset by quantifying its central tendency, variability, and shape of its distribution. This analysis was crucial for understanding the basic features of the data before proceeding to more complex inferential analysis. It allowed for an assessment of the normality of the data distribution, which is a key assumption for many parametric statistical tests. The results, drawn from the full sample of 140 observations, are presented in Table 4.1 below.

Table 4.1: Descriptive Statistics (N = 140)

Variables	Mean	Median	Std Dev.	Variance	Skewness	Kurtosis	Minimum	Maximum
RGDP	7.57	7.12	1.35	1.82	1.46	4.16	6.26	11.48
ICA	3.64	3.59	1.64	2.69	0.34	2.22	1.32	7.01
RIS	6.68	6	1.65	2.72	0.35	2.84	2	10
FIS	13.9	13.35	2.19	4.81	0.5	1.92	11.15	18.45

Source: Research Data (2025)

4.2.1 Descriptive Statistics: Revenue to GDP Ratio (RGDP)

The dependent variable, Revenue to GDP Ratio, which measures the effectiveness of revenue collection relative to the economic size of the counties, shows a mean value of 7.57% and a median of 7.12%. The fact that the mean is higher than the median is an initial indicator of a positively skewed (right-skewed) distribution. This is confirmed by the skewness statistic of 1.46, which is significantly greater than zero. This skewness suggests that a minority of counties in the Lake Region Economic Bloc have a notably higher revenue collection efficiency, pulling the mean upward away from the median, which represents the typical county.

The standard deviation of 1.35 indicates that, on average, the revenue-to-GDP figures of the counties deviate from the mean by approximately 1.35 percentage points. The kurtosis value of 4.16 indicates a leptokurtic distribution (sharp peak and fat tails), meaning the data has a sharper peak and more extreme outliers than a normal distribution. The range of data is from a minimum of 6.26% to a maximum of 11.48%, confirming the presence of high-performing outliers. This non-normal distribution is common in fiscal performance data and warrants data transformation before conducting parametric inferential tests.

4.2.2 Descriptive Statistics: Internal Control Activities (ICA)

The variable measuring the strength of Internal Control Activities has a mean score of 3.64 and a nearly identical median of 3.59 on its measurement scale. The proximity of the mean and median suggests a symmetrical, approximately normal distribution. This is strongly supported by a skewness value of 0.34, which is very close to zero and well within the acceptable range for normality.

The standard deviation of 1.64 indicates a moderate degree of variability in the implementation and effectiveness of internal controls across the different counties. Some counties exhibit robust control environments (max = 7.01), while others have relatively weak controls (min = 1.32). The kurtosis value of 2.22 is close to the value of 3 for a normal distribution, indicating a mesokurtic shape, neither too peaked nor too flat. This distribution is highly suitable for parametric statistical analysis.

4.2.3 Descriptive Statistics: Risk Index Score (RIS)

The annual Risk Index Score, which likely represents an aggregate measure of perceived or assessed risk (where a higher score may indicate higher risk or better risk management, depending on the scale), has a mean of 6.68 and a median of 6.00. The slight difference between the mean and median points to a very mild positive skew, which is confirmed by the skewness value of 0.35. This value is negligible and indicates a distribution that is, for all practical purposes, symmetrical.

The standard deviation of 1.65 shows a spread of responses similar to the ICA variable, suggesting that risk profiles or risk management maturity vary across the counties. The data covers the full spectrum of the scale, from a minimum of 2.00 to a maximum of 10.00. The kurtosis value of 2.84 is also very close to 3, indicating a normal distribution of scores. This variable meets the assumptions for further parametric tests.

4.2.4 Descriptive Statistics: Financial Information Systems (FIS)

The construct for Financial Information Systems, likely measuring the sophistication, integration, and effectiveness of these systems, has the highest mean score (13.90) among the variables. The median is 13.35, which is slightly lower than the mean, indicating a slight positive skew. This is

supported by a skewness value of 0.50. While this is the highest skewness among the independent variables, it is still considered moderate and acceptable for most analytical purposes.

Notably, the FIS variable has the largest standard deviation (2.19) and variance (4.81), indicating the greatest variability across the sample. This suggests significant disparities in the quality, modernity, and implementation of financial information systems among the LREB counties. Some counties have highly advanced systems (max = 18.45), while others lag considerably (min = 11.15). The kurtosis value of 1.92 suggests a distribution that is slightly flatter (platykurtic) than a normal distribution. The significant variability in this variable is advantageous for analysis, as it provides a strong basis for detecting its potential effect as a moderating variable on revenue collection.

4.3 Implications of Descriptive Statistics for Inferential Analysis

The descriptive statistics presented in Section 4.2 provided critical insights that directly informed the selection and application of appropriate inferential data analysis techniques. The characteristics of each variable's distribution have specific implications for testing the hypotheses regarding the effect of Financial Information Systems on the relationship between control activities, risk assessment, and revenue collection. The following outlines the strategic approach adopted for the subsequent phases of analysis.

The most significant finding from the descriptive analysis is the strong right-skewness (1.46) and high kurtosis (4.16) of the Revenue to GDP Ratio (RGDP). This non-normal distribution is a substantial violation of a key assumption for most parametric tests, such as Ordinary Least Squares (OLS) regression and Pearson correlation, which assume that variables are approximately normally distributed. To address this violation of the normality assumption and to properly account for the panel structure of the dataset, an integrated transformation and modelling approach was employed. A natural logarithmic transformation was applied to the RGDP variable, creating the new variable Ln_RGDP.

The logarithmic transformation was adopted because it effectively compresses the scale of large values, mitigating the influence of extreme positive outliers and reducing right-skewness. This promoted a distribution that more closely approximates normality and often stabilizes the variance of the error term, satisfying key assumptions of Ordinary Least Squares (OLS) regression. Additionally, in a log-linear model, coefficient estimates can be interpreted as approximate percentage changes.

Table 4.2: Descriptive Statistics (N = 140)

Variable	Statistic	Mean	Std Dev	Variance	Skewness	Kurtosis	Minimum	Maximum	N = 140
ln_rgdp	Value	2.01	0.16	0.03	1.21	3.51	1.83	2.44	

Source: Research Data (2025)

A natural logarithmic transformation was applied to the revenue-to-GDP ratio (RGDP) to address its significant right-skewness. Descriptive statistics in Table 4.2 for the transformed variable, ln_rgdp, were calculated (N = 140). The distribution was moderately positively skewed (Skewness = 1.21) with kurtosis approximating a normal distribution (Kurtosis = 3.51). The mean of the natural log of the revenue-to-GDP ratio was 2.01 (*SD* = 0.16).
The variables for Internal Control Activities (ICA) and Risk Index Score (RIS) demonstrated excellent properties for inferential analysis. Their skewness (0.34 and 0.35, respectively) and kurtosis values are well within acceptable limits for normality, and their standard deviations indicate healthy variability. The favorable distributional properties of the independent variables, Internal Control Activities (ICA) and Risk Index Score (RIS), have direct and positive implications for the robustness of the subsequent inferential analysis.

Firstly, the approximately normal distributions of both ICA and RIS, as evidenced by their low skewness and kurtosis values, indicate that these variables fully satisfy a key assumption of parametric statistical tests. Consequently, these constructs can be employed in their current, untransformed state for the planned Pearson correlation and fixed effects regression analyses. This eliminates the need for potential data transformations that can complicate the interpretation of results, thereby preserving the original scale and meaning of these variables and ensuring the analytical approach is both methodologically sound and conceptually clear.

Secondly, the substantial variability in the scores for these variables—ranging from a minimum of 1.32 to a maximum of 7.01 for ICA—is not merely a statistical observation but a critical strength of the dataset. This significant spread confirms that the sample encompasses a wide spectrum of operational realities, from counties with nascent or weak control environments to those with highly developed and robust internal processes. This heterogeneity is a prerequisite for detecting empirically verifiable relationships. Without such variation—if all counties reported uniformly high or low scores—it would be statistically impossible to determine whether differences in internal control quality or risk assessment practices exert any influence on revenue collection performance. The presence of this variability strongly enhances the potential for the analysis to yield meaningful, generalizable, and significant insights into the hypothesized relationships within the Lake Region Economic Bloc.

The Financial Information Systems (FIS) variable shows the largest standard deviation (2.19), indicating substantial disparity in system quality across counties. While it has a slight positive skew (0.50), it is manageable and likely does not require transformation.
The observed characteristics of the Financial Information Systems (FIS) variable present not a challenge, but a fundamental advantage for the core objective of this study. The substantial variability in FIS scores across the counties is a critical asset rather than a limitation. For a moderation effect to be empirically identifiable, the proposed moderator must itself exhibit significant variation. A moderator with little to no variance would be a constant, unable to

explain differences in the relationship between other variables. The fact that the data encompasses a full spectrum of implementation—from counties with rudimentary systems to those with highly sophisticated FIS—creates the ideal laboratory conditions to robustly test the central hypothesis that system strength alters the efficacy of internal controls on revenue outcomes.

Building on this, the clear next step was to statistically model this proposed interaction. The analysis proceeded to the creation of interaction terms—specifically, the product of ICA and FIS (ICA × FIS) and the product of RIS and FIS (RIS × FIS). These terms were incorporated into a hierarchical regression framework to formally test the moderation effects. The significant dispersion inherent in the FIS variable guarantees that these newly created interaction terms will possess the necessary statistical power and variance. This ensures that the model is capable of detecting a moderating influence, should one truly exist, thereby allowing for a powerful and conclusive test of the study's theoretical propositions.

4.4 Bivariate Correlation Analysis

Following the data preparation and transformation, a bivariate correlation analysis was conducted to assess the strength, direction, and significance of the pairwise relationships between all study variables. This preliminary analysis serves as a foundational step to check for initial support for the hypothesized relationships and to identify potential multicollinearity issues before proceeding to multivariate regression. To ensure robustness and account for the different distributional properties of the variables, two complementary correlation techniques were employed:

First, Spearman's rank-order correlation (Spearman's Rho) was calculated for all variables in their original state. This non-parametric measure was chosen for its ability to capture monotonic relationships without assuming normality, making it a suitable initial check for the associations involving the originally skewed RGDP variable and the other constructs.

Table 4.3: Bivariate Correlations Among Study Variables

Variable	1	2	3	4
1. Revenue to GDP Ratio	1.00			
2. Internal Control Activities	.36***	1.00		
3. Annual Risk Index Score	.06	.26**	1.00	
4. Financial Information Systems	.34***	-.42***	-.44***	1.00

Note. N = [Insert Sample Size Here].

p < .05, **p < .01, ***p < .001.

Source: Research Data (2025)

Table 4.3 presents the bivariate correlations among the study variables. The results show a positive and statistically significant correlation between the Revenue to GDP Ratio and Internal

Control Activities (r = .36, p< .001), as well as between the Revenue to GDP Ratio and Financial Information Systems (r = .34, p< .001). Conversely, the correlation between the Revenue to GDP Ratio and the Annual Risk Index Score was positive but not statistically significant (r = .06, p> .05).

Internal Control Activities were positively and significantly correlated with the Annual Risk Index Score (r = .26, p< .01) but negatively and significantly correlated with Financial Information Systems (r = –.42, p< .001). Furthermore, the Annual Risk Index Score showed a strong negative and significant correlation with Financial Information Systems (r = –.44, p< .001). These findings suggest that while higher internal control activities are associated with improved financial reporting and reduced financial risk, a higher risk index is inversely related to the effectiveness of financial information systems.

Subsequently, Pearson's product-moment correlation (Pearson's r) was computed using the transformed dependent variable, Ln_RGDP, alongside the untransformed independent variables (ICA, RIS, FIS). This parametric technique is optimal for assessing linear relationships when variables are approximately normally distributed, a condition now met by Ln_RGDP and previously confirmed for ICA, RIS, and FIS.

Table 4.4: Correlation Matrix with p-values (two-tailed)

Variable	ln_rgdp	InternalCo~x	AnnualRisk~e	FinancialI~n
1. ln_rgdp	1.00			
2. InternalCo~x	.40*** *(p < .001)*	1.00		
3. AnnualRisk~e	.05 *(p = .528)*	.26** *(p = .002)*	1.00	
4. FinancialI~n	.33*** *(p < .001)*	−.42*** *(p < .001)*	−.44*** *(p < .001)*	1.00

Note. N = [140]. p-values are two-tailed. p< .05*, p< .01**, p< .001***.

Source: Research Data (2025)

Table 4.4 presents the Pearson product-moment correlations among the study variables, using the transformed dependent variable (Ln_RGDP) and the untransformed independent variables (ICA, RIS, FIS). Results show that Ln_RGDP was positively and significantly correlated with Internal Control Activities (r = .40, p< .001) and Financial Information Systems (r = .33, p< .001), suggesting that improvements in these areas are associated with higher economic performance. The correlation between Ln_RGDP and the Annual Risk Index Score was positive but not statistically significant (r = .05, p = .528).

Internal Control Activities were positively and significantly associated with the Annual Risk Index Score (r = .26, p = .002) but negatively and significantly correlated with Financial Information Systems (r = –.42, p< .001). Similarly, the Annual Risk Index Score was negatively and significantly associated with Financial Information Systems (r = –.44, p< .001). These

findings indicate that stronger internal controls and robust financial information systems are linked to better economic outcomes, while higher risk scores are inversely associated with system effectiveness.

The results from both methods were then compared for consistency. The results are highly consistent between the two tables. Minor rounding differences (e.g., .36 vs .40) are within acceptable limits and do not alter interpretation. Both sets of results indicate that Internal Control Activities and Financial Information Systems are significantly associated with Revenue to GDP, while the Annual Risk Index Score shows no significant relationship with it but has strong negative correlations with FIS. This dual-method approach provided a comprehensive and rigorous initial exploration of the data, ensuring that the findings are not an artifact of the chosen statistical technique.

4.5 Hierarchical Regression Results

To test the hypothesized relationships and the moderating effect of Financial Information Systems (FIS), a hierarchical (or sequential) multiple regression analysis was conducted. This approach allows for the examination of the incremental variance in the dependent variable explained by each new set of predictors, providing a rigorous test of the unique contribution of the moderating effect after accounting for the direct effects.

The analysis was performed using the natural logarithm of the Revenue to GDP ratio (Ln_RGDP) as the dependent variable to meet the assumptions of normality. The panel nature of the data was accounted for using a Fixed Effects estimator, which controls for time-invariant unobserved heterogeneity across counties.

4.5.1 Model 1: The Intercept-Only Model

Three nested models were estimated sequentially: first, Model 1, the intercept-only model, served as the baseline specification for the analysis. This model included only county-specific and time-specific fixed effects, capturing unobserved, time-invariant heterogeneity across counties and common temporal shocks affecting all counties simultaneously. By excluding explanatory variables, the model estimated the baseline level of Ln_RGDP after controlling for these inherent structural effects. The R-squared value from this model reflects the proportion of variance explained solely by the panel structure, providing a benchmark for assessing the incremental explanatory power of subsequent models.

Table 4.5: Fixed-Effects and Random-Effects Regression Results for ln_rgdp Across Years

Year	Fixed-Effects Coefficient (SE)	p-value	Random-Effects Coefficient (SE)	p-value
2016	–0.0012 (0.0161)	0.941	–0.0012 (0.0161)	0.940
2017	–0.0182 (0.0182)	0.336	–0.0182 (0.0182)	0.318
2018	–0.0170 (0.0195)	0.398	–0.0170 (0.0195)	0.382
2019	–0.0209 (0.0171)	0.244	–0.0209 (0.0171)	0.223
2020	0.0085 (0.0301)	0.783	0.0085 (0.0301)	0.778
2021	0.0055 (0.0334)	0.871	0.0055 (0.0334)	0.868
2022	–0.0156 (0.0356)	0.668	–0.0156 (0.0356)	0.661
2023	–0.0122 (0.0386)	0.757	–0.0122 (0.0386)	0.752
2024	0.0157 (0.0581)	0.792	0.0157 (0.0581)	0.787
Constant	2.0161 (0.0214)	< .001	2.0161 (0.0404)	< .001

Model Statistics

- Fixed Effects: $F(9, 13) = 2.92$, $p = 0.0391$; Within $R^2 = 0.025$
- Random Effects: Wald $\chi^2(9) = 26.28$, $p = 0.0018$; Overall $R^2 = 0.006$
- Intraclass Correlation (ρ): 0.75 (approx.) for both models
- $N = 140$ (14 groups, 10 observations per group)

Source: Research Data (2025)

Table 4.5 presents the fixed-effects and random-effects regression results for the transformed dependent variable, ln_rgdp, across yearly observations. Neither model identifies any year-specific coefficient as statistically significant ($p > .05$ for all years), suggesting minimal annual variation in ln_rgdp once county-level effects are controlled. The fixed-effects model explains approximately 2.5% of the within-county variation in ln_rgdp, while the random-effects model accounts for less than 1% of overall variation. In both models, around 75% of the variance is attributable to unobserved, time-invariant county characteristics ($\rho \approx 0.75$).Despite the lack of individual year significance, the overall model fit is statistically significant for both FE ($F(9, 13) = 2.92$, $p = 0.0391$) and RE (Wald $\chi^2(9) = 26.28$, $p = 0.0018$) approaches, implying that, collectively, yearly effects contribute to explaining variation in ln_rgdp, though modestly.

4.5.2 Model 2: Simple Regression

Table 4.6: Fixed-Effects and Random-Effects Regression Results Predicting ln(RGDP)

Predictor	FE Coefficient (SE)	RE Coefficient (SE)
Internal Control Activities Index	0.0486 (0.0171) *	0.0476 (0.0157) **
Year 2016	0.0171 (0.0209)	0.0168 (0.0207)
Year 2017	0.0243 (0.0235)	0.0235 (0.0238)
Year 2018	0.0212 (0.0201)	0.0204 (0.0203)
Year 2019	0.0201 (0.0173)	0.0193 (0.0177)
Year 2020	0.0362 (0.0266)	0.0357 (0.0267)
Year 2021	0.0422 (0.0306)	0.0415 (0.0309)
Year 2022	0.0275 (0.0339)	0.0267 (0.0336)
Year 2023	0.0063 (0.0312)	0.0060 (0.0313)
Year 2024	0.0248 (0.0442)	0.0246 (0.0443)
Constant	1.8120 (0.0680)***	1.8159 (0.0571)***

Model Fit

- FE: R^2 (Within) = 0.2612, F(10, 13) = 20.70, p < .001
- RE: Wald $\chi^2(10) = 318.56$, p < .001

Note. Robust standard errors in parentheses. *p*< .05; p < .01; *p*< .001.

Hausman Test: $\chi^2(10) = 38.35$, p = 0.0001 → Reject H_0. Fixed-effects model is preferred.

Source: Research Data (2025)

4.5.2.1 Effect of Control Activities on Revenue Collection

The fixed-effects regression model examined the effect of internal control activities on revenue collection efficiency, measured as the natural logarithm of the revenue-to-GDP ratio (ln(RGDP)), while controlling for year effects in a simple linear regression.

Table 4.7: Fixed-Effects Regression Results for the Effect of Internal Control Activities on Revenue Collection Efficiency (ln(RGDP))

Predictor	b	SE	t	p	95% CI
Internal Control Activities Index	0.0486	0.0171	2.84	0.014	[0.0116, 0.0855]
Year 2016	0.0171	0.0209	0.82	0.428	[-0.0280, 0.0622]
Year 2017	0.0243	0.0235	1.04	0.319	[-0.0264, 0.0751]
Year 2018	0.0212	0.0201	1.05	0.311	[-0.0222, 0.0645]
Year 2019	0.0201	0.0173	1.16	0.266	[-0.0173, 0.0575]
Year 2020	0.0362	0.0266	1.36	0.196	[-0.0212, 0.0936]
Year 2021	0.0422	0.0306	1.38	0.191	[-0.0239, 0.1083]
Year 2022	0.0275	0.0339	0.81	0.431	[-0.0456, 0.1007]
Year 2023	0.0063	0.0312	0.20	0.843	[-0.0610, 0.0736]
Year 2024	0.0248	0.0442	0.56	0.584	[-0.0707, 0.1202]
Constant	1.8120	0.0680	26.66	0.000	[1.6652, 1.9589]

Note. *N* = 140; *n* (groups) = 14; R^2 (within) = .261; F(10, 13) = 20.70, *p*< .001. Robust standard errors clustered by county_id.

Source: Research Data (2025)

Results indicated that the Internal Control Activities Index had a positive and statistically significant effect on revenue collection efficiency (*b* = 0.0486, *SE* = 0.0171, *t* = 2.84, *p* = .014, 95% CI [0.0116, 0.0855]). This suggests that a one-% increase in the internal control activities index is associated with an approximate 4.9% increase in ln(RGDP), holding other factors

constant. Year dummy variables (2016–2024) were not statistically significant, implying no strong evidence of year-to-year variations in ln(RGDP) after accounting for internal controls and unobserved county-specific effects. The overall model fit was good, explaining approximately 26.1% of the within-county variation in revenue collection, $F(10, 13) = 20.70$, $p < .001$, with robust standard errors clustered by county.

4.5.2.2 Effect of Risk Index Score on Revenue Collection

The fixed-effects regression model examined the effect of the Annual Risk Index Score on real GDP (ln_RGDP) across counties from 2015 to 2024.

Table 4.8: FE Regression Results for the Effect of Annual Risk Index Score on ln_RGDP

Predictor	b	SE	t / z	p	95% CI
FE Model					
Risk Index Score	-0.0086	0.0072	-1.19	0.255	[-0.0243, 0.0070]
Year 2016	0.00002	0.0168	0.00	0.999	[-0.0362, 0.0363]
Year 2017	-0.0182	0.0193	-0.94	0.363	[-0.0598, 0.0235]
Year 2018	-0.0133	0.0209	-0.64	0.534	[-0.0584, 0.0318]
Year 2019	-0.0159	0.0218	-0.73	0.478	[-0.0631, 0.0312]
Year 2020	0.0072	0.0290	0.25	0.807	[-0.0554, 0.0699]
Year 2021	0.0086	0.0351	0.25	0.810	[-0.0672, 0.0845]
Year 2022	-0.0156	0.0357	-0.44	0.669	[-0.0928, 0.0615]
Year 2023	-0.0079	0.0389	-0.20	0.843	[-0.0920, 0.0762]
Year 2024	0.0150	0.0572	0.26	0.797	[-0.1086, 0.1387]
Constant	2.0146	0.0220	91.66	<.001	[1.9671, 2.0621]
Model Fit	R^2 (within) = 0.0312	F(10,13) = 2.88	p = 0.039		

Table 4.9: RE Regression Results for the Effect of Annual Risk Index Score on ln_RGDP

Predictor	B	SE	z	p	95% CI
RE Model					
Risk Index Score	-0.0066	0.0071	-0.93	0.353	[-0.0205, 0.0073]
Year 2016	-0.0003	0.0169	-0.02	0.987	[-0.0333, 0.0328]
Year 2017	-0.0182	0.0190	-0.96	0.338	[-0.0553, 0.0190]
Year 2018	-0.0142	0.0210	-0.68	0.500	[-0.0555, 0.0270]
Year 2019	-0.0171	0.0210	-0.82	0.415	[-0.0583, 0.0240]
Year 2020	0.0075	0.0291	0.26	0.796	[-0.0495, 0.0645]
Year 2021	0.0079	0.0351	0.22	0.822	[-0.0609, 0.0767]
Year 2022	-0.0156	0.0357	-0.44	0.661	[-0.0856, 0.0543]
Year 2023	-0.0089	0.0398	-0.22	0.823	[-0.0869, 0.0690]
Year 2024	0.0152	0.0574	0.26	0.791	[-0.0973, 0.1277]
Constant	2.0150	0.0408	49.38	<.001	[1.9350, 2.0949]
Model Fit	R^2 (within) = 0.0309	Wald $\chi^2(10)$ = 22.06	p = 0.015		

Source: Research Data (2025)

Results in Table 4.8 showed that the Annual Risk Index Score had a negative but statistically insignificant effect on ln_RGDP ($b = -0.0086$, $p = .255$, 95% CI [-0.0243, 0.0070]). None of the yearly dummy variables demonstrated significant associations with ln_RGDP, indicating minimal temporal variation in the dependent variable after controlling for county-level fixed effects. The

model explained approximately 3.1% of the within-county variance in ln_RGDP (R^2 = 0.0312), with the overall model reaching significance, $F(10, 13) = 2.88$, $p = .039$.

The random-effects model, table 4.9 produced similar findings, with the Annual Risk Index Score again showing a negative but non-significant association with ln_RGDP (b = -0.0066, $p = .353$, 95% CI [-0.0205, 0.0073]). Yearly effects were likewise insignificant. The model accounted for 3.1% of the within-county variance (R^2 = 0.0309), and the overall model fit was significant, Wald $\chi^2(10) = 22.06$, $p = .015$.

4.5.2.3 Effect of Financial Information Systems (FIS) on Revenue Collection

Table 4.10: Fixed-Effects and Random-Effects Regression Results for the Effect of Financial Information Systems on ln_RGDP

Predictor	b (FE)	SE (FE)	T	P	95% CI (FE)	b (RE)	SE (RE)	z	p	95% CI (RE)
FIS	0.0407	0.0156	2.61	.022	[0.0070, 0.0743]	0.0386	0.0156	2.47	.014	[0.0079, 0.0692]
Year 2016	-0.0122	0.0150	-0.81	.430	[-0.0446, 0.0202]	-0.0117	0.0148	-0.79	.430	[-0.0406, 0.0173]
Year 2017	-0.0415	0.0192	-2.16	.050	[-0.0828, -0.0001]	-0.0403	0.0190	-2.12	.034	[-0.0776, -0.0030]
Year 2018	-0.0395	0.0211	-1.87	.084	[-0.0852, 0.0061]	-0.0384	0.0210	-1.83	.068	[-0.0796, 0.0028]
Year 2019	-0.0445	0.0188	-2.37	.034	[-0.0852, -0.0039]	-0.0433	0.0186	-2.33	.020	[-0.0799, -0.0068]
Year 2020	-0.0315	0.0234	-1.34	.202	[-0.0821, 0.0191]	-0.0294	0.0238	-1.23	.217	[-0.0762, 0.0173]
Year 2021	-0.0330	0.0227	-1.45	.170	[-0.0821, 0.0161]	-0.0311	0.0230	-1.35	.177	[-0.0762, 0.0141]
Year 2022	-0.0504	0.0287	-1.75	.103	[-0.1125, 0.0117]	-0.0486	0.0290	-1.68	.093	[-0.1054, 0.0082]
Year 2023	-0.0240	0.0380	-0.63	.539	[-0.1062, 0.0582]	-0.0234	0.0378	-0.62	.536	[-0.0974, 0.0506]
Year 2024	0.0030	0.0524	0.06	.956	[-0.1101, 0.1161]	0.0036	0.0527	0.07	.945	[-0.0996, 0.1068]
Constant	1.4730	0.2255	6.53	.000	[0.9859, 1.9600]	1.5007	0.1917	7.83	.000	[1.1249, 1.8765]

Model Statistics

- Fixed-Effects: R^2 (Within) = .251, F(10,13) = 35.51, p < .001
- Random-Effects: R^2 (Overall) = .115, Wald $\chi^2(10) = 299.72$, p < .001

Source: Research Data (2025)

The Hausman test indicated no systematic difference between the fixed-effects and random-effects estimators, $\chi^2(10) = 0.84$, p = 0.9999. Therefore, the random-effects model was selected as the appropriate estimator for subsequent interpretation, given its efficiency under the null hypothesis.

The random-effects regression model in Table 4.10 was selected following the Hausman test, which indicated no significant difference between fixed-effects and random-effects estimators, $\chi^2(10) = 0.84$, p = .9999. Thus, the random-effects model was deemed more efficient for estimation.

The analysis revealed that Financial Information Systems (FIS) had a positive and statistically significant effect on ln_RGDP (b = 0.0386, SE = 0.0156, z = 2.47, p = .014, 95% CI [0.0079, 0.0692]). Interpreting the coefficient, a one-% increase in the FIS index is associated with approximately a 3.86% increase in real GDP (in logarithmic terms), holding other factors constant. This effect is practically meaningful, suggesting that improvements in financial information systems may lead to notable gains in county-level economic performance through better financial controls, reporting, and decision-making.

Year-specific effects showed that 2017 (b = -0.0403, p = .034) and 2019 (b = -0.0433, p = .020) were associated with statistically significant declines in ln_RGDP compared to the baseline year, indicating potential macroeconomic or fiscal shocks during those periods. However, the magnitude of these year effects was relatively small (about 4% declines), and most other years did not show statistically significant deviations from the baseline (p > .05).

The overall model fit was significant, Wald $\chi^2(10) = 299.72$, $p < .001$, with an overall $R^2 = .115$, indicating that approximately 11.5% of the variation in ln_RGDP was explained by FIS and yearly variations combine.

The preliminary regressions successfully establish foundational bivariate relationships, revealing that ICA and FIS are promising predictors of revenue collection efficiency and justifying their inclusion in more complex multivariate models. In contrast, RIS exhibits weak direct influence, indicating its role may emerge more clearly in models that account for interactions or broader contextual effects. These findings validate the stepwise analytical approach and provide evidence for refining theoretical pathways in subsequent stages of analysis.

4.6 Multiple Linear Regression

4.6.1 Model 2: The Direct Effects Model

Model 2, the direct effects model, extends the baseline specification by including the primary independent variables Internal Control Activities (ICA) and Risk Assessment (RIS)—alongside county and time fixed effects. This model directly tests hypotheses H1 and H2, evaluating whether within-county variations in ICA and RIS are associated with changes in revenue performance as measured by Ln_RGDP. The increase in R-squared from Model 1 to Model 2 demonstrates the additional explanatory power contributed by these internal control components, indicating that they provide meaningful insight into variations in revenue collection beyond what is captured by unobserved county-level and time-specific factors.

Table 4.11: Fixed-Effects and Random-Effects Regression Results Predicting Log RGDP

Predictor	FE Coefficient (SE)	t / p	RE Coefficient (SE)	z / p
Internal Control Activities Index	0.049 (0.017)	t= 2.91, p = .012	0.049 (0.016)	z = 3.08, p = .002
Annual Risk Index Score	-0.012 (0.007)	t = -1.82, p = .093	-0.012 (0.006)	z = -1.90, p = .057
Year 2016	0.019 (0.021)	t = 0.93, p = .370	0.019 (0.021)	z = 0.91, p = .362
Year 2017	0.025 (0.025)	t = 1.00, p = .334	0.024 (0.025)	z = 0.97, p = .333
Year 2018	0.027 (0.021)	t = 1.26, p = .230	0.026 (0.022)	z = 1.21, p = .226
Year 2019	0.028 (0.022)	t = 1.28, p = .223	0.027 (0.021)	z = 1.25, p = .212
Year 2020	0.035 (0.026)	t = 1.36, p = .198	0.035 (0.026)	z = 1.33, p = .182
Year 2021	0.047 (0.032)	t = 1.49, p = .161	0.046 (0.032)	z = 1.45, p = .146
Year 2022	0.028 (0.034)	t = 0.83, p = .422	0.028 (0.034)	z = 0.82, p = .415
Year 2023	0.013 (0.030)	t = 0.42, p = .682	0.012 (0.031)	z = 0.39, p = .694
Year 2024	0.024 (0.043)	t = 0.57, p = .582	0.024 (0.043)	z = 0.56, p = .574
Constant	1.888 (0.065)	t = 29.26, p< .001	1.887 (0.064)	z = 29.31, p< .001

Model Fit

- Fixed Effects: R^2 (within) = .274, $F(11, 13) = 18.27$, $p < .001$
- Random Effects: R^2 (within) = .274, Wald $\chi^2(11) = 264.11$, $p < .001$

Hausman Test

$\chi^2(11) = 0.14$, $p = 1.000$ → No systematic difference between FE and RE estimates.

Source: Research Data (2025)

The results of the fixed-effects regression model indicated that the Internal Control Activities Index was a statistically significant positive predictor of the natural log of rgdp (b=0.0493b = 0.0493b=0.0493, *SE* = 0.0170, $t(13) = 2.91$, $p = .012$, 95% CI [0.0127, 0.0859]). This suggests that improvements in internal control mechanisms are associated with higher economic performance across counties. Conversely, Annual Risk Index Score had a negative but marginally significant association with ln_RGDP (b=−0.0121b = -0.0121b=−0.0121, *SE* = 0.0067, $t(13) = -1.82$, $p = .093$, 95% CI [-0.0266, 0.0023]), implying that higher risk levels may slightly reduce economic output, although this effect did not reach conventional levels of statistical significance.

For the time effects, none of the year dummy variables from 2016 to 2024 demonstrated significant relationships with ln_RGDP ($p > .05$ for all), indicating no substantial yearly fixed effect on revenue performance after accounting for other variables. The fixed-effects model explained 27.4% of the within-group variance (Rwithin2=.2737) and showed a strong overall model fit ($F(11, 13) = 18.27$, $p < .001$).

The random-effects model produced similar coefficient estimates, with Internal Control Activities Index remaining significant (b=0.0487b = 0.0487b=0.0487, *SE* = 0.0158, *z* = 3.08, *p* = .002, 95% CI [0.0177, 0.0796]) and Annual Risk Index Score showing a negative but marginal effect (b=−0.0116b = -0.0116b=−0.0116, *SE* = 0.0061, *z* = -1.90, *p* = .057, 95% CI [-0.0235, 0.0004]). Year dummy variables again failed to reach significance. The random-effects model had a strong fit (*Wald* χ^2(11) = 264.11, *p*< .001).

Finally, the Hausman test ($\chi 2\chi^2\chi 2$(11) = 0.14, *p* = 1.00) indicated no systematic difference between fixed- and random-effects estimators, suggesting that the random-effects model is preferred for inference.

Table 4.12: Comparison of Fixed Effects (FE) and Random Effects (RE) Estimates Using the Hausman Test

Predictor	FE (b)	RE (B)	Difference (b–B)	SE of Difference
Internal Control Activities	0.0493	0.0487	0.0006	0.0023
Annual Risk Index Score	–0.0121	–0.0116	–0.0006	0.0028
Year 2016	0.0191	0.0188	0.0003	0.0034
Year 2017	0.0250	0.0244	0.0005	0.0039
Year 2018	0.0269	0.0262	0.0007	0.0039
Year 2019	0.0277	0.0268	0.0009	0.0040
Year 2020	0.0349	0.0346	0.0003	0.0036
Year 2021	0.0471	0.0464	0.0007	0.0038
Year 2022	0.0282	0.0276	0.0006	0.0039
Year 2023	0.0127	0.0121	0.0005	0.0036
Year 2024	0.0240	0.0240	0.0001	0.0033

Note. b = Fixed Effects (FE) estimates; B = Random Effects (RE) estimates.
Hausman test: χ^2(11) = 0.14, p = 1.000.
No significant difference between FE and RE estimates; RE model is appropriate.
Source: Research Data (2025)

The comparison between Fixed Effects (FE) and Random Effects (RE) estimates was conducted using the Hausman specification test. Across all predictors, the coefficient differences (b−Bb-Bb−B) were minimal, ranging from 0.0001 to 0.0009, with relatively small standard errors (0.0023–0.0040). This indicates that both models produced highly consistent parameter estimates.

Key predictors, Internal Control Activities and Annual Risk Index Score, showed only negligible differences between FE and RE estimates (0.0006 and -0.0006, respectively), reinforcing the similarity between the two approaches. Similarly, the year dummy variables from 2016 to 2024 displayed very small coefficient differences, suggesting no systematic variation in time-fixed effects between the models.

The Hausman test confirmed this consistency, yielding a non-significant result ($\chi2(11) = 0.14\chi^2 11) = 0.14\chi2(11) = 0.14$, $p = 1.000$). This means that the null hypothesis, that differences in coefficients are not systematic, cannot be rejected. Consequently, the Random Effects model was preferred due to its efficiency in estimating parameters.

4.6.2 Objective 1: Effect of Control Activities on Revenue Collection

A random-effects generalized least squares (GLS) regression was conducted to evaluate the impact of internal control activities and risk assessment on revenue collection across the LREB counties. Table 1 presents the regression results.

Table 4.13: Random Effects GLS Regression on Revenue Collection

Predictor	Coefficient (B)	Robust SE	Z	p-value	95% CI
Internal Control Activities Index	0.0487	0.0158	3.08	0.002	[0.0177, 0.0796]
Annual Risk Index Score	–0.0116	0.0061	–1.90	0.057	[–0.0235, 0.0004]
Year Dummies (2016–2024)	Not significant				
Constant	1.8868	0.0644	29.31	0.000	[1.7606, 2.0130]

Note. Wald $\chi^2(11) = 264.11$, $p < .001$; $R^2_within = .274$, $R^2_between = .134$, $R^2_overall = .164$; $\rho = .80$.

Source: Research Data (2025)

The results indicate that internal control activities exert a positive and statistically significant effect on revenue collection (B = 0.0487, p = .002). This finding suggests that a one-% increase in the Internal Control Activities Index is associated with an estimated 4.87% increase in revenue collection, holding all other variables constant. Thus, strengthening internal control mechanisms enhances the efficiency and effectiveness of revenue mobilization in LREB counties.

The results of the random-effects regression indicate that internal control activities have a positive and statistically significant effect on revenue collection (B = 0.0487, p = .002). A one-% increase in the Internal Control Activities Index corresponds to an estimated 4.87% rise in revenue collection, holding other factors constant. This finding confirms that structured and effective control mechanisms contribute directly to improved financial performance in county governments.

These results align with prior literature emphasizing the central role of control activities in enhancing revenue collection. COSO (2013) defines control activities as the policies, procedures, and mechanisms that ensure management directives are executed effectively, reducing risks of errors, fraud, and mismanagement. Amudo and Inanga (2009) similarly assert that robust control mechanisms promote financial accountability and operational efficiency.

Studies in Nigeria by Okwoli (2004) and Abiola and Asiweh (2012) found that control activities—particularly segregation of duties and budgetary oversight—significantly enhance public sector revenue performance. Comparable findings in Kenya by Wanjiru (2015) and Mwangi and Ngugi (2014) indicate that counties with formalized control systems, including regular reconciliations and internal audits, report higher revenue collections. The present study's results corroborate these findings, reinforcing the argument that formalized control activities are critical for effective revenue mobilization in decentralized governance systems.

The current results also resonate with Attah-Botchwey (2018) and Kikonyogo (2017), who observed positive and significant associations between internal controls and revenue mobilization in Ghana and Uganda, respectively. Their findings suggested that strong control environments, supported by continuous monitoring and risk evaluation, lead to improved revenue outcomes—a conclusion mirrored in the LREB county context.

However, the findings contrast with studies like Sigilai and Njiru (2016), which reported no significant effect of control activities on revenue generation in Nakuru Level Five Hospital, suggesting that context-specific factors such as institutional capacity, automation levels, and oversight culture may mediate outcomes. Additionally, Ejoh and Ejom (2014) found mixed results in Nigerian higher education institutions, highlighting that weak implementation, poor training, and ineffective monitoring may dilute the benefits of internal control activities.

4.6.3 Objective 2: Effect of Risk Index Score on Revenue Collection

In contrast, the Annual Risk Index Score shows a negative but marginally significant association with revenue collection ($B = –0.0116$, $p = .057$). This implies that higher levels of risk exposure potentially reduce revenue collection by approximately 1.16% for each % increase in the risk score. Although the relationship is only marginally significant, it highlights the importance of robust risk assessment frameworks to mitigate revenue losses.

This finding contrasts with much of the reviewed literature, which predominantly reports a positive association between proactive risk assessment and revenue performance. Asuquo and Imo (2014) found that the use of structured risk assessment tools improved voluntary tax compliance, increasing revenue collection by 19% in Ghana. Similarly, Mukora (2016) highlighted how regular risk assessments in Zimbabwe enabled targeted enforcement strategies that enhanced collection rates. Omondi and Atambo (2018) further reported that Kenyan counties with formalized risk registers and risk committees achieved better revenue outcomes by preventing fraud and misuse of funds.

However, the marginally significant negative relationship observed in this study could reflect contextual limitations, including inadequate implementation of risk assessment frameworks or the presence of unmanaged external risks beyond the control of county revenue authorities. Studies

such as Yeboah and Amoako (2016) found that while system risks showed minimal influence, people and process risks hurt revenue outcomes—similar to the negative coefficient observed here.

From a theoretical perspective, Agency Theory (Eisenhardt, 1989) underscores the role of risk assessment in mitigating information asymmetry between policymakers (principals) and revenue collectors (agents), thereby improving accountability. Contingency Theory (Donaldson, 2006) further suggests that internal control mechanisms, including risk assessment, must align with dynamic operational environments to sustain performance. The modest effect observed in this study implies that while risk assessment is relevant, its potential impact may be underutilized due to gaps in predictive analytics, scenario modeling, and data-driven controls—approaches highlighted as best practice by the OECD (2018).

4.6.4 Joint Significance Test

The joint significance test was conducted to determine whether the Internal Control Activities Index and the Annual Risk Index Score, when considered together, have a statistically meaningful impact on revenue collection. This approach goes beyond assessing their individual coefficients and evaluates whether their combined effect significantly improves the model's explanatory power.

This test was necessary for three reasons. First, it controlled for overlapping effects, as individual tests may overlook cases where predictors exert meaningful influence only when acting in combination due to shared variance. Second, it ensured the robustness of the model by confirming whether the inclusion of multiple internal control components collectively enhances explanatory power rather than producing isolated effects. Third, it aligned with the theoretical underpinnings of Agency Theory and the COSO framework, which posit that internal control components function synergistically. Therefore, testing their joint significance provided a more realistic assessment of the internal control system's influence on revenue collection.

Table 4.14: Joint Significance Test for Internal Control Activities Index and Annual Risk Index Score

Predictor(s)	χ^2(df)	p
Internal Control Activities Index & Annual Risk Index Score	10.61 (2)	.005

Note. The joint test examines whether the coefficients of the Internal Control Activities Index and Annual Risk Index Score are simultaneously equal to zero. Results indicate a statistically significant joint effect ($p < .01$) on revenue collection.

The results in Table 4.8 indicated that the null hypothesis, stating that both coefficients are simultaneously equal to zero, was rejected, $\chi^2(2) = 10.61$, $p = .005$. This finding suggests that,

collectively, these two internal control components explain a statistically significant proportion of the variation in revenue collection across the LREB counties. In other words, while their individual effects may vary in strength, their combined impact is meaningful and reinforces the importance of incorporating both control activities and risk assessment measures in enhancing county revenue performance.

4.7 Comparison between the simple regression and moderation models

4.7.1 Effect of Internal Control Activities and Financial Information Systems on Revenue Collection

The comparison between the simple regression model and the moderation model highlights a substantial improvement in explanatory power and significance when Financial Information Systems (FIS) and their interaction with Internal Control Activities are introduced.

Table 4.15: Results Summary – Simple vs. Moderation Models

Predictor	Simple Model (FE)	Moderation Model (RE)
Internal Control Activities Index	b = 0.0486, SE = 0.0171, t = 2.84, p = .014, 95% CI [0.0116, 0.0855]	b = 0.0581, SE = 0.0075, z = 7.71, p < .001, 95% CI [0.0433, 0.0728]
Financial Information Systems	–	b = 0.0672, SE = 0.0078, z = 8.60, p < .001, 95% CI [0.0519, 0.0825]
ICA × FIS Interaction	–	b = 0.0158, SE = 0.0047, z = 3.33, p = .001, 95% CI [0.0065, 0.0250]
Year Effects (2016–2024)	Not Significant	Not Significant
Constant	b = 1.8120, SE = 0.0680, t = 26.66, p < .001	b = 0.8872, SE = 0.1249, z = 7.10, p < .001
Model Fit	R^2 (within) = .261; F(10,13) = 20.70, p < .001	Overall $R^2 \approx .645$; Wald $\chi^2(12) = 22.06$, p < .001
Preferred Model	Fixed Effects	Random Effects (Hausman $\chi^2(12) = 0.42$, p = 1.000)

Source: Research Data (2025)

In the simple model, Internal Control Activities Index had a positive and statistically significant effect on revenue collection efficiency (b = 0.0486, SE = 0.0171, t = 2.84, p = .014, 95% CI [0.0116, 0.0855]). This indicates that improvements in internal control mechanisms are associated with better revenue performance. However, the model's explanatory power was relatively modest (R^2 = 0.261), suggesting that while internal controls are important, other factors may also play a significant role in explaining variations in revenue collection efficiency. Year effects from 2016 to 2024 were not significant, implying no strong temporal variations after accounting for internal controls.

In the moderation model, the relationship between Internal Control Activities and revenue performance strengthened, with a larger coefficient (b = 0.0581, SE = 0.0075, z = 7.71, p< .001), indicating a more robust effect than in the simple model. Financial Information Systems demonstrated an independent and highly significant positive effect (b = 0.0672, SE = 0.0078, z = 8.60, p< .001), showing that improvements in financial information systems alone contribute substantially to revenue efficiency.

Moreover, the interaction term (ICA × FIS) was positive and significant (b = 0.0158, SE = 0.0047, z = 3.33, p = .001), confirming that FIS moderates the relationship between internal controls and revenue performance. This means that when financial information systems are strong, the positive impact of internal control activities on revenue efficiency is amplified, highlighting a synergistic effect between the two mechanisms.

Model fit improved significantly, with the moderation model explaining approximately 64.5% of the variance in revenue performance compared to 26.1% in the simple model. Based on the Hausman test ($\chi^2(12) = 0.42$, $p = 1.000$), the random-effects estimator was deemed consistent and efficient, making it the preferred specification for reporting.

These findings suggest that while internal controls are crucial for enhancing revenue performance, their effectiveness is significantly elevated when supported by robust financial information systems. This highlights the importance of an integrated approach—combining sound internal control frameworks with advanced technological systems—to achieve optimal fiscal outcomes in county revenue administration.

4.7.2 Effect of Annual Risk Score and Financial Information Systems on Revenue Collection

The simple regression model (Section 4.6.2) and moderation model (Section 4.8.2) present distinct perspectives on the relationship between the Annual Risk Index Score and revenue collection efficiency, with the latter incorporating Financial Information Systems (FIS) as a moderator.

Table 4.16: Comparison of Fixed-Effects (Simple Model) and Random-Effects (Moderation Model) Regression Results

Predictor	Simple Model (FE)	Moderation Model (RE)
Internal Control Activities Index	b = 0.0486, SE = 0.0171, t = 2.84, p = .014, 95% CI [0.0116, 0.0855]	b = 0.0581, SE = 0.0075, z = 7.71, p< .001, 95% CI [0.0433, 0.0728]
Financial Information Systems	–	b = 0.0672, SE = 0.0078, z = 8.60, p< .001, 95% CI [0.0519, 0.0825]
ICA × FIS Interaction	–	b = 0.0158, SE = 0.0047, z = 3.33, p = .001, 95% CI [0.0065, 0.0250]
Year Effects (2016–2024)	Not Significant	Not Significant
Constant	b = 1.8120, SE = 0.0680, t = 26.66, p< .001	b = 0.8872, SE = 0.1249, z = 7.10, p< .001
Model Fit	R^2 (within) = .261; $F(10,13)$ = 20.70, p< .001	Overall $R^2 \approx .645$; Wald $\chi^2(12)$ = 22.06, p< .001
Preferred Model	Fixed Effects	Random Effects (Hausman $\chi^2(12)$ = 0.42, p = 1.000)

Note. FE = Fixed Effects; RE = Random Effects; ICA × FIS = Interaction between Internal Control Activities and Financial Information Systems.
Source: Research Data (2025)

The fixed-effects regression results revealed that the Annual Risk Index Score had a negative but statistically insignificant effect on ln(RGDP) (b = -0.0086, p = .255), suggesting that risk

perceptions alone do not strongly influence revenue efficiency. Similarly, year-specific effects were largely insignificant, indicating minimal temporal variation beyond county-level factors. The model accounted for only 3.1% of within-county variance, signaling limited explanatory power. These findings suggest that risk alone, without considering mitigating institutional factors, may not adequately explain variations in revenue performance.

When FIS and the interaction term were added (Section 4.8.2), the explanatory power of the model increased substantially, with the fixed-effects specification achieving a within R^2 of 0.296, nearly ten times that of the simple model. The Annual Risk Index Score displayed a marginally non-significant negative effect (b = -0.0126, p = .096), but crucially, FIS showed a significant positive association with ln(RGDP) (b = 0.0459, p = .005).
Most notably, the Risk × FIS interaction was positive and statistically significant (b = 0.0089, p = .049), indicating that the adverse effects of risk on revenue performance diminish when financial information systems are robust. This supports the view that FIS enhance decision-making, improves transparency, and facilitates compliance monitoring (Okoye & Ezejiofor, 2014; Muthusi, 2017).

The Hausman test further justified the fixed-effects specification for the moderation model ($\chi^2(12) = 38.35$, $p = 0.0001$), confirming that unobserved county-specific effects correlate with predictors, thus favoring FE estimates for consistent inference. Comparatively, the simple model portrays risk as a weak predictor of revenue performance, while the moderation model highlights the importance of institutional capacity—specifically, financial information systems—in transforming risk management into improved revenue outcomes. These findings align with institutional theory (Meyer & Rowan, 1977), which posits that organizational practices (e.g., robust FIS) legitimize processes and improve performance under conditions of uncertainty.

4.8 Moderation Effect

The primary objective of this study was to investigate the impact of the Financial Information System on the relationship between Control Activities, Risk Assessment, and Revenue Collection in the Lake Region Economic Bloc (LREB) Counties in Kenya. To achieve this objective, both Fe and Re models were tested.

4.8.1 Objective 3: Moderating effect of the Financial Information System on the relationship between Control Activities and Revenue Collection in the LREB Counties in Kenya

The analysis examined whether the Financial Information System (FIS) moderates the relationship between control activities and revenue collection efficiency (ln(RGDP)) in the LREB counties. The fixed-effects model was selected as the appropriate specification, based on the Hausman test results ($\chi^2(12) = 0.42$, p = 1.0000), which indicated no systematic difference between FE and RE estimates, allowing for consistent interpretation. Table 4.17 presents the

results of the fixed-effects and random-effects (RE) regression predicting the natural logarithm of the revenue-to-GDP ratio (ln(RGDP)).

Table 4.17: Financial Information System (FIS) moderates the relationship between control activities and revenue collection efficiency

Predictor	FE Coef.	FE SE	t	FE p	95% CI (FE)	RE Coef.	RE SE	z	RE p	95% CI (RE)
ICA	0.0603	0.0076	7.93	0.000	[0.0438, 0.0767]	0.0581	0.0075	7.71	0.000	[0.0433, 0.0728]
FIS	0.0672	0.0090	7.48	0.000	[0.0478, 0.0866]	0.0672	0.0078	8.60	0.000	[0.0519, 0.0825]
ICA × FIS Interaction	0.0116	0.0056	2.05	0.061	[-0.0006, 0.0237]	0.0158	0.0047	3.33	0.001	[0.0065, 0.0250]
Year 2016	0.0097	0.0169	0.58	0.574	[-0.0268, 0.0463]	0.0112	0.0187	0.60	0.547	[-0.0254, 0.0479]
Year 2017	0.0037	0.0220	0.17	0.867	[-0.0438, 0.0513]	0.0046	0.0243	0.19	0.849	[-0.0430, 0.0522]
Year 2018	0.0009	0.0176	0.05	0.958	[-0.0370, 0.0389]	0.0020	0.0199	0.10	0.919	[-0.0370, 0.0410]
Year 2019	-0.0017	0.0159	-0.11	0.916	[-0.0361, 0.0326]	-0.0009	0.0170	-0.05	0.959	[-0.0342, 0.0324]
Year 2020	-0.0101	0.0140	-0.72	0.485	[-0.0404, 0.0202]	-0.0066	0.0147	-0.45	0.653	[-0.0354, 0.0222]
Year 2021	-0.0002	0.0165	-0.01	0.989	[-0.0358, 0.0353]	0.0026	0.0180	0.14	0.885	[-0.0326, 0.0378]
Year 2022	-0.0059	0.0251	-0.24	0.817	[-0.0601, 0.0482]	-0.0029	0.0251	-0.12	0.908	[-0.0521, 0.0462]
Year 2023	-0.0009	0.0217	-0.04	0.969	[-0.0477, 0.0459]	0.0012	0.0216	0.05	0.957	[-0.0413, 0.0436]
Year 2024	0.0067	0.0274	0.24	0.811	[-0.0526, 0.0660]	0.0065	0.0266	0.25	0.806	[-0.0456, 0.0587]
Constant	0.8747	0.1474	5.93	0.000	[0.5562, 1.1932]	0.8872	0.1249	7.10	0.000	[0.6424, 1.1319]

Source: Research Data (2025)

The Hausman test comparing fixed- and random-effects models yielded $\chi^2(12) = 0.42$, $p = 1.000$, indicating no systematic difference between the estimators. Thus, the random-effects model is consistent and preferred for reporting, while the fixed-effects model is provided as a robustness check.

Table 4.18: Hausman Test Comparing Fixed-Effects and Random-Effects Models

Predictor	FE Coef. (b)	RE Coef. (B)	Difference (b-B)	Std. Error √(V_b-V_B)
Internal Control Index	0.0603	0.0581	0.0022	0.0013
Financial Information Systems	0.0672	0.0672	-0.00002	0.0011
ICA × FIS Interaction	0.0116	0.0158	-0.0042	0.00006
Year 2016	0.0097	0.0112	-0.0015	–
Year 2017	0.0037	0.0046	-0.0009	–
Year 2018	0.0009	0.0020	-0.0011	–
Year 2019	-0.0017	-0.0009	-0.0008	–
Year 2020	-0.0101	-0.0066	-0.0035	–
Year 2021	-0.0002	0.0026	-0.0028	–
Year 2022	-0.0059	-0.0029	-0.0030	–
Year 2023	-0.0009	0.0012	-0.0020	–
Year 2024	0.0067	0.0065	0.0002	–

Hausman Test Statistic: $\chi^2(12) = 0.42$, $p = 1.000$

Source: Research Data (2025)

Note. b = coefficients from fixed-effects (FE) model, consistent under both H0 and H1. B = coefficients from the random-effects (RE) model, efficient under H0 but inconsistent under H1. The test indicates no systematic difference between FE and RE estimates.

The Hausman test evaluates whether the RE estimator is consistent by testing for systematic differences between FE and RE coefficients. In this case, the Hausman test yielded $\chi^2(12) = 0.42$, $p = 1.000$, indicating no significant difference between FE and RE estimates. This suggests that the RE model assumptions hold, specifically that unobserved county-specific effects are uncorrelated with the explanatory variables, making the RE model both consistent and efficient. As such, the RE model is reported as the primary specification, with FE estimates included for robustness and comparative purposes.

In the RE model, both the Internal Control Activities Index and Financial Information Systems are positively and highly significantly linked with ln(RGDP). Specifically, a one-% increase in the Internal Control Activities Index is associated with a 0.058 increase in ln(RGDP) ($z = 7.71$, $p < 0.001$), while a one-% increase in Financial Information Systems corresponds to a 0.067 increase in ln(RGDP) ($z = 8.60$, $p < 0.001$). These findings suggest that stronger internal controls and improved financial information systems contribute significantly to revenue performance relative to GDP.

The interaction term (ICA × FIS) is also positive and significant ($\beta = 0.016$, $z = 3.33$, $p = 0.001$), indicating that the combined effect of strong internal controls and robust financial information systems enhances revenue generation beyond their individual contributions. This highlights a potential synergy between the two mechanisms, implying that countries with both effective internal controls and high-quality financial information systems achieve comparatively higher revenue efficiency.

Yearly dummy variables from 2016 to 2024 are not statistically significant, indicating that, after controlling for internal controls, financial information, and their interaction, there are no systematic temporal effects on ln(RGDP) during the study period. The constant term is positive and highly significant ($\beta = 0.887$, $z = 7.10$, $p < 0.001$), representing the baseline ln(RGDP) when all predictors are at zero.

The RE model accounts for a larger variance in ln(RGDP), with an overall R^2 of 0.645, a within R^2 of 0.717, and a between R^2 of 0.624. The estimated intra-class correlation ($\rho = 0.620$) shows that nearly 62% of the total variance in ln(RGDP) is attributable to differences between counties, reflecting meaningful clustering at the county level.

The positive and significant effects of ICA and FIS align with prior studies that emphasize the enabling role of technology and controls in enhancing revenue efficiency. For instance, Romney and Steinbart (2015) argued that FIS improves transparency, reduces errors, and accelerates

decision-making. Gathogo and Ragui (2014) and Muthusi (2017) similarly observed that integrated revenue systems in Kenyan counties improved collection efficiency and reduced leakages.

The finding that FIS moderates the ICA–revenue relationship extends prior evidence from Kinyua, Gakure, and Gekara (2015) and Wamalwa and Simiyu (2020), who suggested that FIS strengthens internal control effectiveness but did not formally test for interaction effects. By explicitly modeling this moderation, the current study confirms that technologically enabled internal controls are more effective than internal controls in isolation, providing empirical support for Task-Technology Fit (TTF) theory (Goodhue & Thompson, 1995).

While prior studies documented positive FIS or ICA effects, they often relied on cross-sectional designs, binary measures, or descriptive methods, limiting their capacity to capture nuanced interactions or inter-county heterogeneity. In contrast, the current study's panel design and multi-dimensional indices allow for precise estimation of both direct and interaction effects, accounting for clustering at the county level ($\rho = 0.62$).

Moreover, many earlier studies focused on national or urban contexts (e.g., Nairobi County, South Africa's MFMS, Rwanda, Uganda), where institutional capacity and technological readiness differ from the LREB counties. This study demonstrates that even in decentralized, resource-constrained counties, the synergy between ICA and FIS produces meaningful improvements in revenue efficiency, emphasizing the contextual relevance of system quality, staff capacity, and technological infrastructure.

Prior studies examining the interplay between internal controls and FIS primarily used cross-sectional surveys or descriptive quantitative methods (e.g., Gathogo &Ragui, 2014; Muthusi, 2017; Okoye &Ezejiofor, 2014). While these studies documented positive associations between FIS adoption and revenue performance, they did not formally test for moderation, limiting their capacity to identify interaction effects between ICA and FIS. Similarly, Kinyua, Gakure, and Gekara (2015) and Wamalwa and Simiyu (2020) highlighted that FIS enhances internal control effectiveness but relied on descriptive inferences rather than robust panel econometric models.

By contrast, this study employed a Random Effects panel model, capturing both between-county differences and within-county dynamics over nine years. This methodology allows for explicit testing of moderating effects, providing robust statistical evidence for the synergistic interaction between ICA and FIS, an advance over prior linear regression or cross-sectional studies. The high intra-class correlation ($\rho = 0.62$) further confirms meaningful county-level clustering, which is accounted for in the model, enhancing the reliability of the moderation analysis.

Many previous studies were conducted in national or municipal contexts outside the LREB counties (e.g., MFMS in South Africa, municipal systems in Rwanda and Uganda, Nairobi

County). Differences in institutional capacity, FIS maturity, and organizational culture may influence the effectiveness of internal controls and FIS in these settings (Mungai & Ochieng, 2020; Simiyu &Jagongo, 2019). Implementation barriers such as resistance to change, inadequate training, or connectivity challenges often constrained the full potential of FIS in revenue performance.

The current study situates the analysis within decentralized, resource-constrained counties in Kenya, providing novel insights into how FIS can enhance internal control effectiveness under conditions of limited technological infrastructure. The RE model findings demonstrate that even in these contexts, FIS acts as a force multiplier, strengthening internal controls and mitigating fiscal inefficiencies, thereby enhancing the revenue-to-GDP ratio.

Prior research often relied on binary or simplistic measures of FIS adoption (e.g., system presence or absence) or internal control components, which may underestimate the nuanced effects of system quality and integration. Studies that examined internal controls often focused on individual elements, such as audit compliance or budgeting processes, without considering their interaction with information systems.

This study addresses these limitations by constructing multi-dimensional indices for both ICA and FIS, capturing automation, audit trails, risk management integration, user training, and real-time monitoring. The interaction term formally quantifies the moderating influence of FIS, revealing that the presence of a high-quality financial information system significantly amplifies the impact of internal controls on revenue efficiency. This approach aligns with Task-Technology Fit (TTF) theory (Goodhue & Thompson, 1995), which posits that the effectiveness of a technology depends on its alignment with task requirements—in this case, the ability of FIS to support internal control activities.

The key contribution of this study lies in empirically demonstrating the moderating role of FIS, moving beyond previous research that primarily established direct effects. By showing that counties with strong internal controls but weak FIS may not achieve optimal revenue efficiency—and vice versa—this research provides evidence for a synergistic institutional mechanism. FIS not only enhances routine financial operations but also acts as a risk-buffering tool, improving revenue resilience under conditions of uncertainty.

The findings extend theoretical understanding in public financial management by highlighting technology-enabled governance mechanisms, where FIS facilitates real-time monitoring, error detection, and transparency, thereby enhancing the efficacy of internal controls and supporting revenue-to-GDP growth.

4.8.2 Objective 4: Moderating effect of the Financial Information System on the relationship between Risk Score Index and Revenue Collection in the LREB Counties in Kenya

The moderating role of Financial Information Systems (FIS) on the relationship between the Risk Score Index and Revenue Collection Efficiency (ln(RGDP)) was assessed using a fixed-effects regression model, as determined by the Hausman specification test ($\chi^2(12) = 38.35$, $p = 0.0001$).

Table 4.19: Fixed-Effects and Random-Effects Regression Predicting ln(RGDP) (Revenue-to-GDP Ratio)

Predictor	FE Coef.	FE SE	T	FE p	95% CI (FE)	RE Coef.	RE SE	z	RE p	95% CI (RE)
Annual Risk Index Score	-0.0126	0.0070	-1.80	0.096	[-0.0278, 0.0026]	-0.0053	0.0061	-0.87	0.386	[-0.0172, 0.0067]
Financial Information Systems	0.0459	0.0137	3.36	0.005	[0.0164, 0.0754]	0.0422	0.0141	3.00	0.003	[0.0147, 0.0698]
Risk × FIS Interaction	0.0089	0.0041	2.18	0.049	[0.0001, 0.0177]	0.0090	0.0043	2.11	0.035	[0.0006, 0.0174]
Year 2016	-0.0112	0.0166	-0.67	0.512	[-0.0470, 0.0247]	-0.0112	0.0157	-0.72	0.474	[-0.0419, 0.0195]
Year 2017	-0.0517	0.0212	-2.44	0.030	[-0.0975, -0.0059]	-0.0497	0.0212	-2.35	0.019	[-0.0913, -0.0082]
Year 2018	-0.0414	0.0236	-1.76	0.103	[-0.0923, 0.0095]	-0.0425	0.0242	-1.76	0.078	[-0.0899, 0.0048]
Year 2019	-0.0443	0.0230	-1.92	0.077	[-0.0940, 0.0054]	-0.0464	0.0222	-2.09	0.**037**	[-0.0899, -0.0028]
Year 2020	-0.0384	0.0227	-1.69	0.115	[-0.0876, 0.0107]	-0.0338	0.0240	-1.41	0.159	[-0.0807, 0.0132]
Year 2021	-0.0297	0.0246	-1.21	0.248	[-0.0828, 0.0234]	-0.0288	0.0256	-1.12	0.262	[-0.0790, 0.0215]
Year 2022	-0.0556	0.0297	-1.87	0.084	[-0.1198, 0.0086]	-0.0525	0.0306	-1.71	0.087	[-0.1125, 0.0076]
Year 2023	-0.0166	0.0369	-0.45	0.660	[-0.0963, 0.0631]	-0.0191	0.0369	-0.52	0.604	[-0.0914, 0.0531]
Year 2024	0.0010	0.0505	0.02	0.985	[-0.1081, 0.1100]	0.0027	0.0515	0.05	0.959	[-0.0982, 0.1035]
Constant	1.4992	0.1872	8.01	0.000	[1.0947, 1.9036]	1.5013	0.1650	9.10	0.000	[1.1778, 1.8248]

Model Statistics

- FE: Within $R^2 = 0.296$, Between $R^2 = 0.128$, Overall $R^2 = 0.151$, $F(12,13) = 15.21$, $p < 0.001$, $\sigma_u = 0.148$, $\sigma_e = 0.072$, $\rho = 0.808$
- RE: Within $R^2 = 0.290$, Between $R^2 = 0.162$, Overall $R^2 = 0.182$, Wald $\chi^2(12) = 144.27$, $p < 0.001$, $\sigma_u = 0.114$, $\sigma_e = 0.072$, $\rho = 0.715$]

Source: Research Data (2025)

Hausman Test

The Hausman test was conducted to determine the appropriate model specification for analyzing the effect of Annual Risk Index, Financial Information Systems, and their interaction on ln(RGDP).

Table 4.20: Hausman Test Comparing Fixed-Effects and Random-Effects Models Predicting ln (RGDP)

Predictor	FE Coef. (b)	RE Coef. (B)	Difference (b-B)	Std. Error √(V_b-V_B)
Annual Risk Index Score	-0.0126	-0.0053	-0.0073	0.0030
Financial Information Systems	0.0459	0.0422	0.0037	0.0025
Risk × FIS Interaction	0.0089	0.0090	-0.0002	0.0009
Year 2016	-0.0112	-0.0112	0.00003	–
Year 2017	-0.0517	-0.0497	-0.0020	–
Year 2018	-0.0414	-0.0425	0.0012	–
Year 2019	-0.0443	-0.0464	0.0021	–
Year 2020	-0.0384	-0.0338	-0.0047	–
Year 2021	-0.0297	-0.0288	-0.0010	–
Year 2022	-0.0556	-0.0525	-0.0032	–
Year 2023	-0.0166	-0.0191	0.0025	–
Year 2024	0.0010	0.0027	-0.0017	–

Hausman Test Statistic: $\chi^2(12) = 38.35$, p = 0.0001*Source: Research Data (2025)*

Note. b = coefficients from fixed-effects (FE) model, consistent under both H0 and H1. B = coefficients from random-effects (RE) model, efficient under H0 but inconsistent under H1. The significant Hausman test indicates systematic differences between FE and RE estimates, favoring the FE model for reporting.

The test yielded a chi-square statistic of $\chi^2(12) = 38.35$ with a p-value of 0.0001. The null hypothesis of the Hausman test states that the random-effects (RE) estimator is consistent, implying no systematic difference between the fixed-effects (FE) and RE coefficients. Given that the p-value is below the 0.05 significance threshold, the null hypothesis is rejected, indicating a systematic difference between FE and RE estimates. This result suggests that the assumption underlying the RE model—that unobserved county-specific effects are uncorrelated with the predictors—is violated. Consequently, the fixed-effects model is the preferred specification for reporting, as it provides consistent estimates of the relationships of interest. The random-effects model may still be reported as a robustness check, but the FE model is statistically justified as the primary model.

Table 5 presents the results of the fixed-effects regression examining the influence of the Annual Risk Index, Financial Information Systems, and their interaction on the natural logarithm of the revenue-to-GDP ratio (ln(RGDP)) across 14 counties over 10 years. Based on the Hausman test ($\chi^2(12) = 38.35$, $p = 0.0001$), the fixed-effects model was selected as the preferred specification because it produces consistent estimates, accounting for unobserved county-specific characteristics that may be correlated with the predictors.

In the FE model, the Annual Risk Index Score has a negative but marginally non-significant effect on ln(RGDP) ($\beta = -0.013$, $t = -1.80$, $p = 0.096$), suggesting that higher perceived annual risk may slightly reduce revenue performance relative to GDP, although this effect does not reach conventional levels of statistical significance. Financial Information Systems show a positive and statistically significant association with ln(RGDP) ($\beta = 0.046$, $t = 3.36$, $p = 0.005$), indicating that counties with stronger financial information systems tend to achieve higher revenue efficiency.

The interaction between risk and financial information systems (Risk × FIS) is also positive and significant ($\beta = 0.009$, $t = 2.18$, $p = 0.049$), implying that the adverse effects of annual risk on revenue performance are mitigated when financial information systems are robust. This result highlights the synergistic effect of risk management and information systems in sustaining revenue performance.

The year-specific dummy variables suggest temporal variation in revenue performance. Notably, the year 2017 shows a statistically significant negative effect ($\beta = -0.052$, $t = -2.44$, $p = 0.030$), indicating that ln(RGDP) was lower in that year compared to the reference year (2015, omitted). Other yearly coefficients are negative but not statistically significant at the 5% level, suggesting no consistent temporal trend after controlling for the main predictors.

The model's within R^2 of 0.296 shows that nearly 30% variance in ln(RGDP) within counties over time is explained by the predictors, while the estimated intra-class correlation ($\rho = 0.808$) shows that a substantial portion of the total variance is attributed to differences across counties.

The findings of objective 4 align with and extend existing literature on the role of Financial Information Systems (FIS) in public financial management and revenue performance. Prior research has consistently demonstrated the direct benefits of FIS, but few have explored its moderating role in complex institutional relationships, such as between risk management and revenue efficiency.

Gathuku& Muturi (2024) established that automated revenue collection systems significantly amplify the benefits of budgeting practices on financial performance in Kenyan county governments. Their findings suggest that technology-driven financial systems enhance the capacity of institutions to translate planning into improved fiscal outcomes. The present study builds on this by showing a similar amplifying effect, but within the context of risk

management—illustrating how FIS not only supports routine budgeting but also helps mitigate performance risks.

Mbanze& Okiro (2023) study revealed that digital tax systems moderate the relationship between sociological attributes (e.g., taxpayer behavior and compliance culture) and tax compliance. This parallels the present findings, where FIS is shown to moderate the adverse effects of fiscal risk, suggesting that robust technological systems can act as buffers against non-structural factors—be it behavioral or institutional—that could otherwise undermine revenue outcomes.

Ajernet (2023) and Njuguna (2024) reported strong positive associations between FIS capabilities and financial performance or revenue growth, reinforcing the general premise that FIS investments yield measurable fiscal benefits. However, neither study incorporated a moderation framework, leaving open the question of whether FIS interacts with other institutional or operational factors—an area addressed in this research.

Uyar et al. (2021), in a global study, these authors found that e-government systems can interact with institutional risk to influence revenue leakage, suggesting that digital platforms not only facilitate efficiency but also shape how risks translate into fiscal outcomes. This conceptual foundation strongly supports the present study's empirical finding that FIS mitigates the negative effects of risk on revenue collection efficiency.

This study offers fresh empirical evidence of FIS's moderating influence, particularly in the relationship between the Annual Risk Index Score and Revenue Collection Efficiency, whereas prior research has mostly concentrated on the direct effects of FIS. The results demonstrate that FIS does more than improve revenue outcomes directly—it also enhances institutional resilience, enabling counties to sustain or improve revenue performance even under heightened fiscal risks. This contribution is particularly important for public financial management research because it shifts the conversation from viewing FIS merely as a performance-enhancing tool to recognizing it as a risk-management and performance-stabilizing mechanism. By empirically confirming this moderating role, the study offers a richer, more nuanced understanding of how digital financial systems interact with institutional dynamics to drive fiscal sustainability.

Although this study's results are generally consistent with previous research, there are some clear differences. Contrary to Ajernet (2023), who reported that the effect of Financial Information Systems (FIS) on revenue outcomes is largely uniform across institutional settings, the present study finds that FIS effects are contingent on the level of institutional risk, indicating a moderating rather than purely direct relationship.

Muthusi (2022) suggested that the adoption of FIS yields diminishing returns when risk levels are high, implying potential substitution effects. In contrast, this study finds evidence that FIS enhances institutional resilience under high-risk conditions, thereby amplifying revenue

collection efficiency rather than neutralizing it. While Waweru & Mutinda (2021) reported that the role of FIS is marginal compared to broader governance reforms, the present analysis highlights its significant interactive role with risk management, suggesting that technological systems may have a more strategic function than previously recognized.

4.9Comparison between Simple Regression and the Moderation Model

4.9.1 Effect of Internal Control Activities and Financial Information Systems on Revenue Collection

The Random Effects generalized least squares (GLS) regression was employed to examine how Internal Control Activities (ICA) and the Annual Risk Index (ARI) influence revenue collection across the LREB counties. The results reveal that ICA has a positive and statistically significant effect on revenue collection (B = 0.0487, p = 0.002), suggesting that counties with stronger internal control mechanisms—such as proper segregation of duties, robust audit trails, and effective financial reporting procedures—tend to achieve higher revenue performance. This finding is consistent withwith prior studies emphasizing the role of internal controls in enhancing accountability and minimizing revenue leakages.

The Annual Risk Index (ARI), which measures the level of institutional and operational risk, shows a negative association with revenue collection (B = –0.0116), although this effect is only marginally significant (p = 0.057). This indicates that higher risk levels may slightly dampen revenue efficiency, reflecting potential vulnerabilities such as weak oversight, fraud, or non-compliance. The relatively low overall explanatory power of the model (R^2_overall = 0.164) suggests that other factors beyond ICA and ARI contribute to county revenue performance. Nonetheless, the high intra-class correlation ($\rho = 0.80$) underscores that a substantial portion of the variation in revenue collection is attributable to differences between counties, highlighting the importance of county-level contextual factors such as governance quality, staff capacity, and institutional maturity.

The Random Effects model incorporating Financial Information Systems (FIS) and the interaction term (ICA × FIS), with year dummies as controls, offers a more comprehensive understanding of revenue performance determinants. In this model, both ICA (B = 0.0581, p < 0.001) and FIS (B = 0.0672, p < 0.001) remain positive and highly significant, reinforcing the importance of internal control activities while highlighting the independent contribution of advanced financial information systems to revenue efficiency.

Critically, the interaction term between ICA and FIS is also significantly positive (B = 0.0158, p = 0.001), suggesting a synergistic effect: counties that combine strong internal controls with high-quality financial information systems realize higher revenue collection than would be expected from the sum of their individual effects. This indicates that FIS not only improves revenue outcomes directly but also strengthens the effectiveness of internal controls, supporting

the notion of technology-enabled governance. Compared to the simple RE GLS model, the moderation model exhibits substantially higher explanatory power, demonstrating that capturing interactions between institutional mechanisms and technological enablers is essential for understanding revenue performance in decentralized county settings.

These results are important from a theoretical and practical standpoint. Theoretically, they are consistent with the Task-Technology Fit (TTF) idea, which holds that technology enhances task-specific procedures, including internal control operations, to produce the biggest performance gains. Practically, the results suggest that county governments seeking to improve revenue efficiency should not only invest in internal control systems but also ensure these controls are integrated with robust financial information systems to maximize their impact.

4.9.2 Effect of Annual Risk Score and Financial Information Systems on Revenue Collection

The simple regression models, both fixed-effects (FE) and random-effects (RE), examined the direct effect of the Annual Risk Index (ARI) on revenue collection efficiency (ln(RGDP)) across LREB counties. The FE model reported a negative but statistically insignificant effect ($b = -0.0086$, $p = 0.255$), while the RE model produced similar results ($b = -0.0066$, $p = 0.353$). None of the yearly dummy variables were statistically significant in either model, indicating minimal temporal variation in revenue performance after accounting for county-level heterogeneity. The explanatory power of these models was low, with $R^2_within \approx 0.031$, reflecting that only about 3% of the within-county variation in ln(RGDP) was explained by the ARI alone. Despite the low within-county R^2, both models achieved overall significance (FE: $F(10,13) = 2.88$, $p = 0.039$; RE: Wald $\chi^2(10) = 22.06$, $p = 0.015$), suggesting that some between-county variance contributed to the model fit. In practical terms, this indicates that higher risk scores have a slight, non-significant tendency to reduce revenue collection efficiency, but the effect is weak and inconsistent across counties and time.

In contrast, the moderation model incorporated Financial Information Systems (FIS) and an interaction term between ARI and FIS, allowing an assessment of whether FIS moderates the effect of risk on revenue performance. The Hausman test indicated that a FE specification was appropriate, but both FE and RE results are reported for robustness. In this model, the direct effect of ARI remained negative and marginally significant (FE: $b = -0.0126$, $p = 0.096$; RE: $b = -0.0053$, $p = 0.386$). Importantly, FIS exhibited a positive and statistically significant main effect (FE: $b = 0.0459$, $p = 0.005$; RE: $b = 0.0422$, $p = 0.003$), confirming that counties with more developed financial information systems achieve higher revenue efficiency. The interaction term (Risk × FIS) was positive and significant in both FE ($b = 0.0089$, $p = 0.049$) and RE ($b = 0.0090$, $p = 0.035$) models, indicating that FIS moderates the relationship between risk and revenue efficiency: higher-quality financial systems attenuate the negative impact of risk on revenue

collection. This suggests a synergistic effect, whereby the adverse influence of higher risk scores is mitigated when effective technological systems are in place.

Model fit in the moderation analysis improved relative to the simple regression. Within-county R^2 increased to 0.290–0.296, and overall explanatory power rose to 0.151–0.182, reflecting the additional variance explained by FIS and the interaction term. The high intra-class correlation ($\rho \approx 0.715$–0.808) persisted, underscoring substantial county-level clustering in revenue efficiency.

Comparing the simple regression models with the moderation models reveals several important insights regarding the dynamics between risk, technology, and revenue collection efficiency. First, the direct effect of the Annual Risk Index (ARI) on revenue efficiency is weak and statistically non-significant when Financial Information Systems (FIS) are not considered, indicating that risk alone does not strongly predict revenue outcomes across the LREB counties. Second, the inclusion of FIS and the interaction term between risk and FIS demonstrates a clear moderating effect: technological systems strengthen institutional capacity, mitigating the adverse impact of higher risk on revenue performance. The significant positive interaction between ARI and FIS is consistent with the Task-Technology Fit (TTF) theory, suggesting that revenue collection tasks achieve better outcomes when supported by appropriately aligned technology. Third, the moderation model exhibits substantially higher explanatory power compared to the simple regression, capturing more variance in revenue efficiency. This improvement underscores the key role of integrated internal controls and technological systems in enhancing revenue performance, particularly in decentralized county contexts where institutional capacity and system quality vary widely.

CHAPTER FIVE
SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

5.1 Introduction

This chapter summarizes the main research findings, offers a thorough analysis of the conclusions reached, and offers helpful suggestions based on the study's goals. Examining how Financial Information Systems (FIS) affect the connection between Internal Controls and Revenue Collection in Kenya's Lake Region Economic Bloc (LREB) counties was the main goal. In particular, the study assessed how risk assessment and control activities affected revenue collection and how FIS moderated the impact of internal control systems on their efficacy.

5.2 Summary of Major Findings

The main conclusions of the study are summarized in this section, along with the connections between revenue collection and internal control operations in Kenya's LREB counties. Using both fixed-effects and random-effects regression models to account for county-specific variables and temporal fluctuations, the investigation examined the impact of structured control mechanisms on financial performance. The results offer empirical proof of how well internal control operations improve revenue mobilization, providing valuable information for guiding governance procedures, policy, and capacity-building programs in county governments.

5.2.1 The effect of internal control activities on revenue collection in the LREB counties in Kenya

The analysis of Objective 1 examined the effect of internal control activities on revenue collection efficiency in the LREB counties in Kenya. The study hypothesis stated that 'There is no effect of control activities on Revenue Collection in the Lake Region Economic Bloc Counties in Kenya'. Results from both fixed-effects and random-effects regression models consistently indicate that internal control activities exert a positive and statistically significant impact on revenue performance. Specifically, the Internal Control Activities Index was positively associated with revenue collection, with a one-% increase in the index corresponding to approximately a 4.87–4.9% increase in ln(RGDP), holding other factors constant ($b = 0.0486$, $SE = 0.0171$, $t = 2.84$, $p = .014$; $B = 0.0487$, $p = .002$).

Year-specific dummy variables (2016–2024) were not statistically significant, suggesting that there were no strong year-to-year variations in revenue collection efficiency after accounting for internal control activities and unobserved county-specific effects. The overall model demonstrated a good fit, explaining roughly 26.1% of the within-county variation in revenue collection efficiency ($F(10, 13) = 20.70$, $p < .001$), with robust standard errors clustered by county.

5.2.2 The Effect of the Annual Risk Index Score on revenue collection (ln_RGDP) in the LREB counties

The study findings indicate that the Annual Risk Index Score has a negative but statistically insignificant effect on revenue collection efficiency in the LREB counties. Both fixed-effects and random-effects models yielded consistent results, showing minimal influence of annual risk on revenue performance. The marginally significant estimate (B = –0.0116, p = .057) suggests that higher risk exposure could potentially reduce revenue collection by approximately 1.16% per % increase in the risk score, although this effect is relatively small.

These results do not provide strong evidence for rejecting the null hypothesis, an indication that, in the LREB counties, variations in the Annual Risk Index alone do not substantially affect revenue collection. However, the joint significance test ($\chi^2(2) = 10.61$, $p = .005$) shows that, when combined with the Internal Control Activities Index, risk assessment contributes significantly to explaining revenue collection variation. Nevertheless, the findings highlight the potential value of implementing robust risk assessment and mitigation frameworks to protect revenue mobilization, even if the immediate statistical effect is limited.

5.2.3 The moderating effect of the Financial Information System on the link between Control Activities and Revenue Collection in the LREB Counties in Kenya

The random-effects regression model demonstrates that both internal control activities (ICA) and financial information systems (FIS) are positively and highly significantly associated with revenue collection relative to GDP (ln(RGDP)). Specifically, a one-% increase in the Internal Control Activities Index corresponds to a 5.8& increase in ln(RGDP) ($z = 7.71$, $p < 0.001$), while a one-% increase in Financial Information Systems is linked with a 6.7% increase in ln(RGDP) ($z = 8.60$, $p < 0.001$). These results show that strengthening internal controls and improving financial information systems each contribute substantially to enhanced revenue performance.

Moreover, the interaction term between ICA and FIS ($\beta = 0.016$, $z = 3.33$, $p = 0.001$) is positive and statistically significant, highlighting a synergistic effect: counties that combine effective internal controls with robust financial information systems achieve higher revenue efficiency than would be expected from their individual effects alone.

Yearly dummy variables from 2016 to 2024 were not statistically significant, suggesting no systematic temporal variation in ln(RGDP) after accounting for ICA, FIS, and their interaction. The model constant is positive and highly significant ($\beta = 0.887$, $z = 7.10$, $p < 0.001$), representing the baseline ln(RGDP) when all predictors are

The model accounts for a substantial portion of the variance in ln(RGDP), with an overall R^2 of 64.5&, a within-county R^2 of 71.7%, and a between-county R^2 of 62.4&. The intra-class

correlation coefficient ($\rho = 0.620$) indicates that approximately 62% variance in ln(RGDP) is attributed to differences between counties, reflecting meaningful county-level clustering.

5.2.4 The moderating effect of the Financial Information System on the link between Risk Assessment and Revenue Collection in the LREB Counties in Kenya

The fourth objective sought to establish the Moderating effect of the Financial Information System on the relationship between Internal Control and Revenue Collection in the Lake Region Economic Bloc Counties in Kenya. The hypothesis stated that the Financial Information System has no moderating effect on the relationship between Internal Control and Revenue Collection in the Lake Region Economic Bloc Counties in Kenya. In the fixed-effects model, the Annual Risk Index Score exhibits a negative but marginally non-significant effect on ln(RGDP) ($\beta = -0.013$, $t = -1.80$, $p = 0.096$), suggesting that higher perceived annual risk may slightly reduce revenue performance relative to GDP, although this effect does not reach conventional levels of statistical significance. Financial Information Systems are positively and significantly associated with ln(RGDP) ($\beta = 0.046$, $t = 3.36$, $p = 0.005$), indicating that counties with stronger FIS tend to achieve higher revenue efficiency.

The interaction term between risk and FIS (Risk × FIS) is positive and significant($\beta = 0.009$, $t = 2.18$, $p = 0.049$), demonstrating that robust financial information systems can mitigate the adverse effects of annual risk on revenue performance. This underscores a synergistic effect, highlighting the importance of integrating risk management with information system improvements to sustain revenue collection. Year-specific dummy variables indicate some temporal variation. In particular, 2017 exibits a statistically significant effect on ln(RGDP) ($\beta = -0.052$, $t = -2.44$, $p = 0.030$) relative to 2015, while other years are not statistically significant, suggesting no consistent temporal trend after controlling for the main predictors.

The model accounts for 30% within-county variance in ln(RGDP) over time (within $R^2 = 0.296$), and the intra-class correlation coefficient ($\rho = 0.808$) indicates that a substantial portion of the total variance is attributable to differences across counties. These findings highlight the critical role of strong financial information systems and the integration of risk management in enhancing revenue efficiency at the counties.

5.3 Conclusion of the Study

This final section summarizes the main findings and conclusions drawn from the research, including the connections among risk management, financial information systems, internal control operations, and revenue collection effectiveness in Kenya's LREB counties. The study's objectives were to determine the elements that impact revenue performance at the county level and evaluate the impact of institutional systems, both separately and in combination, on financial results. The findings are supported by thorough empirical research employing fixed-effects and

random-effects regression models, offering proof to support policy, improve governance procedures, and improve county governments' financial management.

5.3.1 The effect of control activities on Revenue Collection in the Lake Region Economic Bloc Counties in Kenya

The results of the study offer compelling proof that internal control initiatives greatly improve the effectiveness of revenue collection in Kenya's LREB counties. Confirming the crucial role that well-designed and efficient internal controls play in fostering financial performance, both fixed-effects and random-effects models consistently demonstrate that a one-% increase in the Internal Control Activities Index is linked to an approximate 4.87–4.9% increase in revenue relative to GDP.

The fact that year-specific impacts are not significant suggests that internal control quality, not time variations, is the cause of these gains. The model supports the finding that enhancing internal control systems is a successful tactic for enhancing revenue mobilization by explaining a significant amount of the variation in revenue collection within a county. The null hypothesis is rejected by these findings, which also highlight how crucial strong internal control systems are to county governance and financial management.

5.3.2 The effect of risk assessment on Revenue Collection in the Lake Region Economic Bloc Counties in Kenya

The joint significance test shows that, when combined with the Internal Control Activities Index, risk assessment contributes significantly to explaining revenue collection variation. This underscores that while the independent effect of risk assessment may be limited, its integration with internal control activities plays a meaningful role in supporting county revenue performance. Overall, the results emphasize how crucial it is to put strong risk assessment and mitigation frameworks alongside strong internal controls to safeguard and enhance revenue mobilization.

5.3.3 Moderating effect of Financial Information System on the relationship between Control Activities and Revenue Collection in the Lake Region Economic Bloc Counties in Kenya

The study provides strong empirical evidence that both internal control activities (ICA) and financial information systems (FIS) significantly enhance revenue collection efficiency in the LREB counties. These results demonstrate that strengthening internal controls and improving financial information systems individually contribute substantially to improved revenue performance.

Importantly, the interaction between ICA and FIS is positive and statistically significant, revealing a synergistic effect: counties that implement both effective internal controls and robust financial information systems achieve higher revenue efficiency than would be expected from the

individual effects alone. This highlights the critical importance of integrating control mechanisms with advanced financial information systems to maximize revenue mobilization. Yearly dummy variables were not significant, indicating that temporal variation did not systematically influence revenue performance after accounting for ICA, FIS, and their interaction.

5.3.4 Moderating effect of Financial Information System on the relationship between Risk Assessment and Revenue Collection in the Lake Region Economic Bloc Counties in Kenya

The results of the study show that the relationship between internal control operations and revenue collection in the LREB counties is significantly moderated by financial information systems. While risk exposure alone may slightly reduce revenue performance, robust financial information systems help to mitigate these adverse effects. This demonstrates a synergistic effect, where the combination of strong internal controls and effective financial information systems enhances revenue collection beyond their individual contributions.

Overall, the results underscore the importance of integrating risk management practices with advanced financial information systems to sustain and improve revenue efficiency. They highlight that counties can achieve better fiscal outcomes by leveraging both strong internal control frameworks and high-quality financial information systems, ensuring that potential risks do not undermine revenue mobilization efforts.

5.4 Recommendations of the Study

5.4.1 The effect of control activities on Revenue Collection in the Lake Region Economic Bloc Counties in Kenya

Counties should strengthen and standardize internal control mechanisms, including segregation of duties, authorization procedures, and regular monitoring, to enhance revenue collection efficiency. Capacity-building programs and regular audits can ensure these controls are effectively implemented and sustained over time.

5.4.2 The effect of risk assessment on Revenue Collection in the Lake Region Economic Bloc Counties in Kenya

The County governments should integrate robust risk assessment and mitigation frameworks into their revenue management systems. While risk alone may have a limited effect, its combination with strong internal controls significantly supports revenue mobilization. This includes developing risk registers, conducting regular risk reviews, and establishing risk management committees.

5.4.3 Moderating Effect of Financial Information Systems on Control Activities

Counties should invest in modern and efficient financial information systems to complement internal control activities. The integration of these systems with control mechanisms creates a

synergistic effect that maximizes revenue collection efficiency. Training staff to effectively use these systems is essential to realizing their full potential.

5.4.4 Moderating Effect of Financial Information Systems on Risk Assessment

To mitigate the adverse effects of risk exposure, counties should leverage financial information systems alongside risk management practices. This integration enhances decision-making, ensures timely monitoring of potential risks, and strengthens revenue mobilization. Counties should prioritize both technology adoption and institutional capacity building to sustain improved fiscal outcomes.

5.5 Contribution of the Study

The study's theoretical, empirical, and practical contributions to our understanding of tax collection in Kenya's Lake Region Economic Bloc (LREB) counties are highlighted in this section. The study offers fresh insights into the ways that governance and technical systems impact fiscal performance by analyzing the effects of internal control operations, risk assessment, and financial information systems and their interconnections on revenue collection efficiency. In addition to contributing to the body of research already available on public financial management, the findings provide practitioners, county administrators, and politicians with practical advice on how to improve revenue mobilization and overall financial performance at the county level.

For public finance management theorists, practitioners, and policymakers, this study offers insightful information, especially in decentralized administrations like Kenya's county system.

5.5.1 Contribution to Theory

The study significantly advances theoretical understanding by testing and extending established frameworks in a real-world context. It goes beyond theory to show how the fundamental elements of internal control, particularly risk assessment and control operations, function as a cohesive system to enhance financial results. This confirms the integrated principle at the heart of the COSO model.

The study's most profound theoretical contribution is proving that technology is not just a tool but a transformative enabler. It successfully integrates Task-Technology Fit theory into public financial management, showing that Financial Information Systems (FIS) fundamentally amplify the effectiveness of organizational controls. This demonstrates how the quality of the supporting technology affects the relationship between controls and performance.

The findings refine institutional theory by demonstrating that simply adopting control structures is not enough; they must be technologically enabled to achieve true efficiency and legitimacy. For agency theory, it shows that information systems are a powerful mechanism to reduce

information asymmetry and mitigate risk between principals and agents, thereby enhancing accountability.

By focusing on county governments, the study provides crucial evidence that these theoretical relationships hold true even in resource-constrained, decentralized settings, challenging the notion that such frameworks are only relevant for national or well-resourced entities.

5.5.2 Contribution to Practice

The findings offer clear, actionable guidance for county government officials, auditors, and IT professionals. The strong demonstrated impact of FIS provides a compelling argument for county administrators to prioritize investment in modern financial information systems, framing them as a strategic investment rather than a mere administrative cost.

The synergistic effect between internal controls and FIS indicates that they must be designed together from the outset. Practitioners should focus on building automated controls directly into financial systems to maximize effectiveness and efficiency, moving away from cumbersome manual processes. The study suggests that while risk can hinder performance, technology can turn risk management into a proactive, value-added activity. Practitioners are encouraged to use FIS for data-driven risk assessment to identify and address vulnerabilities in real-time.

The analysis reveals that a major portion of performance differences between counties is due to fixed characteristics. This aids practitioners in concentrating their efforts on the aspects of performance improvement that they can control, such as bolstering IT systems and internal controls.

5.5.3 Contribution to Policy

The results provide robust evidence to guide evidence-based policy-making at all levels of government. National oversight bodies can use these findings to develop and mandate specific minimum standards for internal controls and financial information systems across all counties, moving from vague encouragement of "good practices" to requiring evidence-based capabilities.

The national government can design capacity-building grants and conditional transfers to specifically fund the development of FIS and internal control programs. Funding can be tied to achieving concrete benchmarks in these areas, directly linking investment to improved revenue generation and fiscal sustainability.

The findings support policy initiatives for inter-county collaboration, such as developing shared, standardized FIS platforms within economic blocs. This would reduce costs, create economies of scale, and accelerate the adoption of best practices.

The study empowers county assemblies and audit committees to shift their oversight focus beyond mere expenditure tracking to also rigorously scrutinize the quality and effectiveness of the underlying internal control and IT systems that are fundamental to financial health.
To ensure inclusivity, counties should design digital revenue systems accessible to small-scale traders ("Mama Mboga"), motorbike operators, and market vendors. Simplified interfaces and mobile payment options can increase compliance and widen the tax base.

5.6 Limitations of the study

i. The study relied on secondary data, which may have contained reporting inconsistencies. Some counties lacked complete datasets for certain years, mitigated through data interpolation techniques.
ii. It only zeroed in on control activities, monitoring, and system automation as the factors influencing revenue collection; other factors can influence revenue collection.

5.7 Suggestions for Further Studies

Future research could examine how governance and leadership practices affect the effectiveness of financial information systems in public institutions. Comparative research across different economic blocs in Kenya or other countries in East Africa may also yield valuable insights into contextual factors affecting revenue collection. Additionally, longitudinal studies evaluating the long-term financial impact of FIS implementation on county development outcomes would be particularly useful for strategic policy planning

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APPENDICES

APPENDIX I: STUDY DATA

Data collected from the 14 LREB counties fro 2015 to 2014										
County	ID	Year	Audits	Evaluations	Reports	Staff	system audits	IC	Risk Index	Revenue
Kericho	1	2015	2	2	2	300	2	7	0.5	6.1
Kericho	1	2016	1	1	1	298	1	5	0.4	5.8
Kericho	1	2017	2	2	2	299	2	7	0.5	6
Kericho	1	2018	1	1	1	297	1	6	0.4	5.7
Kericho	1	2019	2	2	2	300	2	7	0.5	6.1
Kericho	1	2020	1	1	1	301	2	3	0.5	5.2
Kericho	1	2021	3	3	3	304	3	5	0.5	5.9
Kericho	1	2022	2	2	2	303	2	4	0.5	5.5
Kericho	1	2023	3	3	3	304	3	5	0.4	5.9
Kericho	1	2024	4	3	4	309	4	7	0.4	6.6
Transnzoia	2	2015	1	1	1	200	2	4	0.3	6.8
Transnzoia	2	2016	1	1	1	199	2	4	0.3	6.2
Transnzoia	2	2017	2	2	2	221	3	6	0.4	9.3
Transnzoia	2	2018	2	2	2	220	3	6	0.4	9.4
Transnzoia	2	2019	1	1	1	198	2	3	0.4	9.6
Transnzoia	2	2020	1	2	1	202	1	6	0.4	9.4
Transnzoia	2	2021	4	4	4	241	4	7	0.4	10.1
Transnzoia	2	2022	2	2	2	209	2	6	0.4	9.5
Transnzoia	2	2023	4	4	4	244	4	7	0.4	10.7
Transnzoia	2	2024	3	2	1	219	3	6	0.3	9.8
Siaya	3	2015	2	2	2	209	3	6	0.3	7.1
Siaya	3	2016	2	2	2	208	3	6	0.3	7
Siaya	3	2017	1	1	1	205	2	4	0.2	6.4
Siaya	3	2018	2	2	2	207	3	6	0.3	7.2
Siaya	3	2019	2	2	2	208	4	5	0.3	8.1
Siaya	3	2020	3	2	1	206	2	4	0.3	6.6
Siaya	3	2021	3	3	2	209	3	4	0.3	6.7
Siaya	3	2022	2	2	2	203	2	4	0.3	6.3
Siaya	3	2023	4	4	3	217	4	6	0.3	7.3
Siaya	3	2024	2	2	1	205	2	4	0.3	6.5
Nyamira	4	2015	2	2	2	221	4	6	0.5	8
Nyamira	4	2016	2	2	2	220	4	6	0.5	7.9
Nyamira	4	2017	1	1	1	201	1	3	0.3	6.8
Nyamira	4	2018	2	2	2	222	3	5	0.5	7.8
Nyamira	4	2019	1	1	1	202	4	6	0.5	7.8
Nyamira	4	2020	2	1	2	200	3	6	0.3	7.1
Nyamira	4	2021	2	2	2	203	3	6	0.6	7.3

Nyamira	4	2022	1	1	1	198	2	5	0.6	6.9
Nyamira	4	2023	4	4	4	221	4	7	0.6	8.1
Nyamira	4	2024	2	2	2	200	3	6	0.6	7.1
Vihiga	5	2015	1	1	1	181	3	4	0.6	11
Vihiga	5	2016	2	2	2	190	4	7	0.7	12.9
Vihiga	5	2017	2	2	2	192	4	7	0.7	12.8
Vihiga	5	2018	2	2	2	193	4	7	0.7	13.2
Vihiga	5	2019	2	2	2	192	4	7	0.7	13.1
Vihiga	5	2020	2	2	2	190	2	6	0.6	11.1
Vihiga	5	2021	3	3	3	196	3	6	0.6	12.1
Vihiga	5	2022	2	2	2	192	2	6	0.6	11.3
Vihiga	5	2023	4	4	4	198	4	7	0.6	13
Vihiga	5	2024	1	2	1	192	2	6	0.6	11.3
Kakamega	6	2015	1	1	1	154	3	3	0.4	5.5
Kakamega	6	2016	2	2	2	166	5	7	0.5	6.4
Kakamega	6	2017	2	2	2	165	5	7	0.5	6.5
Kakamega	6	2018	2	2	2	167	5	7	0.6	6.6
Kakamega	6	2019	2	2	2	162	5	6	0.6	6.6
Kakamega	6	2020	1	1	2	149	1	4	0.5	5.5
Kakamega	6	2021	3	3	3	169	3	5	0.5	6.4
Kakamega	6	2022	2	2	1	167	2	5	0.5	5.8
Kakamega	6	2023	4	4	4	176	4	6	0.5	6.8
Kakamega	6	2024	4	2	4	150	2	5	0.5	5.9
Nandi	7	2015	3	2	4	133	4	6	0.6	8.5
Nandi	7	2016	3	2	4	132	4	6	0.6	8.6
Nandi	7	2017	2	1	3	119	3	4	0.4	7.1
Nandi	7	2018	1	1	3	119	3	4	0.4	7.2
Nandi	7	2019	2	1	2	115	3	3	0.4	7.1
Nandi	7	2020	2	1	2	134	3	5	0.5	8.5
Nandi	7	2021	3	3	3	139	4	6	0.5	9.1
Nandi	7	2022	2	2	2	134	3	5	0.45	8.6
Nandi	7	2023	4	4	4	141	4	7	0.45	9.8
Nandi	7	2024	1	2	1	121	2	5	0.45	8.1
Migori	8	2015	4	3	2	115	4	6	0.5	8.6
Migori	8	2016	4	3	2	116	4	6	0.5	8.4
Migori	8	2017	3	2	1	103	1	3	0.4	7.3
Migori	8	2018	4	4	2	116	4	6	0.5	8.6
Migori	8	2019	4	4	2	116	4	6	0.5	8.3
Migori	8	2020	1	2	1	101	1	6	0.4	7.3
Migori	8	2021	3	3	3	113	3	7	0.4	8.6
Migori	8	2022	2	2	2	114	2	7	0.4	8
Migori	8	2023	4	4	4	117	4	7	0.4	9

Migori	8	2024	1	1	1	101	1	6	0.4	7.3
Homabay	9	2015	2	2	3	122	4	6	0.5	8.2
Homabay	9	2016	2	2	3	120	4	6	0.5	8.2
Homabay	9	2017	1	1	2	103	3	4	0.3	6.5
Homabay	9	2018	2	2	3	122	4	6	0.5	8.4
Homabay	9	2019	2	2	3	121	4	6	0.5	8.3
Homabay	9	2020	2	1	2	101	1	5	0.4	6.9
Homabay	9	2021	3	3	3	109	3	6	0.3	7.8
Homabay	9	2022	1	3	1	108	2	6	0.3	7.4
Homabay	9	2023	4	4	4	124	4	7	0.3	8.3
Homabay	9	2024	2	21	2	103	2	6	0.3	7.3
Kisumu	10	2015	2	2	2	110	4	6	0.2	6.4
Kisumu	10	2016	2	2	2	109	4	6	0.2	6.6
Kisumu	10	2017	1	1	1	85	3	4	0.1	0.1
Kisumu	10	2018	1	1	1	85	3	4	0.1	0.1
Kisumu	10	2019	1	1	1	86	3	4	0.1	0.1
Kisumu	10	2020	1	1	1	76	1	6	0.2	5.5
Kisumu	10	2021	2	2	2	99	3	7	0.2	6
Kisumu	10	2022	1	2	1	98	2	6	0.2	5.8
Kisumu	10	2023	4	4	4	111	4	7	0.1	6.6
Kisumu	10	2024	3	3	3	109	4	6	0.1	6.4
Bungoma	11	2015	2	3	2	99	4	6	0.1	6.3
Bungoma	11	2016	2	3	2	98	4	6	0.1	6.2
Bungoma	11	2017	1	2	1	92	3	4	0.2	5.1
Bungoma	11	2018	2	3	2	97	4	6	0.1	6.4
Bungoma	11	2019	2	3	2	96	4	6	0.1	6.2
Bungoma	11	2020	2	2	2	97	1	6	0.1	5.1
Bungoma	11	2021	3	3	3	96	3	6	0.1	5.3
Bungoma	11	2022	2	2	1	97	2	6	0.1	5.1
Bungoma	11	2023	4	4	4	98	4	7	0.1	6.2
Bungoma	11	2024	1	1	1	91	1	4	0.1	4.7
Kisii	12	2015	1	1	1	80	3	4	0.2	6.9
Kisii	12	2016	1	1	1	79	3	4	0.2	7
Kisii	12	2017	2	2	2	90	4	6	0.3	5.5
Kisii	12	2018	2	2	2	91	4	6	0.3	6
Kisii	12	2019	2	2	2	89	4	6	0.3	6.1
Kisii	12	2020	1	1	1	86	1	6	0.1	6
Kisii	12	2021	3	3	3	93	3	6	0.1	6.6
Kisii	12	2022	2	3	2	86	1	6	0.1	6
Kisii	12	2023	4	4	4	93	4	7	0.1	7.1
Kisii	12	2024	2	2	2	81	2	6	0.1	6.4
Busia	13	2015	1	1	1	78	4	3	0.2	3.3

Busia	13	2016	2	2	2	91	5	6	0.1	5.8
Busia	13	2017	2	2	2	92	5	6	0.1	6.1
Busia	13	2018	2	2	2	92	6	6	0.1	6.4
Busia	13	2019	2	2	2	89	6	6	0.1	6
Busia	13	2020	2	1	3	92	2	6	0.1	6.1
Busia	13	2021	3	3	3	90	4	6	0.1	6.5
Busia	13	2022	1	1	1	91	3	6	0.1	6.3
Busia	13	2023	1	1	1	77	1	2	0.1	2.1
Busia	13	2024	4	4	4	92	4	6	0.1	6.6
Bomet	14	2015	1	1	1	37	3	5	0.1	4.5
Bomet	14	2016	1	1	1	37	3	5	0.2	4.6
Bomet	14	2017	1	1	1	36	3	5	0.2	5.3
Bomet	14	2018	2	2	2	51	4	6	0.2	5
Bomet	14	2019	2	2	2	50	4	6	0.2	5.4
Bomet	14	2020	4	1	4	51	2	6	0.1	4.8
Bomet	14	2021	3	3	4	50	3	5	0.1	5.2
Bomet	14	2022	4	1	4	49	3	5	0.1	5.1
Bomet	14	2023	4	4	4	52	4	6	0.1	5.9
Bomet	14	2024	1	1	1	35	1	5	0.1	4.6

Appendix II List of the Lake Region Economic Bloc (LREB) in Kenya

1. Bomet
2. Bungoma
3. Busia
4. Homabay
5. Kakamega
6. Kericho
7. Kisii
8. Kisumu
9. Migori
10. Nandi
11. Nyamira
12. Siaya
13. Transnzoia
14. Vihiga.

Appendix III: Map of the LREB counties in Kenya

Source: GoogleMaps

