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Digital Technologies and Tax Revenue Collection Efficiency at the Kenya Revenue Authority, Taita Taveta County, Kenya

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ABSTRACT: This study investigates the moderated mediation model linking Green Human Resource Management (GHRM) practices to employees' pro-environmental behavior (PEB) through green mindfulness as the mediating mechanism, with green transformational leadership (GTL) as the boundary condition. Drawing on Ability-Motivation-Opportunity (AMO) Theory, Theory of Planned Behavior (TPB), Self-Determination Theory (SDT), and Social Learning Theory (SLT), we test the model on a time-lagged two-wave sample of 342 employees from ISO 14001-certified manufacturing firms in East and Central Java, Indonesia. Structural Equation Modeling (SEM-CB) and Hayes PROCESS Macro Model 7 with bootstrapping (5,000 resamples) were employed for hypothesis testing. Results confirm that: (1) GHRM positively predicts green mindfulness (β = .48) and PEB (β = .31); (2) green mindfulness mediates the GHRM–PEB relationship (indirect β = .197, 95% BC-CI [.129, .274]); (3) GTL significantly moderates both the GHRM→green mindfulness and green mindfulness→PEB pathways; and (4) the conditional indirect effect of GHRM on PEB is 2.5 times stronger at high GTL than low GTL (moderated mediation index = .082, BC-CI [.041, .131]). Floodlight analysis reveals a GTL significance threshold of 2.87 (5-point scale), encompassing 91.2% of the sample. Findings contribute to GHRM theory by identifying green mindfulness as a new cognitive-affective mediator and GTL as a dual boundary condition amplifier. Practical implications for HR managers, organizational leaders and Indonesia's PROPER environmental rating policy are discussed.

KEYWORDS: Green Human Resource Management (GHRM); Green Mindfulness; Pro-Environmental Behavior; Green Transformational Leadership; Moderated Mediation; Manufacturing; Indonesia

INTRODUCTION

Background of the Study

Tax revenue collection is a fundamental pillar of economic development, as it provides governments with the financial resources necessary to fund public services, infrastructure development, and socio-economic programs. In recent years, digital technologies have transformed public administration globally, particularly in tax administration, by improving efficiency, transparency, accountability, and taxpayer compliance. The increasing integration of digital communication infrastructures into government operations has enabled tax authorities to modernize service delivery, automate administrative processes, and strengthen domestic resource mobilization. The COVID-19 pandemic further accelerated this digital transformation, as governments adopted online systems to maintain service continuity while reducing physical interactions and operational disruptions.

Globally, traditional tax administration systems have often been characterized by cumbersome manual procedures, high compliance costs, lengthy processing times, and low levels of voluntary compliance. To address these challenges, many countries have embraced digital technologies such as electronic filing systems, automated reporting tools, digital payment platforms, and advanced data analytics. These technologies have significantly improved compliance monitoring, reduced administrative costs, and enhanced overall tax performance. Countries such as South Korea have successfully implemented advanced digital tax systems that have streamlined tax reporting processes and encouraged voluntary compliance among taxpayers. Consequently, digitalization has become a central strategy for enhancing tax efficiency and supporting sustainable public finance systems worldwide.

At the regional level, African countries have increasingly recognized the importance of digital transformation in strengthening public finance management and improving revenue mobilization. Rapid growth in mobile telephony, financial technology (fintech), and digital payment systems has created opportunities for governments to automate tax administration and minimize revenue leakages. Kenya is among the leading

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African countries in digital transformation, with the digital economy projected to contribute significantly to national economic growth. The widespread adoption of mobile money platforms, digital identity systems, and automated revenue management tools has enhanced transparency, accountability, and financial inclusion across the region. These developments have demonstrated the potential of digital technologies to support efficient and effective tax administration in Sub-Saharan Africa.

Within Kenya, the Kenya Revenue Authority (KRA) has undertaken extensive reforms aimed at digitizing tax administration. These reforms include the introduction of the Integrated Tax Management System (iTax), the Electronic Tax Invoice Management System (eTIMS), electronic tax registers (ETRs), mobile and online payment platforms, and data analytics tools. These technologies are designed to simplify tax compliance processes, improve taxpayer experience, automate reporting functions, and enhance operational efficiency. The increasing penetration of mobile phones, internet connectivity, smartphone usage, and the growth of fintech innovations have provided a favorable environment for the successful implementation of digital tax systems. Through these initiatives, KRA has sought to improve tax compliance, increase revenue collection, and enhance transparency in tax administration.

Kenya has also expanded the use of digital technologies to county-level revenue collection. Efforts to establish integrated revenue collection systems have been aimed at improving accountability and reducing leakages in public finance management. A notable example is the Nairobi Revenue System (NRS), which was developed following the appointment of KRA as the principal revenue collection agent for Nairobi County. The NRS serves as an integrated digital platform that streamlines revenue collection processes, enhances transparency, and improves accountability in county government finances. Such initiatives demonstrate the growing importance of digital tools in strengthening tax administration and revenue management across different levels of government.

Despite these achievements, several challenges continue to hinder the full realization of the benefits associated with digital tax systems in Kenya. These challenges include limited digital literacy among taxpayers and staff, system reliability issues, cybersecurity vulnerabilities, and resistance to technology adoption. Such constraints can reduce user confidence, hinder effective utilization of digital platforms, and limit improvements in compliance and revenue performance. Additionally, concerns remain regarding the extent to which digital technologies have translated into measurable gains in tax revenue collection efficiency, particularly in relation to compliance monitoring, operational efficiency, and reduction of revenue leakages.

Furthermore, the rapid growth of Kenya's digital economy presents new challenges for tax administration. The emergence of e-commerce platforms, digital service providers, and online freelance marketplaces has created new forms of economic activity that often fall outside traditional taxation frameworks. These developments require KRA to continually adapt its digital systems, regulatory frameworks, and monitoring mechanisms to ensure that digital transactions are effectively captured within the tax net. Failure to do so could result in significant revenue losses and undermine efforts to broaden the tax base.

Although previous studies have examined the impact of digitalization on tax administration in various contexts, empirical evidence focusing on Kenya remains limited, particularly regarding the combined effects of digital platforms, payment systems, data analytics, system integrity, and digital competency on tax revenue collection efficiency. This study was therefore undertaken to assess how these digital technologies influence tax revenue collection efficiency at the Kenya Revenue Authority, with a specific focus on Taita Taveta County. The findings were expected to provide valuable insights for policymakers and tax administrators seeking to strengthen digital transformation initiatives and promote sustainable domestic revenue mobilization.

Statement of the Problem

Digital technologies have become an essential tool for improving tax administration and revenue collection across the world. Many countries have adopted digital tax systems to enhance efficiency, reduce compliance costs, improve transparency, and strengthen revenue mobilization. In Kenya, the Kenya Revenue Authority (KRA) has implemented several digital initiatives, including the Integrated Tax Management System (iTax), the Electronic Tax Invoice Management System (eTIMS), mobile payment platforms, and data analytics tools. These innovations were introduced to simplify tax compliance processes, enhance taxpayer convenience, improve monitoring capabilities, and increase revenue collection performance. Despite these advancements, Kenya continues to experience significant tax revenue collection challenges. A large informal sector, accounting for approximately 83% of employment and contributing about 30% of the country's Gross Domestic Product (GDP), remains largely outside the tax net, limiting the government's ability to maximize revenue collection. Furthermore, although KRA reported revenue growth in the 2024/2025 financial year, the uptake of key digital systems such as eTIMS remains relatively low, with only a small proportion of registered firms fully integrated into the platform. This indicates persistent gaps in compliance, enforcement, and digital adoption.

Additional challenges include limited digital literacy among taxpayers and staff, unreliable digital infrastructure, cybersecurity risks, and resistance to technology adoption. These factors hinder the effective utilization of digital tax systems and may reduce their impact on revenue collection efficiency. The rapid expansion of the digital economy, driven by e-commerce platforms and online service providers, further complicates tax administration because many digital transactions occur outside traditional monitoring mechanisms. Although previous studies have examined digitalization and tax administration, there is limited empirical evidence on how digital platforms, digital payment systems, data analytics, system integrity, and digital competency collectively influence tax revenue collection efficiency within the Kenyan context. This knowledge gap necessitated the current study to provide evidence-based insights for strengthening digital tax administration and improving sustainable revenue mobilization at KRA.

Objective of the Study

The study was guided by five objectives:

i). To examine the effect of digital platforms (iTax, eTims) adoptions on tax revenue collection efficiency at the Kenya revenue authority.
ii). To determine the effect of digital payment systems on tax revenue collection efficiency at Kenya revenue authority
iii). To assess the effect of data analytics on tax revenue collection efficiency at Kenya revenue authority.
iv). To investigate the effect of system integrity on tax revenue collection efficiency at Kenya revenue authority

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v). To evaluate the effect of digital competency on tax revenue efficiency at Kenya revenue authority.

Research Hypotheses

The study sought to answer the following research hypotheses:

i). **H_o1:** There is no significant effect of digital platform adoption (iTax, eTIMS) on tax revenue collection efficiency at the Kenya Revenue Authority.

ii). **H_o2:** There is no significant effect of digital payment systems on tax revenue collection efficiency at the Kenya Revenue Authority.

iii). **H_o3:** There is no significant effect of data analytics on tax revenue collection efficiency at the Kenya Revenue Authority.

iv). **H_o4:** There is no significant effect of system integrity on tax revenue collection efficiency at the Kenya Revenue Authority.

v). **H_o5:** There is no significant effect of digital competency on tax revenue collection efficiency at the Kenya Revenue Authority.

REVIEW OF LITERATURE

The study was anchored on three complementary theories that explain the adoption, utilization, and effectiveness of digital technologies in enhancing tax revenue collection efficiency: the Technology Acceptance Model (TAM), the E-Government Adoption Model, and Human Capital Theory. Together, these theories provide a comprehensive understanding of the technological, institutional, and human factors that influence the success of digital tax systems at the Kenya Revenue Authority (KRA).

The Technology Acceptance Model (TAM), developed by Davis (1989), explains how users accept and utilize new technologies. The model posits that technology adoption is primarily influenced by two factors: perceived usefulness and perceived ease of use. In the context of tax administration, taxpayers and KRA staff are more likely to adopt systems such as iTax and eTIMS when they believe these platforms improve efficiency, accuracy, convenience, and compliance. Conversely, perceptions of complexity, unreliability, or difficulty in usage may discourage adoption and reduce the effectiveness of digital tax systems. TAM therefore provides a basis for understanding the influence of digital platforms on tax revenue collection efficiency.

The E-Government Adoption Model, developed by Carter and Bélanger (2005), extends TAM by incorporating factors such as trust, service quality, accessibility, perceived risk, and confidence in government systems. The theory explains citizens' willingness to adopt government-provided digital services. Applied to KRA, the model suggests that taxpayers are more likely to utilize digital tax platforms when they perceive them as secure, reliable, user-friendly, and trustworthy. Increased adoption of online and mobile tax payment systems consequently enhances compliance and improves revenue collection performance.

The Human Capital Theory, advanced by Schultz (1961) and Becker (1964), emphasizes the importance of education, skills, training, and knowledge in improving organizational performance. Within digital tax administration, digital literacy and technological competence among both taxpayers and KRA staff are critical for effective utilization of digital systems. Higher levels of digital competency enhance system usage, reduce errors, improve compliance, and strengthen tax administration efficiency. The theory therefore highlights the significance of capacity building and continuous training in maximizing the benefits of digital transformation. Collectively, these theories provide a multidimensional framework for explaining how technology adoption, institutional trust, and human capabilities influence the effectiveness of digital technologies in enhancing tax revenue collection efficiency at KRA.

Conceptually, the study illustrates the relationship between digital technologies and tax revenue collection efficiency at the Kenya Revenue Authority. The independent variables include digital platform adoption, digital payment systems, data analytics, system integrity, and digital competency, while tax revenue collection efficiency serves as the dependent variable. The framework assumes that effective utilization of these digital technologies enhances compliance, operational efficiency, transparency, and revenue performance.

Empirical studies consistently demonstrate that digital technologies improve tax revenue collection efficiency. Digital platforms such as iTax, e-filing, and e-invoicing systems have been found to reduce compliance costs, improve administrative efficiency, and enhance revenue performance (Muturi & Kiarie, 2020; Muita, 2011; Okunogbe & Pouliquen, 2022). Mobile and online payment systems increase accessibility and voluntary compliance among taxpayers (Kiring'a & Makori, 2020; Mwaura, 2020). Data analytics enhance audit targeting, compliance monitoring, and decision-making (OECD, 2019; Ahinful et al., 2018). Furthermore, system reliability, cybersecurity, and digital literacy significantly influence the effectiveness and sustainability of digital tax systems (Osei-Assibey, 2019; Nyaga, 2021; Nkundabanyanga et al., 2017).

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Conceptual Framework

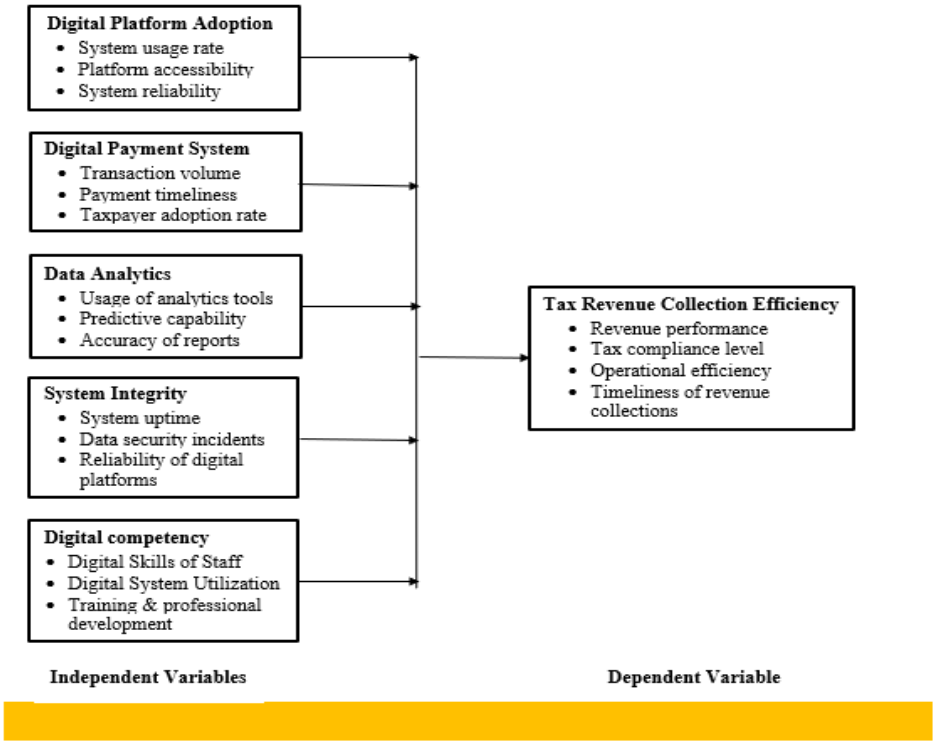

Figure 2.1: Conceptual Framework

MATERIALS AND METHODS

Research Design

The study adopted a descriptive research design to examine the influence of digital technologies on tax revenue collection efficiency at the Kenya Revenue Authority. The design was appropriate because it enabled the collection and analysis of both quantitative and qualitative data on digital platforms, payment systems, data analytics, system integrity, and digital competency, and their relationship with tax revenue performance. Descriptive research design is suitable for studies that seek to determine and describe relationships among variables (Kothari, 2014; Creswell & Creswell, 2023).

Target Population and Sampling Technique

The study targeted a population of 240 respondents comprising 160 Kenya Revenue Authority (KRA) employees from the Information Technology, Domestic Taxes, Debt, and Compliance departments, and 80 registered taxpayers who actively use KRA digital platforms such as iTax and eTIMS in Taita Taveta County. To ensure adequate representation of all respondent categories, the study employed a stratified random sampling technique, where the population was divided into homogeneous strata based on departments and taxpayer categories. Respondents were then randomly selected from each stratum. Using Yamane's (1967) formula, a sample size of 150 respondents was determined and proportionately distributed across the strata to minimize sampling bias and enhance representativeness of the study findings.

Instrumentation and Data Collection Procedure

The study utilized a structured questionnaire as the primary data collection instrument, with separate versions administered to KRA staff and taxpayers to capture their experiences and perceptions regarding digital technologies such as iTax, eTIMS, and mobile payment systems. Both closed-ended and open-ended questions were included. Secondary data were obtained from KRA annual reports, strategic plans, and policy documents. Prior to data collection, the researcher obtained authorization from the university, NACOSTI, and KRA management. Respondents were assured of confidentiality and anonymity, and follow-up communications were conducted to enhance the response rate and data quality (Creswell & Creswell, 2023).

Data analysis

The collected data were coded, cleaned, and analyzed using SPSS Version 27. Descriptive statistics such as frequencies, percentages, means, and standard deviations were used to summarize the study variables and respondent characteristics. Inferential statistics were then employed to establish relationships among the variables. Pearson correlation analysis was conducted to determine the strength and direction of associations between digital technologies and tax revenue collection efficiency. Further, multiple linear regression analysis was used to assess the influence of digital platform adoption, digital payment systems, data analytics, system integrity, and digital competency on tax revenue collection efficiency. Before conducting regression analysis, diagnostic tests for linearity, multicollinearity, heteroscedasticity, and normality were performed to ensure compliance with regression assumptions. The findings were presented using tables and interpreted in relation to the study objectives and hypotheses (Hair et al., 2022; Saunders, Lewis, & Thornhill, 2019).

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Ethical Considerations

Prior to data collection, ethical approval was obtained from the Ethics Review Committee of Taita Taveta University. The study adhered to established ethical research principles by ensuring that participation was voluntary and based on informed consent from all participants. Respondents were assured of confidentiality, and their identities were protected through the use of coded identifiers rather than personal information. All collected data were securely stored and accessed only by authorized personnel. Furthermore, research assistants conducted themselves professionally and treated all respondents with courtesy, dignity, and respect throughout the study process.

RESULTS

A total of 215 questionnaires were issued to respondents, with 207 filled and returned. The returned questionnaires formed a response rate of 96.3% as shown in Table 1.

Table 1: Response Rate

Questionnaire	Frequency	Percent
Returned	144	96.3
Non returned	6	3.7
Total	**150**	**100.0**

Demographic Information Analysis

Table 2: Demographic Data

Category	Indicator	Frequency (n)	Percentage (%)
Respondent Type	KRA Staff	86	59.7
	Taxpayers	58	40.3
Gender	Male	82	56.9
	Female	58	40.3
	Prefer not to say	4	2.8
Age Group	18–25 years	18	12.5
	26–35 years	56	38.9
	36–45 years	44	30.6
	46 years and above	26	18.0
Education Level	Diploma	22	15.3
	Bachelor's Degree	64	44.4
	Master's Degree	46	31.9
	Doctorate	8	5.6
	Other	4	2.8
KRA Staff	IT Department	4	4.65
	Domestic Taxes	28	32.6
	Compliance	20	23.3
	Revenue Accounting	10	11.6
	Other Departments	4	4.6
Years of Service (KRA Staff)	Less than 1 year	8	9.3
	1–3 years	22	25.6
	4–6 years	30	34.9
	7 years and above	26	30.2
Taxpayers	Individual	26	44.8
	SME	18	31.0
	Large Business	8	13.8
	Consultant/Agent	6	10.4
Duration of System Use	Less than 1 year	10	17.2
	1–3 years	20	34.5
	4–6 years	16	27.6

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Category	Indicator	Frequency (n)	Percentage (%)
	7 years and above	12	20.7
Main Digital System Used	iTax	22	37.9
	eTIMS	14	24.1
	Both iTax & eTIMS	22	37.9

Key Findings

The descriptive statistics results indicate that respondents generally agreed that digital technologies have positively influenced tax revenue collection efficiency at the Kenya Revenue Authority. Regarding digital platform adoption (iTax and eTIMS), respondents reported that the systems were widely used, accessible, and reliable, facilitating tax filing, payment processing, and compliance monitoring. On data analytics, respondents agreed that KRA effectively utilized analytics tools to monitor taxpayer behavior, generate accurate reports, and support decision-making, thereby enhancing revenue collection processes.

For digital payment systems, the findings showed high levels of taxpayer adoption, timely tax payments, and increased transaction volumes through mobile and online payment platforms. Respondents further indicated that these systems improved convenience and reduced compliance costs. Concerning system integrity, participants agreed that KRA's digital platforms were generally reliable, secure, and characterized by minimal system failures, which enhanced taxpayer confidence and reduced operational disruptions.

The results on digital competency revealed that both KRA staff and taxpayers possessed adequate digital skills to utilize electronic tax systems effectively. Respondents also acknowledged the importance of continuous training and professional development in improving system utilization and overall efficiency.

Regarding the dependent variable, tax revenue collection efficiency, respondents agreed that digital technologies had contributed to improved revenue performance, enhanced tax compliance levels, greater operational efficiency, and more timely revenue collections. Overall, the descriptive findings suggest that digital transformation initiatives at KRA have significantly strengthened tax administration by improving accessibility, transparency, compliance monitoring, and service delivery, ultimately contributing to enhanced tax revenue collection efficiency.

Table 3: Digital platforms (iTax, eTims) adoption results

n=144	Mean	Std. Deviation	Skewness	Kurtosis
The iTax system has simplified tax return filing for taxpayers.	4.47	0.63	-1.24	2.48
eTIMS has enhanced real-time monitoring of tax transactions.	3.96	0.86	-0.70	0.74
iTax and eTIMS platforms have reduced physical interactions with KRA officers.	4.02	0.77	-0.78	1.62
The integration of iTax and eTIMS has improved the accuracy of tax data.	4.20	0.83	-1.21	2.06
The platforms have significantly reduced incidences of manual errors in tax processing.	3.99	0.90	-0.36	-0.93
Users find the digital platforms user-friendly and accessible.	3.92	0.93	-0.60	-0.24
The digital platforms have enhanced transparency in revenue administration.	2.80	1.39	-0.03	-1.42
The frequency of system downtimes in iTax/eTIMS is minimal and manageable.	3.72	1.11	-0.74	0.08
Digital platforms (iTax, eTims) adoption	**3.66**	**0.73**	**-1.12**	**0.88**

Table 4: Data analytics Results

n=144	Mean	Std. Deviation	Skewness	Kurtosis
Mobile money platforms (e.g., M-Pesa) have made tax payment more convenient.	3.78	0.92	-0.33	-0.50
Online payment channels have reduced the time taken to remit taxes.	3.75	1.09	-0.26	-1.27
Digital payment systems have minimized revenue leakages.	3.86	0.87	0.04	-0.99
Integration between KRA systems and banks ensures efficient transaction processing.	3.64	0.92	-0.41	0.11
Mobile and online payments have enhanced accessibility for taxpayers in remote areas.	3.63	0.87	-0.43	-0.21
I find mobile tax payment systems secure and reliable.	3.49	0.95	-0.13	-0.44
The use of digital payments has improved voluntary compliance among taxpayers.	3.95	0.87	-0.72	0.03
KRA's online payment systems are compatible with most financial service providers.	4.31	0.73	-0.56	-0.94
Data analytics	**3.59**	**0.80**	**-0.64**	**0.30**

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Table 5: Digital payment systems Results

n=144	Mean	Std. Deviation	Skewness	Kurtosis
Data analytics tools help in identifying non-compliant taxpayers.	4.340	0.619	-0.537	0.225
KRA uses data analytics to detect tax evasion and fraud effectively.	3.730	1.200	-0.964	0.016
The use of analytics has improved decision-making in revenue administration.	3.690	1.419	-0.730	-0.784
Data-driven insights enhance audit and enforcement efficiency.	3.430	1.103	-0.291	-0.529
KRA uses analytics to forecast and plan revenue targets accurately.	3.610	1.017	-0.320	-0.643
Real-time data visualization tools enhance operational monitoring.	3.800	0.987	-0.438	-0.245
Analytics integration has minimized cases of duplicate taxpayer records.	3.350	1.001	-0.054	-0.642
Digital payment systems	**3.607**	**0.778**	**-0.793**	**0.661**

Table 6: System integrity results

n=144	Mean	Std. Deviation	Skewness	Kurtosis
KRA's digital systems maintain high standards of data security.	3.270	1.117	-0.324	-0.846
Measures are in place to protect taxpayer data from unauthorized access.	3.940	0.795	-0.538	0.425
The systems are regularly updated to mitigate cybersecurity threats.	3.780	0.835	-0.803	0.555
Network reliability supports seamless tax transactions.	3.750	0.977	-0.838	0.668
System audits are conducted regularly to ensure compliance with security standards.	3.770	0.751	-0.219	0.265
Incidents of data breaches are rare within KRA's digital platforms.	3.500	1.007	-0.467	0.044
Staff adhere to established data confidentiality protocols.	3.690	0.922	-0.354	-0.130
System downtime rarely affects tax collection processes.	3.090	1.123	-0.215	-0.509
The integrity of KRA's systems builds public confidence in digital tax services.	3.340	1.299	-0.235	-1.010
System integrity	**3.400**	**0.755**	**-0.499**	**-0.416**

Table 7: Digital competency results

n=144	Mean	Std. Deviation	Skewness	Kurtosis
KRA staff are adequately trained to handle digital tax systems.	3.95	0.84	-0.62	0.01
Continuous training programs are available for staff on emerging digital tools.	3.94	0.91	-0.38	-0.81
Taxpayer awareness programs improve understanding of digital platforms.	4.07	0.91	-0.94	0.23
Digital literacy has enhanced the adoption of eTIMS and iTax among users.	3.81	1.11	-0.88	0.23
KRA provides adequate technical support for taxpayers using digital platforms.	3.56	1.22	-0.49	-0.73
Employees have the necessary skills to troubleshoot common system challenges.	3.63	1.14	-0.54	-0.42
Management encourages digital innovation and skills development.	4.13	0.95	-1.72	3.64
Digital competency	**3.87**	**0.64**	**-0.20**	**-0.41**

Table 8: Tax revenue efficiency results

N=144	Mean	Std. Deviation	Skewness	Kurtosis
The time required to process tax returns has significantly reduced.	4.03	0.779	-0.94	1.093
Revenue leakages have decreased due to automation.	4.18	0.816	-0.433	-1.117
Digital systems have enhanced compliance monitoring.	4.05	0.624	-0.168	0.046
KRA's digital transformation has increased overall revenue performance.	4.05	0.804	-0.33	-0.455
The cost of tax administration has reduced with digital systems.	1.07	0.259	3.33	9.14
Timeliness of tax remittances has improved.	3.44	1.274	-0.711	-0.368
The accuracy of tax assessments has increased through system automation.	4.28	1.204	-1.822	2.279
Digitalization has improved customer satisfaction in tax administration.	4.4	0.558	-0.962	5.341
Tax revenue efficiency	3.688	0.42973	-0.736	1.007

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Correlation Analysis

The correlation analysis examined the relationship between digital technologies and tax revenue collection efficiency at the Kenya Revenue Authority. The results revealed that all the independent variables; digital platform adoption, digital payment systems, data analytics, system integrity, and digital competency; had positive and statistically significant correlations with tax revenue collection efficiency ($p < 0.05$). This implies that improvements in the adoption and utilization of digital technologies were associated with enhanced revenue performance, increased tax compliance, and greater operational efficiency. Among the variables, digital platform adoption and data analytics exhibited the strongest correlations with tax revenue collection efficiency, indicating their critical role in supporting effective tax administration. Overall, the findings suggest that strengthening digital technologies can significantly improve the efficiency and effectiveness of revenue collection at KRA.

Table 9: Correlation Matrix for Study Variables

Variables	Y	X1	X2	X3	X4	X5
Tax Revenue Efficiency	1					
Digital platforms (iTax, eTims) adoptions	.673**	1				
	0.000					
Data analytics	.685**	.831**	1			
	0.000	0.000				
Digital payment systems	.655**	.784**	.833**	1		
	0.000	0.000	0.000			
System integrity	.540**	.596**	.672**	.519**	1	
	0.000	0.000	0.000	0.000		
Digital competency	.723**	.907**	.947**	.890**	.788**	1
	0.000	0.000	0.000	0.000	0.000	

** Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation analysis examined the relationship between digital technology variables and tax revenue collection efficiency at the Kenya Revenue Authority (KRA). The results revealed that all independent variables had positive and statistically significant correlations with tax revenue collection efficiency at the 0.01 significance level ($p = 0.000$), indicating that improvements in digital technologies are associated with enhanced revenue performance. Specifically, digital competency exhibited the strongest positive correlation with tax revenue collection efficiency ($r = 0.723$, $p = 0.000$), suggesting that higher levels of digital skills, training, and technological awareness among staff and taxpayers are associated with greater efficiency in tax administration and revenue collection. This implies that digitally competent users are more likely to utilize tax systems effectively and comply with tax obligations.

Data analytics also demonstrated a strong positive relationship with tax revenue collection efficiency ($r = 0.685$, $p = 0.000$). This indicates that the use of analytical tools for taxpayer monitoring, compliance tracking, fraud detection, and decision-making contributes significantly to improved revenue collection outcomes. Similarly, digital platform adoption (iTax and eTIMS) was strongly correlated with tax revenue collection efficiency ($r = 0.673$, $p = 0.000$), implying that increased utilization of integrated tax systems enhances operational efficiency, reduces manual errors, and strengthens compliance monitoring.

The findings further showed that digital payment systems had a strong positive correlation with tax revenue collection efficiency ($r = 0.655$, $p = 0.000$). This suggests that mobile and online payment platforms facilitate timely tax remittances, improve accessibility, and reduce revenue leakages. In addition, system integrity exhibited a moderate but significant positive correlation with tax revenue collection efficiency ($r = 0.540$, $p = 0.000$), indicating that reliable, secure, and well-audited digital systems enhance taxpayer trust and support seamless revenue collection processes. Overall, the results confirm that all dimensions of digital transformation are positively associated with tax revenue collection efficiency, providing a strong basis for subsequent regression analysis.

Regression Analysis

The model summary indicates that the combined effect of the predictor variables digital platform adoption, digital payment systems, data analytics, system integrity, and digital competency explain a considerable portion of the variation in the performance of tax revenue collection. The multiple correlation coefficient (R) is 0.733, which suggests a moderate to strong linear relationship between the predictors and the dependent variable.

The R Square value of 0.537 indicates that approximately 53.7% of the variance in Tax Revenue Efficiency is accounted for by the included predictors. When adjusted for the number of predictors in the model, the Adjusted R Square is 0.532, reflecting that around 53.2% of the variability in Tax Revenue Efficiency can be reliably explained by these variables while accounting for potential model overfitting (Field, 2020; Hair et al., 2020). The standard error of the estimate (0.40635) provides a measure of the average distance that the observed Tax Revenue Efficiency scores fall from the regression line, indicating a reasonably good fit between the model and the observed data. Overall, these results suggest that while the predictors collectively have a meaningful relationship with Tax Revenue Efficiency, a significant proportion of the variance (approximately 46.3%) remains unexplained, implying that other factors not included in the model may also influence Tax Revenue Efficiency outcomes (Pallant, 2020; Kothari, 2021). The model summary results are presented in Table 10.

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Table 10: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	R Square Change	F Change	df1	df1	Sig. F Change
1	.733a	0.537	0.532	0.40635	0.537	107.775	4	139	0.000

Table 11: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11.476	4	2.869	15.678	.0000
	Residual	25.481	139	0.183		
	Total	36.958	143			

The ANOVA results for the regression model indicate that the overall model is statistically significant in explaining variation in Tax Revenue Efficiency. The regression sum of squares is 11.476 with 4 degrees of freedom, while the residual sum of squares is 25.481 with 139 degrees of freedom, leading to a total sum of squares of 36.958. The mean square for the regression is 1.2.869, compared to a mean square for the residual of 0.183, yielding an F-statistic of 15.678 with a corresponding significance value of 0.000. Since the p-value is less than the conventional 0.05 threshold, the null hypothesis that all regression coefficients are equal to zero is rejected, indicating that the combined predictor variables digital platform adoption, digital payment systems, data analytics, system integrity, and digital competency have a significant collective effect on Tax Revenue Efficiency (Field, 2020; Hair et al., 2020).

This suggests that while individual predictors may not all be statistically significant on their own, their combined contribution explains a meaningful portion of the variance in Tax Revenue Efficiency outcomes, supporting the theoretical expectation that multiple interrelated organizational factors jointly influence effectiveness (Pallant, 2020; Kothari, 2021). Furthermore, the results reinforce the utility of the regression model as a predictive tool for understanding the determinants of Tax Revenue Efficiency, while also highlighting the potential need to explore additional variables or contextual factors to further improve explanatory power.

Table 12: Regression Coefficient Results

	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	t	Sig.
(Constant)	1.44	0.116		12.449	0
digital platforms (iTax, eTims) adoptions	0.199	0.057	0.245	3.464	0.001
data analytics	0.126	0.062	0.173	2.012	0.045
digital payment systems	0.198	0.052	0.263	3.799	0
system integrity	0.105	0.038	0.135	2.773	0.006
Digital competency	-0.026	0.036	-0.028	-0.71	0.478

Dependent Variable: tax revenue efficiency

The regression coefficient results show the extent to which each independent variable contributes to tax revenue collection efficiency when all other variables are held constant. The regression model was statistically significant ($F = 107.775$, $p < 0.001$) and explained 53.7% of the variation in tax revenue collection efficiency ($R^2 = 0.537$), indicating that digital technologies play a substantial role in improving revenue performance at the Kenya Revenue Authority (KRA).

The findings revealed that digital platforms (iTax and eTIMS) adoption had a positive and significant effect on tax revenue collection efficiency ($B = 0.199$, $p = 0.001$). This implies that a one-unit increase in digital platform adoption results in a 0.199-unit increase in tax revenue collection efficiency, holding other factors constant. Similarly, digital payment systems had a positive and significant effect ($B = 0.198$, $p = 0.000$), indicating that greater utilization of mobile and online payment channels improves revenue efficiency by 0.198 units.

The results further showed that data analytics significantly influenced tax revenue collection efficiency ($B = 0.126$, $p = 0.045$). This suggests that enhanced use of analytical tools contributes to a 0.126-unit increase in revenue efficiency through improved compliance monitoring, audit effectiveness, and decision-making. In addition, system integrity had a positive and significant effect ($B = 0.105$, $p = 0.006$), meaning that improvements in system reliability, security, and operational stability increase tax revenue collection efficiency by 0.105 units.

However, digital competency had a negative and statistically insignificant coefficient ($B = -0.026$, $p = 0.478$), indicating that variations in digital skills among staff and taxpayers did not directly influence tax revenue collection efficiency after controlling for the other digital technology variables. This suggests that competency primarily supports the effective use of digital systems rather than directly improving revenue performance. Consequently, the estimated regression model was:

The overall model becomes:

Tax Revenue Collection Efficiency = 1.44 + 0.199(Digital Platforms) + 0.126(Data Analytics) + 0.198(Digital Payment Systems) + 0.105(System Integrity) − 0.026(Digital Competency).

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Interpretation of Findings

The findings indicate that digital technologies play a significant role in enhancing tax revenue collection efficiency at the Kenya Revenue Authority (KRA). The positive and significant effects of digital platforms, digital payment systems, data analytics, and system integrity suggest that investments in digital transformation improve operational efficiency, taxpayer compliance, and revenue performance. Specifically, digital platforms such as iTax and eTIMS streamline tax administration processes, while digital payment systems facilitate timely and convenient tax remittances. Data analytics enhances decision-making, compliance monitoring, and fraud detection, thereby strengthening revenue collection. Similarly, system integrity improves taxpayer trust through secure, reliable, and stable digital systems. Although digital competency exhibited a strong positive correlation with tax revenue efficiency, its direct effect was statistically insignificant in the regression model, implying that digital skills primarily support the effective utilization of other digital technologies rather than directly influencing revenue outcomes. Overall, the findings confirm that digital transformation is a critical driver of efficient and effective tax administration at KRA.

Practical Implications

The findings provide important practical insights for the Kenya Revenue Authority (KRA) and other revenue administration agencies seeking to improve tax collection efficiency through digital transformation. The positive effects of digital platforms, digital payment systems, data analytics, and system integrity imply that continuous investment in these technologies can enhance compliance monitoring, reduce revenue leakages, and improve service delivery. KRA should prioritize regular upgrades of iTax and eTIMS platforms, expand integration with digital payment channels, and strengthen data analytics capabilities for risk assessment and fraud detection. Additionally, enhancing cybersecurity measures and system reliability will increase taxpayer trust and system usage. Although digital competency was not a significant predictor, continuous training for staff and taxpayers remains essential to maximize the utilization and effectiveness of digital tax systems.

Theoretical Implications

The study contributes to the existing body of knowledge on digital transformation and public revenue administration by providing empirical evidence on the relationship between digital technologies and tax revenue collection efficiency. The findings support the Technology Acceptance Model (TAM) by demonstrating that the adoption and utilization of digital platforms positively influence organizational outcomes. The results also reinforce the E-Government Adoption Model, which emphasizes the role of digital systems in improving service delivery and operational performance. Furthermore, the significant effects of digital platforms, analytics, payment systems, and system integrity validate the propositions of Human Capital Theory and digital governance literature regarding the importance of technological resources in enhancing institutional effectiveness and performance.

Limitations of the Descriptive Analysis

The descriptive analysis was limited to summarizing respondents' perceptions and experiences regarding digital technologies and tax revenue collection efficiency without establishing cause-and-effect relationships. Since the analysis relied primarily on self-reported questionnaire data, the findings may have been influenced by respondent bias, subjectivity, or social desirability tendencies. Additionally, descriptive statistics do not account for the simultaneous influence of multiple variables, making it difficult to determine the relative contribution of each factor to tax revenue efficiency. The analysis was also confined to respondents from KRA offices and taxpayers within Taita Taveta County, which may limit the generalizability of the findings to other regions.

CONCLUSIONS AND RECOMMENDATIONS

The study concluded that digital technologies significantly enhance tax revenue collection efficiency at the Kenya Revenue Authority (KRA). The findings established that digital platform adoption, digital payment systems, data analytics, and system integrity have positive and statistically significant effects on tax revenue collection efficiency. The adoption of digital platforms such as iTax and eTIMS has improved tax administration by streamlining tax filing, enhancing transparency, reducing manual errors, and facilitating compliance monitoring. Similarly, digital payment systems have increased convenience, improved accessibility to tax services, and promoted timely tax remittances, thereby reducing revenue leakages and enhancing collection efficiency.

The study further concluded that data analytics plays a critical role in strengthening tax administration through improved taxpayer monitoring, fraud detection, compliance management, and evidence-based decision-making. Likewise, system integrity, characterized by reliability, security, and operational stability, enhances taxpayer confidence and supports seamless revenue collection processes. Although digital competency exhibited a strong positive association with tax revenue collection efficiency, its direct effect was not statistically significant after controlling for other variables, suggesting that digital skills primarily function as an enabling factor that supports the effective utilization of digital technologies rather than directly influencing revenue outcomes. Based on these findings, the study recommends that KRA continue investing in digital transformation initiatives to enhance tax administration effectiveness. First, KRA should strengthen and continuously upgrade digital platforms such as iTax and eTIMS to improve system reliability, accessibility, and user experience. Second, the Authority should expand integration with digital payment channels and financial service providers to facilitate seamless tax payments and improve taxpayer convenience. Third, KRA should invest in advanced data analytics technologies, including artificial intelligence and predictive analytics, to enhance compliance monitoring, fraud detection, and revenue forecasting.

The study also recommends strengthening cybersecurity infrastructure, disaster recovery systems, and regular system audits to safeguard taxpayer information and improve system integrity. Furthermore, KRA should continue implementing digital literacy and capacity-building programs for both staff and taxpayers to promote effective utilization of digital systems. At the policy level, the government should strengthen legal and regulatory frameworks supporting digital tax administration, invest in digital infrastructure, and promote inter-agency collaboration to facilitate system interoperability and efficient information sharing. Collectively, these measures will contribute to improved tax compliance, enhanced operational efficiency, and sustainable domestic revenue mobilization.

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Future Research Directions

Future studies should adopt longitudinal research designs to examine the long-term effects of digital technologies on tax revenue collection efficiency and establish causal relationships among study variables. Comparative studies involving different counties, regions, or revenue authorities within East Africa would provide deeper insights into how institutional, technological, and socio-economic factors influence the effectiveness of digital tax systems. Further research should also investigate the indirect mechanisms through which digital competency affects revenue performance, particularly its potential mediating or moderating role between technology adoption and tax collection outcomes. Additionally, scholars should explore the influence of emerging technologies such as artificial intelligence, machine learning, blockchain, and automation on tax administration efficiency, fraud detection, and taxpayer compliance. Future studies may also examine taxpayer trust, digital inclusion, cybersecurity risks, and informal sector taxation to provide a broader understanding of the opportunities and challenges associated with digital transformation in public revenue administration.

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ETHICAL DECLARATIONS

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Conflict of Interest: The authors declare that they have no competing interests or conflicts of interest related to this study.

Data Availability: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval and Consent to Participate: Ethical approval for the study was obtained from Taita Taveta University. In addition, all participants provided informed consent prior to their involvement in the research.

RECOGNITIONS OF THE AUTHOR CONTRIBUTION

Sharon Jerop Choge - Conceptualization, methodology, data collection, data analysis, writing.

Patrick Mutua Kimaku - Supervision, refining methodology, reviewing and editing.

Irene Esther Njeri - Supervision, validation, editing and reviewing.

DATA AVAILABILITY

To protect participant confidentiality and privacy, the complete dataset generated and analyzed during this study is not publicly accessible. Nevertheless, anonymized data and relevant supporting documents can be obtained from the corresponding author upon reasonable request and subject to ethical considerations.

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