DIGITALIZATION AND EFFICIENCY OF REVENUE COLLECTION IN NAIROBI CITY COUNTY, KENYA: THE CONTRIBUTION OF E-FILING SYSTEMS, MOBILE PAYMENT PLATFORMS, REVENUE DATABASES AND AUTOMATED COMPLIANCE MONITORING TOOLS

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ABSTRACT

Revenue collection in Nairobi City County, Kenya has remained inefficient despite substantial investment in digital systems. Persistent system downtimes, delayed payment reconciliation, fragmented revenue modules and residual manual processes have slowed service delivery and weakened compliance enforcement, at a time when devolved units are under pressure to mobilize own-source revenue to finance service delivery. Digitalization has emerged as the principal strategy for addressing these weaknesses, yet empirical evidence on how specific digital tools affect administrative efficiency at the county level is scarce. This study examined the effect of digitalization on the efficiency of revenue collection in Nairobi City County. Specifically, it assessed the effects of e-filing systems, mobile revenue payment platforms, revenue databases and automated compliance monitoring tools on the efficiency of revenue collection. The study was anchored on the Technology Acceptance Model, Systems Theory, Diffusion of Innovation Theory and New Public Management Theory. A correlational research design was adopted, targeting 337 officers of the Nairobi City County Revenue Department, from whom a sample of 183 officers was drawn using stratified random sampling. Data were collected through structured questionnaires administered via Google Forms and key informant interviews, and 153 questionnaires were returned, a response rate of 83.6%. A pilot test in Kiambu County confirmed the validity and reliability of the instrument, with Cronbach's alpha coefficients ranging from 0.779 to 0.897. Data were analysed using descriptive statistics, Pearson correlation and multiple linear regression, after diagnostic tests confirmed normality, homoscedasticity and the absence of multicollinearity. The regression results showed that the four digitalization strategies jointly explained 78.7% of the variance in the efficiency of revenue collection ($R^2 = 0.787$, $F(4, 148) = 137.076$, $p < 0.001$). All four predictors had significant positive effects: e-filing systems ($\beta = 0.468$, $p < 0.001$), automated compliance monitoring tools ($\beta = 0.324$, $p < 0.001$), mobile revenue payment platforms ($\beta = 0.315$, $p < 0.001$) and revenue databases ($\beta = 0.307$, $p < 0.001$). The study concluded that digitalization has a significant and substantial positive effect on the efficiency of revenue collection, with e-filing systems as the leading contributor. It recommends continued investment in reliable e-filing infrastructure, streamlined mobile payment reconciliation, better calibration of compliance alerts, improved completeness of revenue database records and an integrated, interoperable digitalization strategy.

Key words: Efficiency of revenue collection, digitalization, e-filing systems, mobile revenue payment platforms, revenue databases, automated compliance monitoring tools.

INTRODUCTION

In a digital global economy, revenue authorities are under growing pressure to improve effectiveness, transparency and compliance as taxpayers engage in increasingly complex and diversified economic activities. Digitalization has transformed the way government services are delivered across the world, with revenue agencies deploying digital tools to streamline processes, improve service quality and widen access to administrative services (Pali & Rama, 2025). Emerging economies in particular have embraced digital fiscal systems to cope with persistent problems of low compliance, inefficient manual processing and revenue leakage, since digital technologies provide real-time data, simplified procedures and stronger monitoring capabilities (Sarvar, 2025). As artificial intelligence, automation and integrated data systems are incorporated into what has been termed revenue collection 3.0, enforcement and analysis of taxpayer behaviour are becoming routine (Belahouaoui & Attak, 2024), and agile, digitally integrated revenue administrations are increasingly regarded as essential for revenue systems to function effectively (Chen & Liu, 2025).

Digitalization of revenue collection is a transformative response to the challenges of collection, compliance monitoring and service delivery. Digital systems help deliver revenue collection that is faster, more accurate and more transparent through automation, which improves information flow and reduces the need for human intervention (Ilahi et al., 2025). They also reduce administrative costs and human error and make taxpayer interactions more efficient, as evidence from Algeria shows (Ramzi, 2024), while digital reporting, data integration and real-time analytics allow revenue authorities to identify non-compliance quickly and strengthen enforcement (Korolyuk et al., 2025). Globally, Estonia's integrated digital revenue system, with automatic filing and real-time data sharing, has substantially reduced administrative overhead (Ilahi et al., 2025); in China, digital revenue systems based on big data analytics and intelligent reporting have improved administrative accuracy and compliance monitoring (Chen & Liu, 2025); and e-invoicing and real-time digital reporting have driven compliance checks in the European Union (Korolyuk et al., 2025).

In Africa, digitalization has become a vital strategy in Nigeria for improving efficiency, transparency and revenue collection, with digital payment systems delivering faster transactions, fewer leakages and greater usability for taxpayers (Omodero & Ekundayo, 2025), and digital transformation of a harmonized tax structure yielding a simpler, better-organized system with fewer administrative bottlenecks (Somorin & Awodun, 2024). At the state level, e-filing portals, revenue registration systems and electronic payment systems have aligned Nigerian revenue collection with international best practice in monitoring, real-time reporting and the reduction of manual manipulation (Mohammed et al., 2023). In East Africa, Uganda has achieved better taxpayer identification, easier access to services and real-time transaction monitoring, although a lack of integrated systems and limited digital competence remain challenges (Besigomwe, 2025); Tanzania's electronic revenue systems and mobile payment technologies have considerably increased efficiency by eliminating manual processes (Mande, 2023); and Rwanda's digital compliance tools and machine learning-based revenue forecasting models have enhanced accuracy and evidence-based decision-making (Uwizeye, 2023).

In Kenya, digitalization has substantially enhanced the efficiency of revenue collection, most notably through the Kenya Revenue Authority's iTax platform, which has improved registration, filing and payment processes and, in turn, revenue performance and compliance (Achibo & Wanjohi, 2024). The efficiency of these systems varies with the supporting regulatory environment, since policies that promote interoperability, security and technology adoption are associated with higher revenue performance (Rutto et al., 2025). At the county level, digital reforms are a growing development, with blockchain being explored to increase transparency, curb manipulation and ensure accountability in revenue processes in Nairobi City County (Manani & Mose, 2024). However, revenue collection in Nairobi City County has remained sub-optimal because of fragmented collection systems and weak technological infrastructure (Bando & Njoka, 2025), while governance-related deficiencies such as weak oversight and inconsistent enforcement undermine the efficiency of existing digital efforts (Lena, 2024). More broadly, county governments in Kenya lack sufficient tax management capacity to assess, collect and enforce revenue, leaving many counties with resource shortages and revenue shortfalls (Kariuki, 2025), compounded by inconsistent revenue practices, poor enforcement and poor integration of digital systems (Onderi et al., 2024).

Efficiency of revenue collection denotes how proficiently a revenue authority executes its collection mandate by making optimal use of administrative resources and minimizing operational delays. It comprises the timely processing of returns, precise assessment of liabilities and enforcement mechanisms that secure voluntary compliance (Idrus, 2024), and efficient systems also lower collection costs, eliminate redundancies and ensure predictable, transparent processes (Ug'iloy, 2025). Digital revenue collection, in turn, denotes the adoption of digital technologies such as e-filing platforms, automated data systems, digital payment channels and online user interfaces in revenue systems to achieve efficiency, accuracy and convenience (Mpofu, 2024; Deshi et al., 2025). In this study, digitalization was operationalized through four components: e-filing systems, which enable rapid filing, automated verification and expedited handling of revenue data (Nguvava & Anatory, 2025); mobile revenue payment platforms, which speed up collection through instantaneous payment and real-time posting while relieving payment-cycle bottlenecks and cash-handling risks (Ug'iloy, 2025; Omodero & Ekundayo, 2025); revenue databases, which aggregate computerized records to support identification, assessment and monitoring of revenue streams and payers (Ilaboya & Uwaifo, 2025; Anastasiou et al., 2023); and automated compliance monitoring tools, which analyse payer behaviour, flag anomalies and accelerate enforcement action (Olabanji et al., 2024; Idrus, 2024).

Statement of the Problem

Ideally, revenue collection should be characterized by timely processing, correct assessments, appropriate compliance oversight and reliable supporting information systems (Pali & Rama, 2025). Even with digitalization, however, inefficiencies persist. Systems such as NairobiPay in Nairobi City County still experience system downtimes, late payment reconciliation, poor integration among revenue modules and residual manual processes that slow service delivery and weaken compliance enforcement (Sarvar, 2025). Although modern digital tools have the

potential to enhance administrative efficiency, many revenue administrations have struggled to implement them effectively, resulting in continued inefficiency (Belahouaoui & Attak, 2024).

Empirical evidence shows that Nairobi City County has fragmented revenue systems, inconsistent taxpayer records, weak enforcement mechanisms and limited tax management capacity, all of which contribute to poor administrative efficiency (Macharia et al., 2021; Kariuki, 2025). Digital solutions such as iTax and blockchain are being used to improve accuracy and streamline revenue processes (Achibo & Wanjohi, 2024; Rutto et al., 2025; Manani & Mose, 2024), but at the devolved level these benefits have been hampered by governance gaps, weak automation and technical challenges, leading to persistent revenue leakages and sub-optimal efficiency outcomes (Bando & Njoka, 2025).

Although there are empirical studies on digitalization in revenue collection, there is little evidence on the role that specific digital tools play in county-level administrative efficiency. Some research has focused on taxpayer compliance (Ilahi et al., 2025), and other studies on advanced digital revenue systems in different administrative environments (Chen & Liu, 2025), while local studies have tended to treat digital tools and efficiency descriptively rather than empirically (Macharia et al., 2021). Methodologically, much of the prior work has examined taxpayers rather than the administrative mandate, or has embedded digital tools within moderated models that obscure their independent effects. This gap between digitalization and actual efficiency gains motivated the present study, which empirically examined how e-filing systems, mobile revenue payment platforms, revenue databases and automated compliance monitoring tools contribute to the efficiency of revenue collection in Nairobi City County.

Research Objectives

General objective

The general objective of this research was to assess the effect of digitalization on the efficiency of revenue collection in Nairobi City County, Kenya.

Specific objectives

i. To assess the effect of e-filing systems on the efficiency of revenue collection in Nairobi City County.
ii. To examine the influence of mobile revenue payment platforms on the efficiency of revenue collection in Nairobi City County.
iii. To determine the contribution of revenue databases to the efficiency of revenue collection in Nairobi City County.
iv. To evaluate the role of automated compliance monitoring tools on the efficiency of revenue collection in Nairobi City County.

LITERATURE REVIEW

Theoretical Literature Review

This section discusses the theories that explain the relationship between digitalization and the efficiency of revenue collection. The study was anchored on the Technology Acceptance Model, Systems Theory, Diffusion of Innovation Theory and New Public Management Theory.

Technology Acceptance Model

The Technology Acceptance Model (TAM), founded by Davis (1989), holds that a user's decision to adopt a technological system is driven by two beliefs: the perceived usefulness of the technology and its perceived ease of use. Users respond positively to a system they perceive as useful and easy to use, which shapes their attitude towards use and, in turn, actual use. Prior experience, user confidence and the clarity of system design influence how these perceptions are formed. Applied to revenue administration, TAM indicates that acceptance of digital revenue instruments depends heavily on perceived convenience, accuracy and compliance support (Wulandari & Dasman, 2023), and that users whose obligations are simplified by digital systems are more likely to adopt them (Abdi et al., 2024).

TAM has been criticized for oversimplifying technology adoption by reducing it to perceived usefulness and ease of use, while neglecting broader institutional and situational considerations (Mandasari, 2024). It does not sufficiently account for infrastructure readiness, system reliability and mandatory compliance requirements that affect adoption in revenue settings (Zakaria et al., 2024), and it assumes rational user behaviour, overlooking managerial directives and institutional constraints that shape real-world use (Olumoh & Sanni, 2025).

TAM was nonetheless pertinent to this study because it explains how revenue officers' perceptions of the usefulness and ease of use of e-filing systems, mobile revenue payment platforms, revenue databases and automated compliance monitoring tools determine whether those tools are used effectively. Where the tools are perceived as efficient and easy to use, their use increases, translating into quicker transactions, accurate record keeping and lower administrative cost. TAM therefore provided a theoretical explanation of how the effective implementation of digitalization components affects revenue collection efficiency in Nairobi City County.

Systems Theory

Systems Theory, originally proposed by Von Bertalanffy (1968), views an organization as an assemblage of interrelated components that interact continuously with one another and with the external environment. From this perspective, effectiveness depends on the extent to which these components communicate, respond and adapt (Chen & Thapa, 2025). In revenue collection, this implies that digital elements such as automated revenue systems, data platforms and compliance technologies must be integrated into a web of connected systems for efficiency gains to be realized, since poor linkage or coordination can disrupt workflows, reduce accuracy and alter compliance outcomes (Tarus, 2025).

The theory has been faulted for assuming that all components of the revenue ecosystem work together harmoniously, whereas administrative entities are often geographically and temporally separated, which reduces productivity when the overall system is not synchronized (Zhuravleva, 2024). It also leaves out behavioural elements that affect compliance, such as trust, perceptions of fairness and enforcement pressure (Darmayasa & Hardika, 2024), and it underplays the policy differences and regulatory gaps that complicate administrative processes (Okoh & Ofor, 2024).

Systems Theory was relevant because revenue collection is a linked system whose performance depends on the interaction of its parts. E-filing systems, mobile revenue payment platforms, revenue databases and automated compliance monitoring tools must work together for administrative processes to be efficient; when they are well synchronized and share data efficiently, processing delays fall, accuracy improves and overall revenue collection efficiency in Nairobi City County increases.

Diffusion of Innovation Theory

The Diffusion of Innovation Theory (DIT), developed by Rogers (1962), proposes that new technologies spread through an organization through a systematic process shaped by communication channels, time and the features of the innovation itself. Relative advantage, compatibility with prevailing systems, simplicity, trialability and observability of results govern adoption, and adopters vary from innovators and early adopters to the early majority, late majority and laggards. Innovations that demonstrate clear efficiency gains or solve operational dilemmas are more likely to be adopted (Deshi et al., 2025), while institutional readiness, leadership backing and observable benefits guide adoption choices (Ogbeta & Ayeni, 2024).

DIT has been challenged for offering a simplistic account of technology uptake that ignores structural, institutional and bureaucratic constraints (Okunogbe & Santoro, 2023), for focusing on adopter types at the expense of organizational features such as leadership, resource capacity and systemic readiness, and for overlooking the behavioural resistance and cultural obstruction that can impede adoption where innovations require significant changes to existing habits or skills (Kabir, 2021).

DIT was relevant to this study because it explains the uptake and incorporation of digital tools within the revenue collection system of Nairobi City County, capturing why some innovations gain adoption swiftly while others take longer, and highlighting the role of perceived advantage, compatibility and observable benefits in adoption. The study drew on the theory to interpret the diffusion of digital solutions across functional units and the variation in efficiency outcomes that results.

New Public Management Theory

New Public Management (NPM) Theory, developed by Hood (1991), advocates the application of private-sector management practices in public institutions to achieve efficiency, accountability and improved service delivery. Its central assumption is that public

organizations become more productive when they employ innovation, decentralized processes, measurable outputs and customer-centred processes enabled by modern technology, and that explicit performance indicators and managerial autonomy improve responsiveness. Recent scholarship observes that collaborative and technologically driven approaches in public administration are closely aligned with the efficiency and accountability that NPM promotes (De Widt & Mulligan, 2024).

NPM has been widely criticized for oversimplifying the intricacies of the public sector. Market-style mechanisms and performance metrics may fragment functions and erode cohesion within public organizations (Hildreth, 2021); modernization efforts based on NPM often neglect the cultural and motivational dimensions that affect taxpayer engagement (Wahyuddin & Rachmat, 2023); and its advocacy of privatization and technological innovation may miss the deeper governance complexities that undermine revenue collection (Prasetyo et al., 2025).

NPM Theory was fitting for this study because digitalization of revenue collection is an efficiency-enhancing reform that introduces modern management practice into a public institution. The theory helped explain how digital tools support efficient work, better monitoring and service delivery, and autonomous compliance monitoring, and it provided a framework for understanding how digitalization could streamline revenue processes in Nairobi City County, leading to greater transparency, responsiveness and performance accountability.

Empirical Literature Review

Nguvava and Anatory (2025) explored the impact of e-filing systems on revenue collection efficiency in Tanzania, guided by TAM. Using a quantitative methodology with 152 large VAT taxpayers and multiple regression analysis, they found that e-filing simplified revenue collection through real-time data submission, reduced human intervention and increased transaction traceability. However, the study focused on large taxpayers, leaving open the question of e-filing and efficiency across different revenue categories and administrative settings, which the present study addressed. Sulkiah (2025) examined the impact of e-filing on compliance and efficiency in Lombok using a mixed-methods approach with 180 participants, concluding that e-filing was associated with lower compliance costs, faster filing, quicker administrative response and overall efficiency, but the non-urban setting left a contextual gap regarding metropolitan revenue administrations. Lannai (2024) used a descriptive survey of 210 Indonesian taxpayers and showed that e-filing increased efficiency by reducing processing time, minimizing filing errors and improving record accuracy, though its taxpayer focus left institutional efficiency unexamined.

Ug'iloy (2025) studied the impact of mobile revenue payment platforms on revenue collection efficiency in Uzbekistan using five-year panel data across administrative units, and found that mobile platforms decreased payment delays, reduced administrative costs and provided real-time transaction visibility, although the study concentrated on revenue outcomes rather than administrative efficiency. Omodero and Ekundayo (2025), using ten years of macroeconomic and revenue data in Nigeria, showed that digital payment platforms improved the accuracy and timeliness of remittances, with inflation and exchange rates acting as moderators, but did not

examine internal workflow efficiency. Rutto et al. (2025) investigated mobile-enabled tax payment systems in Kenyan county revenue offices using a descriptive correlational design and found that mobile platforms simplified payment flows, eliminated queues and enhanced remittance consistency, with effects strengthened by a strong regulatory framework; the inclusion of the regulatory framework as a moderator, however, obscured the independent effect of mobile payment platforms. Salahova (2025) conceptually linked digital payment platforms in Azerbaijan to streamlined transaction verification, stronger audit trails and real-time monitoring, but did not measure operational efficiency quantitatively.

Anastasiou et al. (2023) applied data envelopment analysis to revenue administrations in 26 European countries and found that integrated and accurate databases increased efficiency by improving compliance monitoring, reducing record duplication and supporting optimal use of administrative resources, though the cross-country focus did not capture how databases function at the local administrative level. Ilaboya and Uwaifo (2025) conceptually showed that centralized and integrated databases improved payer identification, simplified compliance verification and facilitated predictive detection of non-compliance, without isolating the specific contribution of databases to day-to-day efficiency. Onderi (2025) surveyed 150 revenue staff in Kisii County and found that accurately maintained taxpayer databases minimized unregistered taxpayers and assessment errors and supported compliance monitoring, but examined revenue growth rather than operational efficiency. Pali and Rama (2025), using a mixed-methods study of 120 tax administrators in India, found that digital databases improved data accuracy, reduced manual verification workload and accelerated information processing, though in an administrative context different from devolved systems in Kenya.

Achibo and Wanjohi (2024) examined automated compliance features of the Kenya Revenue Authority's iRevenue system using a descriptive design with 210 staff and found that automated return validation, system-generated alerts and real-time error detection reduced manual audit workload, enhanced processing speed and reinforced follow-up with non-compliant taxpayers, although the study focused on revenue improvements rather than day-to-day operational efficiency. Idrus (2024) surveyed 180 tax officers and found that automated compliance tools eliminated manual verification tasks, increased the speed of non-compliance detection and improved the consistency of enforcement, but did not isolate the operational efficiency gains attributable to automation. Olabanji et al. (2024) used an experimental design on administrative revenue databases and found that machine learning-based monitoring detected fraud faster, reduced manual audits and improved compliance metrics, while enabling officers to prioritize cases, though in a technologically advanced environment unlike Nairobi City County. Collectively, these studies reveal conceptual, methodological and contextual gaps that the present study addressed by isolating the independent effect of each digitalization component on administrative efficiency within a devolved revenue administration.

Conceptual Framework

Figure 1 presents the conceptual framework, which treats digitalization of revenue collection as a multidimensional construct comprising e-filing systems, mobile revenue payment

platforms, revenue databases and automated compliance monitoring tools (independent variables), each of which was expected to influence the efficiency of revenue collection (dependent variable), measured through timeliness of processing, accuracy of assessments, cost-effectiveness and reliability of operations.

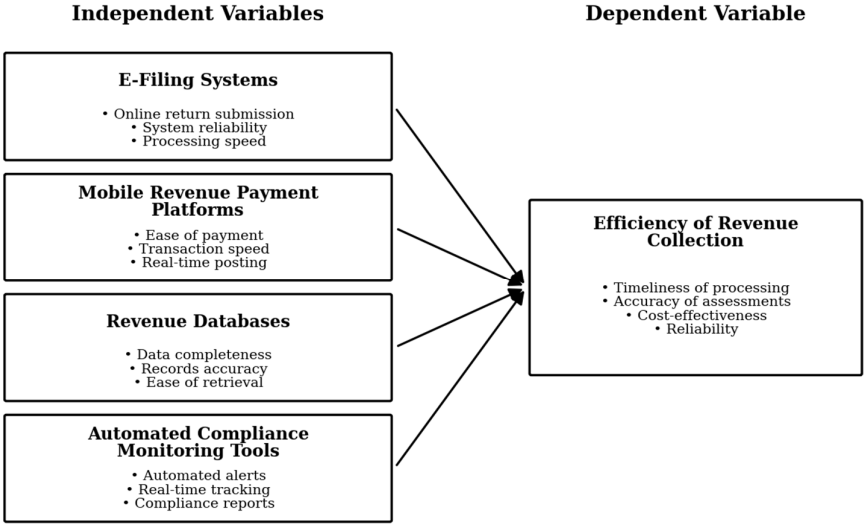


Figure 1: Conceptual Framework

RESEARCH METHODOLOGY

The study adopted a correlational research design, which allowed the strength and nature of the relationship between the digitalization components and efficiency indicators to be examined and permitted inferential analysis through multiple regression. The target population comprised 337 officers of the Nairobi City County Revenue Department working in the e-filing operations, mobile revenue payment platforms, revenue database management, automated compliance monitoring, compliance and audit, and revenue enforcement units. A sample of 183 officers was determined using the Yamane (1967) formula at a 95% confidence level and a 5% margin of error, and respondents were selected through stratified random sampling with proportional allocation across the six functional units, followed by simple random sampling within each stratum (Etikan & Bala, 2017).

Primary data were collected using structured questionnaires with closed-ended items on a five-point Likert scale, administered electronically through Google Forms, supplemented by open-ended items and key informant interviews with senior officials. Each construct was measured with eight items, two of which were negatively worded and reverse-scored, and the efficiency of revenue collection was measured as a composite index of timeliness, accuracy and cost-effectiveness (Creswell & Creswell, 2021). A pilot test involving 18 respondents (10% of the sample) was conducted in Kiambu County to assess the clarity, validity and reliability of the instrument. Content and face validity were established through expert review by the supervisor and industry experts, while reliability was assessed with Cronbach's alpha against a threshold of 0.70 (Khan, 2018; Cooper & Schindler, 2018). Data collection commenced after approval

from Kenyatta University, a research permit from the National Commission for Science, Technology and Innovation (NACOSTI) and authorization from Nairobi City County, with participation being voluntary, anonymous and confidential (Saunders et al., 2019).

Quantitative data were coded and analysed in SPSS using descriptive statistics (means and standard deviations), Pearson correlation and multiple linear regression, while qualitative data from open-ended responses and interviews were analysed thematically. Diagnostic tests for normality (Kolmogorov–Smirnov and Shapiro–Wilk tests on standardized residuals), multicollinearity (variance inflation factors) and heteroscedasticity (Breusch–Pagan test) were conducted before regression. The empirical model estimated was:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

where Y is the efficiency of revenue collection, X_1 is e-filing systems, X_2 is mobile revenue payment platforms, X_3 is revenue databases, X_4 is automated compliance monitoring tools, β_0 is the intercept, β_1–β_4 are the regression coefficients and ε is the error term.

RESULTS AND DISCUSSION

Response Rate and Respondent Characteristics

Of the 183 questionnaires administered, 153 were duly completed and returned, a response rate of 83.6%, which exceeds the 70% threshold regarded as satisfactory for survey-based analysis (Kothari, 2019). Male officers accounted for 61.4% of respondents and female officers for 38.6%. Most respondents had substantial experience in revenue collection, with 43.8% having worked for four to seven years and 28.8% for eight years or more, so that 72.6% had served for at least four years. The respondents were also well educated: 62.7% held a bachelor's degree, 30.1% a master's degree and 2.0% a PhD, with only 5.2% holding a diploma. This profile indicates that the respondents were well placed to evaluate the technical and operational aspects of digitalization covered by the study.

Descriptive Statistics

Table 1 summarizes the descriptive statistics and reliability coefficients for the study constructs. All constructs recorded overall means above the scale midpoint of 3.00, and all Cronbach's alpha coefficients exceeded the 0.70 threshold.

Table 1: Descriptive Statistics and Reliability of Study Constructs

Construct	N	Mean	Std. Dev	Cronbach's α
E-filing systems	153	3.50	1.13	0.813
Mobile revenue payment platforms	153	3.52	1.08	0.779
Revenue databases	153	3.37	1.13	0.784
Automated compliance monitoring tools	153	3.43	1.05	0.831
Efficiency of revenue collection	153	3.51	1.16	0.897

The first objective was to assess the effect of e-filing systems on the efficiency of revenue collection. Respondents held moderately positive perceptions of e-filing systems (Mean = 3.50, Std. Dev = 1.13). They agreed most strongly that e-filing is used frequently for processing returns (Mean = 3.55), that information submitted through e-filing is complete (Mean = 3.53) and that e-filing has reduced the need for manual data entry (Mean = 3.52), while on balance disagreeing that the system often experiences downtimes (Mean = 2.48) or that many returns still require manual correction (Mean = 2.50). The open-ended responses reinforced this pattern, with 39 respondents citing improved accuracy through reduced manual entry, although 33 noted that downtime and user support remain concerns.

The second objective was to examine the influence of mobile revenue payment platforms, which attracted the most favourable assessment of the four constructs (Mean = 3.52, Std. Dev = 1.08). Respondents particularly agreed that mobile platforms have reduced delays in revenue posting (Mean = 3.61) and that mobile payments are processed faster than traditional methods (Mean = 3.60), while disagreeing that reconciliation takes longer (Mean = 2.48) or that failed transactions are frequent (Mean = 2.50). Qualitative responses highlighted faster posting and prompt confirmation (36 respondents), although 29 respondents noted that failed transactions and delayed reconciliation occasionally slow operations.

The third objective was to determine the contribution of revenue databases, which received the most cautious assessment of the four constructs (Mean = 3.37, Std. Dev = 1.13). Respondents valued the support that database information gives to enforcement decisions (Mean = 3.45) and the consistency of records across units (Mean = 3.42), but the negatively worded items on incomplete records and limited use of the database in enforcement recorded the highest means of any negatively worded items in the study (both 2.65), pointing to mixed experiences with record completeness and currency. This was echoed by 35 respondents who observed that incomplete records require regular updating.

The fourth objective was to evaluate the role of automated compliance monitoring tools, which were rated moderately favourably (Mean = 3.43, Std. Dev = 1.05). Respondents agreed most strongly that automated alerts quickly identify non-compliant revenue sources (Mean = 3.54) and that automated monitoring supports prioritization of high-risk cases (Mean = 3.51), while on balance disagreeing that the systems generate many unnecessary alerts (Mean = 2.59) or that manual follow-ups are still required for most cases (Mean = 2.61). Nineteen respondents nonetheless noted that many alerts still require human review to remove false positives. The dependent variable, efficiency of revenue collection, recorded an overall mean of 3.51 (Std. Dev = 1.16), with consistently similar ratings across processing time, backlog reduction, error reduction, complaint resolution, workload, cost and smoothness of operations, indicating moderate, broad-based efficiency gains from digitalization. The relatively large standard deviations across all constructs, however, indicate that perceptions varied considerably across officers and units.

Correlation Analysis

Table 2 presents the Pearson correlation results for the relationship between the four digitalization components and the efficiency of revenue collection.

Table 2: Correlation Results

		Efficiency	**E-filing**	**Mobile payment**	**Databases**	**Monitoring**
Efficiency of revenue collection	Pearson Correlation	1				
	Sig. (2-tailed)					
E-filing systems	Pearson Correlation	.672**	1			
	Sig. (2-tailed)	.000				
Mobile revenue payment platforms	Pearson Correlation	.463**	.161*	1		
	Sig. (2-tailed)	.000	.047			
Revenue databases	Pearson Correlation	.524**	.267**	.123	1	
	Sig. (2-tailed)	.000	.001	.130		
Automated compliance monitoring tools	Pearson Correlation	.512**	.221**	.105	.166*	1
	Sig. (2-tailed)	.000	.006	.195	.040	
**. Correlation is significant at the 0.01 level (2-tailed). *. Correlation is significant at the 0.05 level (2-tailed). Listwise N = 153						

The results show that e-filing systems have a strong, positive and statistically significant correlation with the efficiency of revenue collection ($r = 0.672$, $p < 0.01$), the strongest bivariate relationship among the four components. This is consistent with Nguvava and Anatory (2025) and Sulkiah (2025), who found that e-filing adoption is closely associated with gains in administrative efficiency and compliance. Revenue databases showed a moderate-to-strong positive correlation with efficiency ($r = 0.524$, $p < 0.01$), supporting Anastasiou et al. (2023) and Onderi (2025), who emphasized the centrality of administrative data quality to revenue performance. Automated compliance monitoring tools likewise demonstrated a moderate-to-strong positive correlation with efficiency ($r = 0.512$, $p < 0.01$), aligning with Achibo and

Wanjohi (2024) and Idrus (2024), who found that automated monitoring supports faster and more consistent enforcement. Mobile revenue payment platforms recorded the weakest, though still moderate and significant, positive correlation with efficiency ($r = 0.463$, $p < 0.01$), consistent with Ug'iloy (2025) and Rutto et al. (2025).

Notably, the correlations among the four independent constructs were weak ($r = 0.105$ to 0.267). This indicates that although the four constructs are components of a single digitalization strategy, officers' assessments of each component were largely independent of one another, which favours isolating the unique contribution of each component in the regression model.

Diagnostic Tests

Table 3 summarizes the diagnostic tests conducted before regression analysis. The Kolmogorov–Smirnov statistic for the standardized residuals was 0.042 ($p = 0.940$), corroborated by the Shapiro–Wilk test ($W = 0.989$, $p = 0.305$), confirming that the residuals did not depart significantly from normality. The Breusch–Pagan test yielded a Lagrange multiplier statistic of 5.201 with 4 degrees of freedom ($p = 0.267$), so the null hypothesis of constant error variance was not rejected and ordinary least squares standard errors were retained. Variance inflation factors ranged from 1.038 to 1.131 (mean VIF = 1.084), with tolerance values between 0.884 and 0.963, indicating that multicollinearity was not a concern and that all four components could be retained in the model.

Table 3: Diagnostic Test Results

Test	Statistic	df	Sig.
Kolmogorov–Smirnov (standardized residuals)	0.042	153	.940
Shapiro–Wilk (standardized residuals)	0.989	153	.305
Breusch–Pagan (heteroscedasticity)	5.201	4	.267
VIF: E-filing systems	1.131	Tolerance	.884
VIF: Mobile revenue payment platforms	1.038	Tolerance	.963
VIF: Revenue databases	1.097	Tolerance	.912
VIF: Automated compliance monitoring tools	1.070	Tolerance	.935

Test of Hypothesis

This section presents the results of the multiple linear regression analysis, including model fitness, analysis of variance (ANOVA) and regression coefficients, to assess the strength, significance and predictive power of the model.

Table 4: Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.887[a]	.787	.782	.541
a. Predictors: (Constant), Automated compliance monitoring tools, Mobile revenue payment platforms, E-filing systems, Revenue databases				

Table 4 shows that the regression model achieved a strong fit, with an R value of 0.887 and an R Square of 0.787. This implies that e-filing systems, mobile revenue payment platforms, revenue databases and automated compliance monitoring tools jointly explained 78.7% of the variation in the efficiency of revenue collection in Nairobi City County, with the remaining 21.3% attributable to factors outside the model and random error. The Adjusted R Square of 0.782 confirms that the explanatory power holds after accounting for the number of predictors.

Table 5: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	160.638	4	40.160	137.076	.000[b]
	Residual	43.360	148	.293		
	Total	203.998	152			
a. Dependent Variable: Efficiency of revenue collection						
b. Predictors: (Constant), Automated compliance monitoring tools, Mobile revenue payment platforms, E-filing systems, Revenue databases						

Table 5 presents the ANOVA results. The F statistic of 137.076 with a p-value of less than 0.001 indicates that the model is statistically significant at the 5% level, confirming that the combined effect of the four digitalization components significantly predicts the efficiency of revenue collection.

Table 6: Regression Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-1.637	.230		-7.124	.000
	E-filing systems	.479	.041	.468	11.615	.000
	Mobile revenue payment platforms	.337	.041	.315	8.167	.000
	Revenue databases	.314	.041	.307	7.721	.000
	Automated compliance monitoring tools	.358	.043	.324	8.275	.000
a. Dependent Variable: Efficiency of revenue collection						

The multiple regression model used is illustrated below:

$$\mathbf{Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon}$$

$$\mathbf{Y = -1.637 + 0.479 X_1 + 0.337 X_2 + 0.314 X_3 + 0.358 X_4}$$

Table 6 displays the regression coefficients, showing the unique contribution of each digitalization component to the efficiency of revenue collection while holding the other predictors constant. All four components were statistically significant at the 5% level. E-filing systems had the strongest positive and significant effect (B = 0.479, β = 0.468, t = 11.615, $p < 0.001$), implying that a one-unit improvement in e-filing systems is associated with a 0.479-unit increase in efficiency. Automated compliance monitoring tools had the second-largest effect (B = 0.358, β = 0.324, t = 8.275, $p < 0.001$), followed by mobile revenue payment platforms (B = 0.337, β = 0.315, t = 8.167, $p < 0.001$) and revenue databases (B = 0.314, β = 0.307, t = 7.721, $p < 0.001$). The differences among the last three standardized effects are small and their confidence intervals overlap, so these three components are best regarded as making broadly comparable contributions, with e-filing systems clearly the leading contributor. Given the low VIF values, each coefficient represents a stable estimate of the unique partial effect of that component.

The significant positive effect of e-filing systems is consistent with Nguvava and Anatory (2025), Sulkiah (2025) and Lannai (2024), who associated e-filing with reduced processing time, fewer manual interventions and improved accuracy, and it provides clear empirical support for TAM, since officers who perceive e-filing as useful in reducing manual entry and improving the completeness of submissions sustain its use and realize efficiency gains. At the same time, the dispersion of responses on downtime and manual correction illustrates TAM's acknowledged limitation of underweighting system reliability as an adoption barrier (Mandasari, 2024; Zakaria et al., 2024). The positive effect of mobile revenue payment platforms supports Ug'iloy (2025), Omodero and Ekundayo (2025), Rutto et al. (2025) and Salahova (2025), and is well explained by DIT, since the speed, convenience and wide reach of mobile channels reflect the relative advantage, compatibility and observability that Rogers (1962) identified as accelerating diffusion; the weak correlation of this construct with the back-office components, alongside its independent contribution to efficiency, is consistent with DIT's view that taxpayer-facing innovations can diffuse and deliver benefits somewhat separately from back-office systems.

The positive contribution of revenue databases is in line with Anastasiou et al. (2023), Ilaboya and Uwaifo (2025), Onderi (2025) and Pali and Rama (2025), who reported efficiency benefits from integrated digital databases supported by sound data governance. From a Systems Theory perspective, revenue databases sit at the centre of the revenue system, since e-filing records, mobile payment references and compliance alerts all depend on the database for storage, retrieval and cross-referencing; the finding that databases contribute independently to efficiency, while showing the strongest inter-construct correlation with e-filing (r = 0.267), supports this systems view. The significance of automated compliance monitoring tools echoes Achibo and Wanjohi (2024), Idrus (2024) and Olabanji et al. (2024), who established that automation improves compliance detection and reduces manual workload, and aligns with

NPM Theory's emphasis on measurable outputs and technologically enabled accountability; the qualitative reports that some alerts still require human review mirror NPM's acknowledged limitation that metric-driven reforms improve measurable outputs without necessarily resolving deeper resourcing constraints (Hildreth, 2021; Wahyuddin & Rachmat, 2023). Taken together, the regression results provide consistent evidence that each of the four digitalization components makes an independent, positive contribution to the efficiency of revenue collection in Nairobi City County, and that these contributions are additive rather than overlapping.

CONCLUSION

Based on the study findings, it is concluded that digitalization, operationalized through e-filing systems, mobile revenue payment platforms, revenue databases and automated compliance monitoring tools, has a statistically significant and substantial positive effect on the efficiency of revenue collection in Nairobi City County, with the four components jointly explaining 78.7% of the variance in efficiency. Each component made a significant, positive and independent contribution, and the low intercorrelation among the predictors means that these contributions are additive. This confirms that digitalization strategy as a whole is a central driver of revenue collection performance in the county, in line with Systems Theory's characterization of revenue collection as an interdependent digital system whose components complement one another.

Firstly, the study concludes that e-filing systems are the single most influential digitalization component for improving the efficiency of revenue collection, given both the strongest bivariate correlation and the largest independent regression effect. This is attributed to the direct reduction in manual data entry and the improved completeness and timeliness of submissions that e-filing affords, consistent with TAM's emphasis on perceived usefulness as a driver of sustained technology use, although system downtime and user support gaps in some units remain a constraint on realizing the system's full potential.

Secondly, the study concludes that automated compliance monitoring tools and mobile revenue payment platforms are robust, statistically significant positive contributors to efficiency, with broadly comparable independent effects and with automated compliance monitoring emerging as the second-strongest driver overall. This affirms the value of measurable, technology-enabled enforcement consistent with NPM Theory, and of convenient, widely accessible payment channels consistent with DIT, even as residual manual review of alerts and transaction-failure and reconciliation concerns among a minority of officers indicate that neither component has yet reached its full potential.

Finally, the study concludes that revenue databases are a significant and independent contributor to the efficiency of revenue collection, but also the component with the greatest unrealized potential, since they received the most cautious descriptive assessment of the four constructs, with record completeness, currency and the consistent use of the database in enforcement identified by officers as the main gaps. Overall, digitalization of revenue collection in Nairobi City County has yielded real and measurable, though as yet moderate,

efficiency gains, and continued investment in an integrated, well-coordinated digitalization strategy, rather than in isolated components, offers the most promising path to further improvement.

RECOMMENDATIONS

Based on the findings of this study, it is recommended that the Nairobi City County Revenue Department prioritize continued investment in the reliability of its e-filing infrastructure, given that e-filing systems emerged as the strongest driver of revenue collection efficiency. This should include measures to reduce system downtime and to strengthen user support in the units where these concerns were raised, so as to consolidate and extend the efficiency gains already being realized.

Secondly, revenue administrators should work with mobile network operators and payment service providers to reduce the incidence of failed transactions and to streamline back-end reconciliation processes, thereby strengthening the reliability of mobile channels as a convenient point of revenue collection for taxpayers away from county offices.

Thirdly, revenue administrators should continue to strengthen automated compliance monitoring tools by improving the calibration of compliance alerts to reduce false positives and by progressively automating routine follow-up actions currently handled manually, in order to further reduce the manual workload associated with compliance enforcement.

Fourthly, the Revenue Department should invest in the accuracy, completeness and currency of revenue databases by strengthening data governance practices, regular data cleaning and consistent record updating across functional units, and should institutionalize the use of database information in audit and enforcement decisions, since closing these gaps is expected to enlarge the efficiency contribution of this component.

Lastly, county policymakers should pursue an integrated digitalization strategy that coordinates e-filing systems, mobile revenue payment platforms, revenue databases and automated compliance monitoring tools as components of a single interoperable system, so that improvements in one component are transmitted to the others rather than being developed in isolation. National policymakers, through the National Treasury and the Ministry responsible for county governments, should support county governments with harmonized digital revenue administration standards, technical capacity building and adequate funding for digital infrastructure, so as to sustain and replicate the efficiency gains documented in this study. Future studies should examine other factors that may account for the unexplained variation in efficiency, such as artificial intelligence-based risk assessment, cybersecurity, system interoperability and staff digital competencies, extend the investigation to other counties, and adopt longitudinal designs to track efficiency gains over time.

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