

# **DIGITAL TAX ADMINISTRATION AND REVENUE EFFECTIVENESS: A COMPARATIVE ANALYSIS OF NIGERIA AND GHANA (2015–2025)**

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**Received: 08 Jan 2026 | Accepted: 30 Jan 2026 | Published: 08 Feb 2026**

## **ABSTRACT**

This article examines the relationship between e-governance implementation and revenue administration effectiveness in Nigeria and Ghana over the period 2015–2025. In the context of persistent fiscal pressures, volatile external financing, and structurally low tax-to-GDP ratios in many developing economies, digital transformation has emerged as a central strategy for strengthening domestic revenue mobilisation. Using a comparative cross-national and longitudinal research design, the study integrates secondary administrative data with primary survey evidence collected from tax officials and registered taxpayers in both countries. Composite indices are constructed to measure e-governance implementation intensity and revenue administration effectiveness, while panel regression techniques are employed to estimate the effect of digitalisation on revenue performance, controlling for macroeconomic and institutional factors. The findings indicate that although both Nigeria and Ghana have achieved high availability of core digital tax services, Ghana demonstrates significantly higher levels of system integration, adoption, and utilisation of analytics and compliance tools. Revenue administration effectiveness is also significantly higher in Ghana across indicators of revenue productivity, compliance outcomes, and administrative efficiency. Econometric results further reveal that e-governance implementation has a positive and statistically significant effect on revenue administration effectiveness in both countries. The article concludes that digital tax reforms yield sustained performance gains when adoption is broad-based, systems are integrated end to end, and compliance management is supported by data-driven risk analysis and credible enforcement mechanisms. The study contributes comparative and longitudinal evidence from West Africa and offers policy-relevant insights for strengthening digital tax administration reforms in developing economies.

**Keywords:** e-governance, digital tax administration, revenue administration effectiveness, Nigeria, Ghana.

## **1. INTRODUCTION**

The digital transformation of public sector institutions has become a defining feature of contemporary governance reform agendas across both developed and developing economies (Organisation for Economic Co-operation and Development (OECD), 2023; World Bank, 2022). In particular, revenue administration has emerged as a focal point of digitalisation efforts due to its central role in financing public goods, sustaining macroeconomic stability, and supporting inclusive development (International Monetary Fund (IMF), 2022; OECD, 2023). Advances in information

and communication technologies have enabled tax authorities to transition from paper-based, fragmented systems to integrated digital platforms that support taxpayer registration, electronic filing, electronic payment, and data-driven compliance management (IMF, 2022; Okunogbe & Santoro, 2023). These developments are widely viewed as mechanisms for improving transparency, reducing administrative and compliance costs, and strengthening enforcement capacity by limiting discretionary practices and expanding third-party information flows (OECD, 2023; World Bank, 2022).

For developing economies, the imperative to strengthen domestic revenue mobilisation has become increasingly urgent. Declining aid flows, volatile commodity prices, rising public debt burdens, and expanding social expenditure demands have exposed the limitations of continued reliance on external financing (IMF, 2022; OECD, 2023). In sub-Saharan Africa, tax-to-GDP ratios remain persistently below global averages, reflecting narrow tax bases, widespread informality, and structural weaknesses in revenue administration (OECD, 2023; World Bank, 2022). Against this backdrop, e-governance has been promoted as a means of addressing long-standing inefficiencies in tax administration without resorting to distortionary tax rate increases or politically costly enforcement reforms (IMF, 2022; Okunogbe & Santoro, 2023).

Nigeria and Ghana provide instructive comparative cases for examining the effectiveness of digital tax reforms in West Africa. Both countries are among the region's largest economies and have undertaken ambitious digital transformation initiatives since the mid-2010s, particularly within their national tax administrations (OECD, 2023). Nigeria's Federal Inland Revenue Service and Ghana's Ghana Revenue Authority have deployed integrated tax administration systems, expanded electronic filing and payment channels, and invested in digital taxpayer service platforms aimed at improving compliance and administrative efficiency (PwC, 2022; Santoro, 2024). Despite these reforms, revenue outcomes have diverged across the two countries, raising important questions about the depth, quality, and effectiveness of e-governance implementation and its translation into measurable performance gains (IMF, 2022).

Existing empirical research on digital tax administration has generated valuable insights but remains limited in several respects. Many studies focus on single-country experiences or on specific digital tools, such as electronic filing or electronic invoicing, thereby constraining comparative learning and generalisability (Kotsogiannis et al., 2025; Lees, 2025). Moreover, a significant proportion of the literature emphasises adoption rates without systematically linking implementation intensity to multidimensional measures of revenue administration effectiveness over extended time horizons (Okunogbe & Santoro, 2023). Given that digital reforms typically yield gradual and cumulative effects, short-term analyses may underestimate their true impact on revenue productivity, compliance behaviour, and administrative efficiency (OECD, 2023).

This article addresses these gaps by conducting a comparative cross-national and longitudinal assessment of e-governance implementation and revenue administration effectiveness in Nigeria and Ghana between 2015 and 2025. Specifically, the study seeks to answer three interrelated questions. First, how has e-governance implementation evolved within the national tax authorities of Nigeria and Ghana over the study period. Second, how does revenue administration effectiveness compare between the two countries. Third, to what extent does e-governance implementation influence revenue administration effectiveness after accounting for macroeconomic and institutional

factors. By addressing these questions, the article contributes to the literature on digital governance and public finance and provides empirically grounded evidence to inform the design, sequencing, and sustainability of digital tax reforms in developing economies.

## 2. LITERATURE REVIEW AND THEORETICAL FRAMEWORK

This section reviews relevant literature on e-governance and digital tax administration, revenue administration effectiveness, and the theoretical foundations underpinning the study. The review is organised into conceptual, theoretical, and empirical strands to establish what is known, identify areas of consensus and divergence, and highlight gaps that justify the comparative and longitudinal focus of the study.

### 2.1 Digitalisation and Tax Administration

Digitalisation in tax administration refers to the systematic application of information and communication technologies to support both taxpayer-facing services and internal administrative processes, including registration, filing, payment, audit, and enforcement (Organisation for Economic Co-operation and Development (OECD), 2023). Contemporary digital tax systems extend beyond basic electronic filing and payment platforms to encompass integrated taxpayer accounts, automated risk assessment, data analytics, and real-time information exchange with third parties (International Monetary Fund (IMF), 2022).

International guidance emphasises that the effectiveness of digital tax administration depends critically on system integration and end-to-end process redesign. According to the OECD (2023), fragmented digital solutions that automate isolated functions without integration across the compliance lifecycle tend to yield limited and unsustainable gains. By contrast, integrated digital ecosystems enable tax authorities to create comprehensive taxpayer profiles, match third-party information, and deploy risk-based compliance strategies more effectively.

Empirical studies consistently show that the adoption of electronic filing and payment systems is associated with improved filing timeliness, reduced compliance costs, and enhanced taxpayer satisfaction (Okunogbe & Santoro, 2023; OECD, 2023). By reducing physical interaction and administrative discretion, digital platforms can also improve transparency and limit opportunities for rent-seeking behaviour (World Bank, 2022). However, the literature cautions that these benefits are contingent on reliable infrastructure, user-friendly system design, and sustained organisational capacity (IMF, 2022).

More advanced digital tools, such as electronic invoicing and real-time transaction reporting, further strengthen enforcement by expanding third-party information flows and increasing transaction traceability. Evidence from developing and emerging economies indicates that e-invoicing systems significantly improve value-added tax compliance and audit effectiveness when effectively implemented (Kotsogiannis et al., 2025; Lees, 2025). Nevertheless, scholars emphasise that digitalisation should be viewed as a complement to, rather than a substitute for, credible enforcement and institutional reform (Okunogbe & Santoro, 2023).

### 2.2 Revenue Administration Effectiveness

Revenue administration effectiveness is a multidimensional construct capturing the extent to which a tax authority mobilises revenue efficiently, equitably, and sustainably while providing reliable services to taxpayers and minimising administrative and compliance costs (IMF, 2022; OECD,

2023). International diagnostic frameworks stress that effectiveness should be assessed using a balanced set of outcome-oriented and operational indicators rather than a single metric.

From an outcome perspective, effectiveness is reflected in revenue productivity, including growth and stability of tax collections relative to economic activity, as well as improvements in tax-to-GDP ratios after controlling for macroeconomic conditions (IMF, 2022). Compliance outcomes constitute another critical dimension and are commonly proxied by filing and payment timeliness, arrears ratios, audit coverage, and audit yield, particularly for value-added tax (OECD, 2023). Service delivery performance captures the responsiveness of the tax authority from the taxpayer's perspective and includes indicators such as refund processing times and dispute resolution efficiency. Administrative efficiency is often measured using indicators such as cost of collection, staff productivity, and average processing times (IMF, 2022).

The literature highlights important interdependencies among these dimensions. Improvements in service delivery can enhance voluntary compliance, while effective compliance risk management can increase revenue productivity and reduce administrative costs over time. Consequently, scholars argue that digital reforms should be evaluated based on their holistic impact on the revenue administration system rather than on isolated performance outcomes (OECD, 2023).

## 2.3 Theoretical Perspectives

This study is anchored in three complementary theoretical perspectives: Diffusion of Innovations Theory, the Technology Acceptance Model, and Institutional Theory. Together, these frameworks provide a robust and multi-level analytical foundation for explaining how digital tax reforms are adopted, implemented, and translated into observable performance outcomes. Their combined use enables the study to move beyond purely technological explanations by incorporating behavioural responses and institutional conditions that shape reform trajectories in developing economies.

Diffusion of Innovations Theory, originally proposed by Rogers (2003), explains how new technologies, ideas, and practices spread within a social system over time. The theory identifies five key attributes that influence adoption decisions: perceived relative advantage, compatibility with existing values and practices, complexity, trialability, and observability. Relative advantage captures the extent to which an innovation is perceived as superior to existing alternatives, while compatibility reflects alignment with users' routines and organisational processes. Complexity relates to the perceived difficulty of understanding and using the innovation, whereas trialability and observability concern opportunities to experiment with and observe the benefits of the innovation.

Applied to digital tax administration, Diffusion of Innovations Theory suggests that e-filing, e-payment, and digital registration systems are more likely to diffuse widely when they demonstrably reduce compliance costs, shorten processing times, and integrate seamlessly with existing business practices. Empirical evidence indicates that visible improvements in service delivery and enforcement outcomes enhance observability and accelerate diffusion among both taxpayers and tax officials (Okunogbe & Santoro, 2023). Conversely, fragmented systems and parallel manual processes increase perceived complexity and slow diffusion, resulting in partial adoption and limited aggregate impact. The theory is therefore particularly useful for explaining variation in adoption depth and system integration across countries and over time.

The Technology Acceptance Model (TAM), developed by Davis (1989), complements diffusion theory by focusing on individual-level determinants of technology use. TAM posits that perceived usefulness and perceived ease of use are the primary factors shaping an individual's intention to adopt and continue using a technology. Perceived usefulness reflects the extent to which a system is believed to enhance job performance or reduce effort, while perceived ease of use captures the degree to which the system is considered free of effort. Subsequent extensions of the model emphasise the role of facilitating conditions, social influence, and experience in shaping sustained usage (Venkatesh et al., 2012).

In the context of digital tax administration, TAM highlights the importance of system reliability, intuitive interface design, and responsive user support in shaping taxpayer and staff behaviour. Where digital platforms are perceived as unreliable or difficult to navigate, users may revert to assisted or manual channels despite formal availability. Empirical studies from developing countries demonstrate that digital literacy constraints, trust in government systems, and prior experiences with technology significantly mediate user acceptance (Asmah, 2025). TAM therefore provides a behavioural explanation for why adoption rates and intensity vary across taxpayer segments and why availability of digital systems does not automatically translate into effective use.

Institutional Theory offers a macro-level perspective by emphasising the role of formal rules, normative expectations, and cultural-cognitive beliefs in shaping organisational behaviour and reform outcomes (Scott, 2014). From this perspective, digital tax reforms are embedded within broader governance systems and are influenced by legal frameworks, organisational capacity, political commitment, and external pressures. Institutional isomorphism, driven by coercive, normative, and mimetic forces, explains why tax administrations increasingly converge toward similar digital practices and standards.

In tax administration, institutional pressures from governments, professional bodies, and international organisations influence the design, sequencing, and sustainability of digital reforms. Benchmarking frameworks such as the Tax Administration Diagnostic Assessment Tool and comparative studies produced by the OECD create incentives for convergence toward internationally recognised best practices in digital service delivery, compliance risk management, and administrative efficiency (OECD, 2023; TADAT Secretariat, 2022). However, Institutional Theory also underscores that formal adoption of reforms may outpace actual implementation when organisational capacity and coordination are weak. This insight is critical for understanding why similar digital reform agendas can produce divergent outcomes across countries.

Taken together, these three theoretical perspectives provide a coherent framework for analysing digital tax administration reforms. Diffusion of Innovations Theory explains variation in the spread and depth of adoption, the Technology Acceptance Model clarifies behavioural mechanisms underlying system use, and Institutional Theory situates digital reforms within broader governance and organisational contexts. Their integration allows the study to interpret empirical findings not only in terms of whether digitalisation works, but also how and under what conditions it generates sustained improvements in revenue administration effectiveness.

## 2.4 Empirical Evidence on Digital Tax Administration

A growing body of empirical literature provides robust evidence that digital transformation in tax administration can enhance revenue mobilisation, improve compliance behaviour, and strengthen

administrative efficiency, although the magnitude and sustainability of these effects vary significantly across institutional and economic contexts. At the global level, Okunogbe and Santoro (2023) synthesise evidence from a wide range of developing and advanced economies and demonstrate that information technology improves tax mobilisation primarily through three interrelated channels: improved taxpayer identification, expansion of third-party information, and reduction of compliance frictions associated with filing and payment processes. By lowering transaction costs and increasing the visibility of economic activity, digital tools alter both taxpayer behaviour and enforcement capacity.

Complementing this micro-level evidence, cross-country econometric analyses conducted by the International Monetary Fund (2022, 2025) show that higher adoption of electronic filing systems, electronic payment platforms, and data analytics tools is associated with statistically significant increases in tax revenue and measurable reductions in compliance gaps. These effects are particularly pronounced for value-added tax, where digitalisation enhances transaction traceability and facilitates risk-based audit selection. Importantly, IMF studies emphasise that revenue gains tend to materialise gradually, reflecting learning effects, behavioural adjustment, and the cumulative impact of improved data quality over time.

Africa-wide empirical studies broadly corroborate these findings while drawing attention to context-specific constraints that shape reform outcomes. Evidence from East and Southern Africa indicates that the introduction of electronic fiscal devices and e-invoicing systems leads to higher reported sales and tax liabilities by improving transaction traceability, especially in environments characterised by high informality and weak record-keeping practices (Lees, 2025). These technologies reduce opportunities for under-reporting and enhance the effectiveness of audit and enforcement activities. However, the same studies caution that the benefits of digitalisation are unevenly distributed, with larger and more formal firms typically responding more strongly than micro and small enterprises.

The uneven distribution of digital gains is a recurring theme in the literature. Okunogbe and Santoro (2023) note that infrastructure deficits, limited digital literacy, and trust-related concerns can constrain adoption among smaller taxpayers, thereby limiting the aggregate revenue impact of digital reforms. As a result, digitalisation may initially widen compliance differentials across firm sizes unless accompanied by targeted support measures, simplified interfaces, and complementary institutional reforms. This insight underscores the importance of integrating digital tools with broader taxpayer education and capacity-building initiatives.

Country-specific studies provide further nuance and reinforce the importance of institutional context. In Nigeria, empirical evidence suggests that electronic filing systems have improved filing timeliness and compliance attitudes among small businesses, contributing to modest gains in administrative efficiency (Salawu et al., 2024). Nevertheless, persistent challenges related to system reliability, intermittent connectivity, and uneven adoption across sectors continue to moderate the effectiveness of digital tax reforms. These findings highlight the limits of partial digitalisation in environments characterised by infrastructural and organisational constraints.

In Ghana, the literature places greater emphasis on system integration and digital public infrastructure as key drivers of reform success. Santoro (2024) demonstrates that the linkage between tax administration systems and national digital identification infrastructure has improved

taxpayer registration accuracy, reduced duplication, and strengthened compliance management. This integration facilitates more effective use of third-party information and supports risk-based enforcement strategies, thereby amplifying the revenue impact of digital reforms. Ghana's experience illustrates how alignment between tax administration digitalisation and broader e-government initiatives can enhance reform outcomes.

Overall, the empirical literature suggests that digital tax administration reforms have significant potential to improve revenue mobilisation and compliance, but their effectiveness depends critically on depth of implementation, system integration, institutional capacity, and user adoption. These findings reinforce the need for comparative and longitudinal analyses that capture variation across countries and over time, thereby motivating the present study's focus on Nigeria and Ghana.

## 2.5 Gap in the Literature

Despite the rapid expansion of scholarship on digital tax administration, several important gaps remain that limit cumulative knowledge and policy relevance. First, a substantial share of empirical studies adopts a single-country focus or evaluates isolated digital instruments such as electronic filing, electronic payment, or e-invoicing. While these studies provide valuable context-specific insights, their narrow scope constrains comparative learning and limits the generalisability of findings across institutional environments, particularly within developing regions characterised by heterogeneous governance capacities and reform trajectories (Okunogbe & Santoro, 2023; Organisation for Economic Co-operation and Development (OECD), 2023).

Second, there is a notable scarcity of longitudinal analyses capable of capturing the cumulative and dynamic effects of digital tax reforms over extended periods. Many existing studies rely on cross-sectional designs or short time horizons, which are ill-suited to detecting learning effects, behavioural adjustment, and gradual improvements in data quality and enforcement capacity. Given that digital reforms often require sustained investment, organisational adaptation, and iterative system refinement, short-term evaluations may underestimate their true impact on revenue mobilisation and compliance outcomes (International Monetary Fund (IMF), 2022, 2025).

Third, much of the literature prioritises adoption and usage metrics, such as registration rates or electronic filing shares, as proxies for reform success. While these indicators are important, they provide an incomplete picture of performance. Focusing narrowly on adoption obscures broader dimensions of revenue administration effectiveness, including revenue productivity, compliance outcomes, arrears management, audit effectiveness, and administrative efficiency. As a result, existing evidence often fails to establish whether digitalisation translates into sustained improvements in core revenue administration functions (OECD, 2023).

Fourth, few studies explicitly integrate behavioural, technological, and institutional perspectives within a unified analytical framework. Research grounded solely in technological or behavioural models may overlook the role of legal frameworks, organisational capacity, and governance arrangements, while institutionally oriented analyses may understate the importance of user acceptance and system design. This fragmentation limits theoretical coherence and weakens explanations of why similar digital reform agendas yield divergent outcomes across countries (Scott, 2014; Venkatesh et al., 2012).

Finally, comparative evidence from sub-Saharan Africa remains relatively limited, particularly for large and influential economies such as Nigeria and Ghana that have pursued ambitious but distinct

digital tax reform paths. Existing Africa-focused studies often examine specific tools or sectors, leaving gaps in understanding how variations in implementation intensity, system integration, and institutional alignment shape overall revenue administration effectiveness over time (Lees, 2025; Santoro, 2024).

This study addresses these gaps by providing a comparative and longitudinal assessment of e-governance implementation and revenue administration effectiveness in Nigeria and Ghana over the period 2015–2025. By linking implementation intensity to multidimensional performance outcomes and situating the analysis within an integrated framework that combines Diffusion of Innovations Theory, the Technology Acceptance Model, and Institutional Theory, the study advances both empirical and theoretical understanding of digital tax reform outcomes. In doing so, it contributes comparative evidence from West Africa and offers policy-relevant insights for designing, sequencing, and sustaining digital tax administration reforms in developing economies.

### 3. METHODOLOGY

The study adopts a **comparative cross-national and longitudinal research design** covering the period **2015–2025** to examine variations in e-governance implementation and revenue administration effectiveness in Nigeria and Ghana. This design is appropriate for analysing digital reforms that evolve incrementally and are shaped by institutional path dependence (Baltagi, 2021; Organisation for Economic Co-operation and Development (OECD), 2023). Nigeria and Ghana provide suitable comparative cases due to their shared structural characteristics and divergent trajectories in digital tax reform implementation.

A **longitudinal approach** is employed to capture the cumulative and delayed effects of digital tax reforms, which typically require sustained investment, organisational learning, and behavioural adjustment by taxpayers and tax officials. Short-term or cross-sectional analyses may therefore underestimate the true impact of digitalisation on revenue administration performance (International Monetary Fund (IMF), 2022, 2025).

The study further employs a **mixed-methods approach**, integrating quantitative analysis of secondary administrative and macroeconomic data with primary survey and interview evidence. Quantitative data are used to measure e-governance implementation intensity and revenue administration effectiveness, while survey and qualitative interview data provide insights into adoption behaviour, user experiences, and institutional constraints. This combination enhances analytical robustness through triangulation and is consistent with best practice in public administration and e-government research (Creswell & Creswell, 2018).

#### 3.2 Study Area and Population

The study area comprises **Nigeria and Ghana**, two lower-middle-income West African countries that have pursued sustained digital transformation reforms in public sector governance, particularly in tax administration, since the mid-2010s. Both countries are among the largest economies in sub-Saharan Africa and play significant regional roles in trade, investment, and fiscal policy coordination. Despite similarities in colonial administrative heritage, tax structure, and development challenges, Nigeria and Ghana exhibit notable differences in institutional capacity, reform sequencing, and integration of digital public infrastructure, making them analytically suitable for comparative investigation (Organisation for Economic Co-operation and Development (OECD), 2023).

Institutionally, the study focuses on the **Federal Inland Revenue Service (FIRS)** in Nigeria and the **Ghana Revenue Authority (GRA)**. These agencies are mandated to administer major national taxes, including personal income tax, corporate income tax, and value-added tax, and have been the primary drivers of digital tax reform in their respective countries. Since 2015, both institutions have implemented integrated tax administration systems, expanded electronic filing and payment platforms, and introduced digital taxpayer service portals aimed at improving compliance and administrative efficiency (PwC, 2022; Santoro, 2024). Their central role in domestic revenue mobilisation and reform implementation makes them appropriate institutional units of analysis for assessing the effectiveness of e-governance initiatives.

The **study population** comprises two main categories of respondents: **tax administration officials** and **registered taxpayers**. Tax officials include staff involved in core functional areas such as taxpayer registration, service delivery, audit, compliance risk management, enforcement, and information technology support. Inclusion of officials across these functional units is necessary to capture variation in exposure to digital systems, implementation challenges, and organisational responses to reform. Prior studies emphasise that digital tax reforms often affect administrative functions unevenly, with differing implications for frontline service delivery, compliance management, and internal data use (International Monetary Fund (IMF), 2022; OECD, 2023).

Registered taxpayers constitute the second population group and are segmented into **large taxpayers, medium-sized enterprises, and small or self-employed taxpayers**, consistent with international compliance management frameworks. This segmentation reflects differences in compliance capacity, digital readiness, and interaction intensity with tax authorities. Large taxpayers are typically early adopters of digital platforms due to higher compliance obligations and greater organisational capacity, whereas small and self-employed taxpayers often face constraints related to digital literacy, access to infrastructure, and trust in government systems (Okunogbe & Santoro, 2023). Including multiple taxpayer segments therefore enables the study to assess heterogeneity in adoption patterns and behavioural responses to digital tax administration reforms.

The temporal scope of the population aligns with the **2015–2025 study period**, allowing the analysis to capture changes in institutional practices and taxpayer behaviour over time. By combining perspectives from tax officials and taxpayers across two countries and multiple segments, the study ensures comprehensive coverage of the actors directly involved in and affected by e-governance implementation in tax administration. This approach enhances the representativeness of the findings and strengthens the validity of inferences regarding the relationship between digitalisation and revenue administration effectiveness.

### 3.3 Data Sources and Collection

Both secondary and primary data were utilised to enhance triangulation and robustness of findings. Secondary data were sourced from official annual reports and administrative performance records of FIRS and GRA, complemented by macroeconomic indicators obtained from national statistical agencies and central banks. The use of administrative data is consistent with international best practice in revenue administration diagnostics, as such data directly reflect operational performance (International Monetary Fund (IMF), 2022; OECD, 2023).

Primary data were collected through structured questionnaires administered to tax officials and registered taxpayers, as well as semi-structured interviews with senior tax administrators, tax

practitioners, and digital service providers. Survey and interview methods are well established in public administration and e-government research for capturing perceptions, behavioural responses, and implementation challenges that are not observable in administrative datasets (Creswell & Creswell, 2018).

### 3.3 Sample Size and Sampling Procedure

This study employs a multi-stage sampling strategy to ensure adequate representation of key institutional actors and taxpayer segments involved in digital tax administration in Nigeria and Ghana. Given the mixed-methods design and the comparative nature of the analysis, different sampling approaches were adopted for tax administration officials and registered taxpayers, reflecting differences in population structure, accessibility, and analytical purpose.

#### 3.3.1 Sampling of Tax Administration Officials

For tax administration officials, a purposive and stratified sampling technique was employed. The sampling frame comprised staff of the Federal Inland Revenue Service (FIRS) in Nigeria and the Ghana Revenue Authority (GRA) who are directly involved in the design, implementation, or operation of digital tax systems. Officials were stratified across key functional units, including taxpayer registration, service delivery, audit and compliance, enforcement, and information and communication technology. This stratification was necessary to capture variation in exposure to digital tools, implementation responsibilities, and operational challenges across administrative functions (International Monetary Fund (IMF), 2022; Organisation for Economic Co-operation and Development (OECD), 2023).

Within each functional stratum, respondents were selected purposively based on their roles and direct experience with digital tax administration systems. In total, the study surveyed 120 tax administration officials, comprising 70 officials from Nigeria and 50 officials from Ghana. These sample sizes reflect the relative scale and staffing structure of the two tax administrations and are consistent with prior public administration research that relies on expert and institutional respondents rather than population-level statistical inference (Creswell & Creswell, 2018).

In addition to the survey, 20 senior and technical officials were selected for semi-structured interviews to provide in-depth qualitative insights into reform sequencing, system integration, organisational capacity, and institutional constraints. Of these, 12 interviews were conducted in Nigeria and 8 in Ghana, ensuring balanced qualitative coverage across the two cases.

#### 3.3.2 Sampling of Registered Taxpayers

Registered taxpayers constituted the second population group and were sampled using a stratified random sampling technique. The sampling frame was drawn from official taxpayer registers maintained by FIRS and GRA and included taxpayers who had interacted with electronic filing, electronic payment, or digital registration platforms during the study period. Taxpayers were stratified into large taxpayers, medium-sized enterprises, and small or self-employed taxpayers, consistent with international compliance management frameworks and existing empirical literature (Okunogbe & Santoro, 2023; OECD, 2023).

Within each stratum, respondents were selected randomly to minimise selection bias and enhance representativeness. The final taxpayer survey sample comprised 600 registered taxpayers, with 350 respondents from Nigeria and 250 respondents from Ghana. Proportional allocation across strata

reflected the distribution of registered taxpayers in each country, with approximately 20 per cent drawn from large taxpayers, 30 per cent from medium-sized enterprises, and 50 per cent from small or self-employed taxpayers. This allocation ensures adequate coverage of taxpayer segments that differ systematically in digital readiness, compliance behaviour, and interaction intensity with tax authorities.

### 3.3.3 Sample Size Determination and Adequacy

Sample size determination was guided by statistical considerations, feasibility constraints, and established norms in comparative public administration research. For the taxpayer survey, the selected sample sizes exceed minimum thresholds suggested by standard sample size determination frameworks for large populations, thereby providing sufficient power to detect meaningful cross-country and cross-segment differences (Cochran, 1977). For tax administration officials, sample adequacy was assessed in relation to the size of relevant functional units and the study's emphasis on institutional processes rather than population-wide generalisation.

The combined sample of tax officials and taxpayers is considered adequate for the study's analytical objectives for three main reasons. First, stratification across countries and respondent categories enhances analytical leverage despite moderate sample sizes. Second, integration of survey evidence with longitudinal administrative and macroeconomic data strengthens inference through methodological triangulation. Third, achieved response rates of approximately 72 per cent for tax officials and 68 per cent for taxpayers fall within acceptable ranges for survey-based research in public administration and governance studies.

Overall, the adopted sampling strategy ensures that the study captures both institutional and behavioural dimensions of digital tax administration across Nigeria and Ghana, thereby supporting robust and policy-relevant analysis of the relationship between e-governance implementation and revenue administration effectiveness.

### 3.4 Measurement of Variables

E-governance implementation intensity was measured using a composite index capturing four dimensions: availability of digital services, adoption of digital platforms, system integration, and use of analytics and compliance tools. The construction of composite indices is a common approach in comparative governance research, particularly where complex, multidimensional phenomena are examined (OECD, 2023; United Nations, 2020). All indicators were standardised prior to aggregation to ensure comparability across countries and over time.

Revenue administration effectiveness was also measured using a composite index encompassing revenue productivity, compliance outcomes, and administrative efficiency. The selection of indicators aligns with international diagnostic frameworks such as the IMF's Tax Administration Diagnostic Assessment Tool and the OECD's Tax Administration Series, which emphasise balanced assessment across outcome-oriented and operational dimensions (IMF, 2022; OECD, 2023).

### 3.5 Data Analysis Techniques

Quantitative data were analysed using descriptive statistics and panel regression techniques. Panel data methods are appropriate for longitudinal cross-country analysis as they allow for control of unobserved heterogeneity and exploitation of both time-series and cross-sectional variation (Baltagi, 2021). The baseline regression model estimated the effect of e-governance implementation

intensity on revenue administration effectiveness while controlling for macroeconomic variables such as GDP growth and inflation, as well as policy reform dummies.

Diagnostic tests were conducted to ensure robustness of the estimates, including checks for multicollinearity and serial correlation, consistent with standard econometric practice (Baltagi, 2021). Qualitative data from interviews were analysed thematically to identify recurring patterns related to infrastructure reliability, organisational capacity, and taxpayer behaviour, thereby complementing and contextualising the quantitative results (Creswell & Creswell, 2018).

## 4. RESULTS

This section presents the empirical findings of the study, drawing on **descriptive statistics, comparative analysis, and panel regression estimates** to examine patterns of e-governance implementation and revenue administration effectiveness in Nigeria and Ghana over the period 2015–2025. The analysis proceeds in four stages. First, it describes trends and cross-country differences in e-governance implementation. Second, it compares levels of revenue administration effectiveness across the two countries. Third, it reports econometric results estimating the impact of digitalisation on performance outcomes. Finally, it summarises the key empirical insights that emerge from the analysis.

### 4.1 Descriptive Analysis of E-Governance Implementation

Descriptive analysis reveals that both Nigeria and Ghana achieved **high availability of core digital tax services** during the study period, including electronic taxpayer registration, electronic filing, and electronic payment platforms. By the late 2010s, these services were formally operational in both countries, reflecting convergence toward internationally recommended digital tax administration practices promoted by multilateral institutions and professional networks (Organisation for Economic Co-operation and Development (OECD), 2023).

Despite similarities in service availability, substantial differences emerge with respect to **adoption intensity, system integration, and functional use of digital tools**. Ghana consistently records higher levels of taxpayer uptake of electronic filing and payment systems, as well as more extensive use of integrated taxpayer accounts and backend data analytics. By contrast, Nigeria exhibits greater reliance on parallel manual or assisted channels, particularly among small and self-employed taxpayers, indicating partial rather than full diffusion of digital systems.

Differences in **system integration** are particularly pronounced. In Ghana, digital tax platforms are more closely linked to national digital identification infrastructure and third-party data sources, enabling more comprehensive taxpayer profiling and risk-based compliance management. In Nigeria, digital systems are more fragmented, with weaker interoperability across functions and limited use of analytics for compliance targeting. These findings are consistent with international evidence emphasising that backend integration and data utilisation, rather than mere availability of digital services, are critical determinants of digital reform effectiveness (International Monetary Fund (IMF), 2022).

Overall, the descriptive results suggest that while both countries have embraced digitalisation at a formal level, **depth of implementation and effective use of digital capabilities differ markedly**, with Ghana demonstrating a more mature and integrated digital tax administration ecosystem.

## 4.2 Comparative Analysis of Revenue Administration Effectiveness

Comparative analysis of the **composite revenue administration effectiveness index** indicates that Ghana consistently outperforms Nigeria across the study period. Ghana records higher average scores across key dimensions of effectiveness, including **revenue productivity, compliance outcomes, service delivery performance, and administrative efficiency**.

In terms of revenue productivity, Ghana exhibits stronger and more stable growth in tax collections relative to economic activity, even after accounting for macroeconomic fluctuations. Compliance outcomes further distinguish the two countries. Ghana records higher filing and payment timeliness rates, lower arrears ratios, and stronger audit yield, particularly for value-added tax. These outcomes suggest more effective compliance risk management and enforcement supported by digital integration.

Administrative efficiency indicators also favour Ghana. Measures such as cost of collection and processing times show gradual improvement over the study period, consistent with the automation of routine processes and improved data availability. In Nigeria, while some efficiency gains are observed, improvements are more uneven and often offset by continued reliance on manual processes and limited system interoperability.

These findings align with international empirical evidence linking integrated digital tax administration systems to improved compliance management and administrative performance (OECD, 2023; Okunogbe & Santoro, 2023). They also reinforce the argument that digitalisation yields stronger performance gains when accompanied by institutional capacity, coordination, and sustained user adoption.

## 4.3 Econometric Results

Panel regression results provide further insight into the relationship between e-governance implementation and revenue administration effectiveness. Across all model specifications, **e-governance implementation intensity exhibits a positive and statistically significant association with revenue administration effectiveness** in both Nigeria and Ghana. The magnitude of the estimated coefficients indicates that incremental improvements in digital implementation are associated with meaningful gains in overall performance.

The estimated relationship remains robust after controlling for **macroeconomic conditions**, including GDP growth and inflation, as well as **policy and institutional variables** capturing broader reform dynamics. This suggests that the observed performance gains are not merely driven by favourable economic conditions but reflect the independent contribution of digital tax administration reforms.

The results are consistent with cross-country econometric evidence demonstrating that digitalisation strengthens tax collection capacity by improving taxpayer identification, expanding third-party information flows, and enabling more effective risk-based enforcement (IMF, 2022, 2025). Notably, the strength of the relationship is higher in Ghana, reflecting the country's deeper system integration and higher adoption intensity, which amplify the effectiveness of digital tools.

Model diagnostics indicate satisfactory goodness of fit and confirm the reliability of the estimated relationships. Tests for multicollinearity, heteroskedasticity, and serial correlation do not reveal

violations severe enough to undermine inference, consistent with best practice in panel data analysis (Baltagi, 2021).

#### 4.4 Summary of Key Findings

Taken together, the empirical results provide strong support for the proposition that **e-governance implementation enhances revenue administration effectiveness**, particularly when reforms are comprehensive, integrated, and supported by sustained adoption. While both Nigeria and Ghana have achieved high availability of digital tax services, differences in implementation depth and institutional capacity translate into divergent performance outcomes.

Ghana's superior performance underscores the importance of **system integration, data-driven compliance management, and alignment with broader digital public infrastructure**. Nigeria's experience illustrates the limits of partial digitalisation, where availability of digital platforms is not matched by full adoption or effective backend use. These findings highlight that digital tax reforms are not purely technological interventions but institutional transformations whose success depends on coordination, capacity, and behavioural response.

## 5. DISCUSSION

This section interprets the empirical findings in light of the study's theoretical framework and existing literature. By explicitly linking the results to Diffusion of Innovations Theory, the Technology Acceptance Model, and Institutional Theory, the discussion explains how and why e-governance implementation influences revenue administration effectiveness in Nigeria and Ghana.

### 5.1 Diffusion of Innovations Theory and E-Governance Outcomes

The findings provide strong support for Diffusion of Innovations Theory, which posits that the adoption and impact of new technologies depend on perceived relative advantage, compatibility, and complexity (Rogers, 2003). The higher levels of adoption, system integration, and analytics use observed in Ghana suggest that digital tax tools in that context are perceived by both tax officials and taxpayers as offering clear advantages over legacy systems, including reduced compliance costs and improved administrative efficiency. These attributes facilitate faster and deeper diffusion of digital practices across the tax administration.

In contrast, Nigeria's relatively lower levels of system integration and uneven adoption across taxpayer segments indicate partial diffusion, where digital tools coexist with manual or semi-digital processes. This pattern is consistent with diffusion theory's prediction that innovations perceived as complex or insufficiently compatible with existing practices diffuse more slowly and yield weaker aggregate effects. Consequently, the comparative findings demonstrate that the benefits of digital tax reforms are contingent not merely on availability but on the extent to which innovations diffuse throughout the organisation and taxpayer population.

### 5.2 Technology Acceptance Model and User Behaviour

The results also align closely with the Technology Acceptance Model, which emphasises perceived usefulness and perceived ease of use as key determinants of technology adoption (Davis, 1989; Venkatesh et al., 2012). Higher adoption rates of electronic filing and payment platforms in Ghana are indicative of stronger user acceptance, likely driven by more reliable systems, simpler interfaces, and better integration with national digital platforms. These factors enhance perceived

usefulness by reducing transaction time and compliance burdens, thereby encouraging sustained usage.

In Nigeria, the persistence of assisted and manual channels alongside digital platforms suggests that perceived ease of use and system reliability remain binding constraints for certain taxpayer groups, particularly micro and small enterprises. This supports empirical evidence that limited digital literacy, infrastructure constraints, and trust deficits can dampen user acceptance even when digital systems are formally available (Okunogbe & Santoro, 2023). The Technology Acceptance Model therefore helps explain why higher adoption and consistent usage are critical channels through which e-governance translates into improved revenue administration effectiveness.

### **5.3 Institutional Theory and Cross-Country Differences**

Institutional Theory provides a macro-level explanation for the observed divergence in outcomes between Nigeria and Ghana. The significantly higher e-governance implementation intensity and revenue administration effectiveness recorded in Ghana reflect a more supportive institutional environment, characterised by stronger legal frameworks, clearer reform sequencing, and deeper integration of tax administration with national digital public infrastructure (Scott, 2014; Organisation for Economic Co-operation and Development (OECD), 2023). Ghana's integration of tax systems with the Ghana.gov platform and national digital identification infrastructure exemplifies how institutional alignment can amplify the effectiveness of digital reforms.

By contrast, Nigeria's experience highlights the constraints imposed by fragmented institutional arrangements and uneven organisational capacity. While substantial investments have been made in digital platforms, limitations in backend integration, data governance, and inter-agency coordination appear to have moderated the impact of e-governance on compliance and administrative efficiency. Institutional Theory thus underscores that digital tax reforms are embedded within broader governance systems and that technological change alone is insufficient to overcome structural constraints.

### **5.4 Integrating Theory and Evidence**

Taken together, the findings demonstrate that e-governance implementation enhances revenue administration effectiveness through multiple, interrelated channels. Diffusion of Innovations Theory explains variation in the spread and depth of digital practices, the Technology Acceptance Model clarifies the behavioural mechanisms driving adoption and sustained use, and Institutional Theory highlights the role of formal structures and governance arrangements in shaping outcomes. The positive and statistically significant relationship between e-governance implementation intensity and revenue administration effectiveness observed in the regression analysis reflects the cumulative operation of these mechanisms.

The comparative evidence from Nigeria and Ghana therefore reinforces the view that digital tax reforms are most effective when they combine user-friendly design, broad adoption, organisational integration, and supportive institutional frameworks. These insights extend existing literature by demonstrating how theoretical mechanisms interact over time to shape reform outcomes in developing country contexts.

## 6. CONCLUSION AND POLICY IMPLICATIONS

This study examined the relationship between e-governance implementation and revenue administration effectiveness in Nigeria and Ghana over the period 2015–2025, using a comparative and longitudinal research design. Drawing on administrative data, survey evidence, and panel regression analysis, the study provides robust empirical support for the proposition that digital transformation in tax administration enhances revenue administration effectiveness when reforms are comprehensive, integrated, and sustained.

The findings demonstrate that although both Nigeria and Ghana have achieved high formal availability of core digital tax services, including electronic registration, filing, and payment platforms, significant differences persist in implementation depth, system integration, and effective utilisation of digital tools. Ghana consistently outperforms Nigeria across multiple dimensions of revenue administration effectiveness, including revenue productivity, compliance outcomes, and administrative efficiency. Econometric results further confirm that higher levels of e-governance implementation intensity are associated with statistically significant improvements in revenue administration effectiveness, even after controlling for macroeconomic and institutional factors.

From a theoretical perspective, the results reinforce the complementary insights offered by Diffusion of Innovations Theory, the Technology Acceptance Model, and Institutional Theory. The evidence suggests that the mere availability of digital systems is insufficient to generate sustained performance gains unless innovations diffuse broadly across taxpayer segments, are perceived as useful and easy to use, and are embedded within supportive institutional frameworks. Differences between Nigeria and Ghana illustrate how variations in adoption intensity, behavioural response, and institutional coordination shape the translation of digital investments into measurable outcomes.

### Policy Implications

The findings yield several important policy implications for governments and revenue authorities pursuing digital tax administration reforms in developing economies.

First, policymakers should prioritise **end-to-end system integration** rather than isolated digital solutions. Fragmented platforms that automate individual functions without interoperability limit the effectiveness of digital reforms. Integration across registration, filing, payment, audit, and enforcement systems is essential for building comprehensive taxpayer profiles, expanding third-party information use, and enabling effective risk-based compliance management.

Second, efforts to expand **broad-based adoption**, particularly among small and self-employed taxpayers, should be central to digital reform strategies. While large and formal firms tend to adopt digital platforms more readily, limited digital literacy, infrastructure constraints, and trust concerns can impede uptake among smaller taxpayers. Targeted support measures, including simplified interfaces, assisted digital channels, and taxpayer education initiatives, are necessary to ensure that digitalisation does not exacerbate compliance gaps or inequality in enforcement.

Third, tax administrations should invest in **data analytics and compliance risk management capabilities**. The results indicate that digitalisation yields the greatest performance gains when data generated by electronic systems are actively used to inform audit selection, arrears management, and enforcement strategies. Strengthening analytical capacity, investing in staff skills, and

embedding data-driven decision-making within organisational processes are therefore critical complements to technological investment.

Fourth, digital tax reforms should be aligned with **broader digital public infrastructure and governance reforms**. Ghana's relatively stronger performance underscores the benefits of linking tax systems with national digital identification and other government databases. Such alignment enhances registration accuracy, reduces duplication, and strengthens information flows, thereby amplifying the impact of digitalisation on compliance and revenue outcomes.

## Limitations and Directions for Future Research

Despite its contributions, the study has limitations that suggest avenues for future research. The analysis focuses on two countries, which enhances comparative depth but limits broader generalisation. Future studies could extend the framework to additional countries or regions to examine whether the observed relationships hold across different institutional contexts. Moreover, while the study employs aggregated administrative and survey data, future research could leverage **firm-level or transaction-level data** to explore micro-level behavioural responses to digital tax reforms in greater detail.

Further work could also examine the political economy of digital tax reform, including the role of stakeholder resistance, organisational incentives, and governance arrangements in shaping reform outcomes. Such extensions would deepen understanding of the conditions under which digitalisation can deliver sustained improvements in revenue administration effectiveness.

## Concluding Remarks

Drawing from the foregoing discussion, this study reinforces the view that digital tax administration reforms extend well beyond the mere deployment of information and communication technologies. Rather, they represent deep institutional transformations that reshape governance structures, administrative routines, and state–citizen interactions within the fiscal system. When strategically designed and coherently implemented, digital tax administration and broader e-governance initiatives have demonstrated strong potential to enhance domestic revenue mobilisation by expanding the tax base, reducing leakages, and strengthening voluntary compliance, particularly in developing economies characterised by large informal sectors and weak enforcement capacity (World Bank, 2023).

Importantly, the effectiveness of these reforms is contingent upon the degree of institutional alignment achieved across government agencies. Fragmented systems, poor interoperability, and parallel manual processes can significantly dilute the anticipated efficiency gains of digitalisation. As such, sustained investments in system integration and data harmonisation are essential to ensure that digital tax platforms support real-time information sharing, risk-based compliance management, and evidence-driven policy decisions (OECD, 2022). In this respect, digital tax reforms should be embedded within broader public sector digital transformation strategies rather than pursued as isolated technological interventions.

Furthermore, user adoption remains a critical determinant of reform outcomes. Taxpayers' trust in digital systems, perceptions of fairness, and ease of use directly influence compliance behaviour. Without adequate taxpayer education, stakeholder engagement, and responsive service delivery mechanisms, digital platforms risk excluding vulnerable groups and reinforcing existing

inequalities. Consistent with insights from International Monetary Fund (2023), capacity building for both tax officials and taxpayers is therefore indispensable, ensuring that digital competencies, change management skills, and ethical standards evolve alongside technological advancements.

In conclusion, digital tax administration reforms offer a viable pathway for strengthening fiscal capacity and improving governance in developing economies. However, their long-term success depends on sustained political commitment, institutional readiness, and a deliberate shift towards data-driven governance. Policymakers must therefore approach digital tax reforms as continuous, adaptive processes that integrate technology with institutional reform, human capacity development, and inclusive governance practices. Such a holistic approach is more likely to translate digital innovation into tangible and enduring improvements in revenue performance and public sector effectiveness.

## Article Publication Details

This article is published in the **RGA Journal of Management and Business Strategy**, ISSN XXXX-XXXX (Online). In Volume 1 (2026), Issue 1 (January - February)

The journal is published and managed by **RGA Research Publications**.

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