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Technology-Based Innovations and Tax Compliance in Nigeria

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Abstract

Inefficiency, corruption, and limited transparency in Nigeria's traditional tax administration present challenges to tax revenue generation. This study examined the relationships between technology-based innovations, tax compliance, and revenue generation, focusing on electronic tax payment, electronic processing of value-added tax (VAT) returns, electronic filing of pay-as-you-earn (PAYE) returns, and electronic personal assessment. A descriptive survey design was adopted. Questionnaires were administered to 150 selected personnel of Nigeria's federal revenue authority and relevant tax practitioners, yielding 144 valid responses for analysis. Data were analyzed using descriptive statistics, analysis of variance, and multiple regression with SPSS. The findings indicated that all four technology-based innovations were positively and significantly associated with tax revenue generation. These results suggest that digital tax administration has the potential to support more effective revenue collection. The study highlights the importance of strengthening digital tax platforms, improving user support and taxpayer awareness, expanding secure electronic payment channels, automating VAT and PAYE return processing, and simplifying electronic personal assessment. These priorities provide practical directions for improving tax administration and supporting voluntary compliance and revenue mobilization in Nigeria.

Keywords: Digital Tax Administration; Tax Compliance; Tax Revenue Generation; Electronic Tax Filing; Nigeria

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INTRODUCTION

The introduction of technology has brought about new innovations which have collectively enhanced efficiency in tax administration and ultimately increased tax compliance and revenue generation in Nigeria. The advent of digital technologies has revolutionized tax administration in Nigeria, transforming it into a more efficient, transparent, and effective system. Nigeria's traditional tax administration system was plagued by inefficiencies, corruption and tax evasion, resulting in low tax revenue generation (Adegbite & Fasina, 2019). The manual and paper-based processes were time-consuming, prone to errors, and often led to delays in tax compliance and revenue generation (Etale et al., 2021). The importance of technology driven innovations such as of technology-based innovations in administration of taxes in Nigeria cannot be emphasized. The introduction of technology-based innovations in tax administration have improved compliance and revenue generation, with studies consistently showing a positive impact on tax revenue generation in Nigeria (Tivde, 2024; Falana et al., 2024). The use of digital tax platforms has been a significant factor in this improvement (Akinleye et al., 2019). Digital tax platforms have streamlined tax filing and payment processes, reducing the time and cost of tax compliance for taxpayers (Akinleye et al., 2019). These platforms provide taxpayers with easy-to-use interfaces for filing and paying taxes, reducing the complexity and burden of tax compliance (Etale et al., 2021) The implementation of E-payment has also been a crucial innovation in tax administration in Nigeria (Akinleye et al., 2019).

E-payment is a critical component of electronic tax administration designed to facilitate the efficient collection of taxes while improving convenience, transparency, accountability, and taxpayer compliance. E-payment systems enable taxpayers to fulfill their tax obligations electronically without visiting tax offices or financial institutions physically, thereby reducing the time and costs associated with tax payments (Nasir, 2015; OECD, 2023). Traditional tax payment methods often involve manual processes characterized by paperwork, long queues, cash handling risks, delayed payment confirmation, and administrative inefficiencies. These challenges not only increase compliance costs for taxpayers but also create opportunities for revenue leakages, fraud, and corruption. Consequently, governments have increasingly adopted electronic payment systems to modernize tax administration and improve revenue collection efficiency (Allahverd et al., 2017; Okunogbe & Santoro, 2022).The use of technology-based innovations has also

reduced the cost of tax administration, improving the efficiency and effectiveness of tax authorities (Babatunde & Akinsanmi, 2021).

Tax revenue generation which is a function of tax compliance, refers to the process by which governments collect taxes from individuals, businesses, and other entities to fund public goods and services, playing a vital role in supporting economic development, social welfare and public infrastructure (Adegbite & Fasina, 2019). It involves various aspects, including tax base, tax rates, tax compliance, and tax administration, all of which are critical for effective revenue generation (Nnubia et al., 2020). However, despite the identified overwhelming benefits of applying technology-based innovations in tax administration in Nigeria, there are still the challenges of non-compliance with tax policies of government resulting in shortfall in revenue targets of government. These arise as a result of different challenges and limitations which need to be addressed. These challenges have posed as limitations that have subsumed the benefits of technology-based innovation. This study therefore will be an attempt to identify whether technology-based innovations has any effect on tax compliance and revenue generation in Nigeria.

Statement Of The Problem

The inadequacies in Nigeria's traditional tax administration system have posed significant challenges to tax revenue generation, including inefficiencies, corruption, and lack of transparency, ultimately resulting in low tax revenue generation (Nnubia et al., 2020; Adegbite & Fasina, 2019). According to Ajaero et al. (2025) over the years, revenue generation has always been generally manually administered with the inherent challenges of corruption, tax compliance and evasion, which adversely affected tax revenue for the economy. These systemic issues have hindered the country's ability to optimize tax collection and have underscored the need for innovative solutions to improve tax administration and revenue generation.

Technology-based innovations such as digital tax platforms, electronic payment systems and, e processing of VAT returns have shown promise in addressing these challenges by enhancing tax compliance, reducing tax evasion, and streamlining tax administration processes (Falana et al., 2024; Akinleye et al., 2019; Tivde, 2024). Despite the potential benefits of Technology-based innovations , there is doubt whether the expected tax compliance cum revenue targets have been met by the Federal Inland Revenue Service (FIRS) now known as Nigerian Revenue Service (NRS). Nigeria still faces

a significant tax gap, which hampers the government's ability to generate sufficient revenue and achieve its development objectives. This raises the fundamental question of whether the adoption of Technology-based innovations have not actually produced the result that was being expected. This identified gap has engendered this study which seeks to explore whether the introduction of technology-based innovations has any effect on tax compliance, which is measured by tax revenue generation in Nigeria. Thus, this study was carried out to examine the effect of Technology-based innovations and tax compliance in Nigeria.

Objectives of the study

The main objective of this study was to examine the relationship between technology-based innovations and tax compliance in Nigeria.

The specific objectives were to:

1. Ascertain the relationship between e-payment of taxes and tax revenue generation in Nigeria.
2. Determine the relationship between e-processing of VAT returns and tax revenue generation in Nigeria.
3. Examine the relationship between e-filing of PAYE returns generation in Nigeria and tax revenue
4. Examine the relationship between e-personal assessments filing and tax revenue generation in Nigeria.

Research questions

In order to meet the objectives of this study, the following research questions were raised;

1. What is the relationship between e-payment of taxes and tax revenue generation in Nigeria?
2. How does e-processing of VAT returns affect tax revenue generation in Nigeria?
3. What relationship does e-filing of PAYE returns have on tax revenue generation in Nigeria?
4. To what extent does e-personal assessments relate with tax revenue generation in Nigeria?

Research hypotheses

To achieve the earlier stated objectives and answer the research questions listed above, the following null hypotheses were formulated and tested in the study

H01. : E-payment of taxes has no relationship with tax revenue generation in Nigeria.

H02: E-Processing of VAT returns has no relationship with tax revenue generation in Nigeria

H03: . E-filing of PAYE returns has no relationship with tax revenue generation in Nigeria.

H04:. E-personal assessment has no relationship with tax revenue generation in Nigeria.

E-payment of taxes

The concept of E-payment of taxes refers to the electronic remittance of tax liabilities through digital payment channels such as online banking platforms, mobile banking applications, debit and credit cards, electronic funds transfers, payment gateways, and other internet-enabled payment systems approved by tax authorities. It is a critical component of technology-based innovations designed to facilitate the efficient collection of taxes while improving convenience, transparency, accountability, and taxpayer compliance. E-payment systems enable taxpayers to fulfill their tax obligations electronically without visiting tax offices or financial institutions physically, thereby reducing the time and costs associated with tax payments (Nasir, 2015; OECD, 2023). The emergence of e-payment systems is closely linked to the broader digital transformation of tax administration across the world. Traditional tax payment methods often involve manual processes characterized by paperwork, long queues, cash handling risks, delayed payment confirmation, and administrative inefficiencies. These challenges not only increase compliance costs for taxpayers but also create opportunities for revenue leakages, fraud, and corruption.

Consequently, governments have increasingly adopted electronic payment systems to modernize tax administration and improve revenue collection efficiency (Allahverd et al., 2017; Okunogbe & Santoro, 2022). E-payment systems function by integrating tax administration platforms with banking and financial technology infrastructures. Through these integrated systems, taxpayers can generate payment references, calculate tax liabilities, make payments electronically, and receive instant confirmation of transactions. This

automation minimizes human intervention and enhances the accuracy and reliability of tax payment processes

E-processing of VAT returns

The concept of E-processing of Value Added Tax (VAT) returns refers to the use of electronic platforms and digital technologies for the preparation, submission, verification, assessment, and processing of VAT returns by taxpayers and tax authorities. VAT is a consumption tax imposed on the value added to goods and services at various stages of production and distribution. The digitalization of VAT return processes enables taxpayers to file VAT returns electronically through online tax administration systems, thereby reducing manual procedures and enhancing the efficiency of tax administration (OECD, 2023; Kinanti et al., 2025).

Traditionally, VAT return processing involved manual preparation and submission of tax documents to tax offices. Such procedures were often associated with delays, errors, excessive paperwork, administrative bottlenecks, and difficulties in monitoring compliance. The increasing complexity of tax administration and the need for improved revenue collection prompted governments worldwide to adopt electronic VAT administration systems. Through e-processing platforms, taxpayers can prepare and submit VAT returns online, upload supporting documentation, receive electronic acknowledgments, and monitor the status of their submissions in real time (Nguyen et al., 2024; Mandasari, 2024). E-processing of VAT returns forms an integral component of electronic tax administration because VAT constitutes one of the most important sources of government revenue in many economies.

E-filing of pay as you earn (PAYE) returns

This concept refers to the electronic submission of PAYE tax information by employers to tax authorities through digital tax administration platforms. PAYE is a tax collection mechanism under which employers deduct personal income tax from employees' salaries and remit the deducted amounts to the appropriate tax authorities on behalf of employees. The e-filing system enables employers to prepare, submit, and manage PAYE returns electronically, thereby improving the efficiency, accuracy, and transparency of tax administration processes (OECD, 2023; Olumoh, 2024).

The concept of PAYE was introduced to facilitate the timely collection of personal income taxes and ensure a steady flow of government revenue. Traditionally, PAYE

returns were prepared and submitted manually, involving extensive paperwork, physical visits to tax offices, and lengthy verification procedures. These manual processes often resulted in filing errors, delays in tax remittances, loss of records, and administrative inefficiencies. The introduction of electronic filing systems has transformed PAYE administration by allowing employers to submit employee tax information online through integrated tax management platforms (Kiabel, 2021; Umaru et al., 2019). E-filing of PAYE returns forms an essential component of electronic tax systems because it enhances compliance among employers and facilitates effective monitoring by tax .

E-processing of personal assessments

E-processing of personal assessments refers to the use of electronic tax administration systems for the assessment, computation, review, approval, and management of personal income tax liabilities of individual taxpayers. Personal assessment is the process through which tax authorities determine the amount of tax payable by an individual based on taxable income, allowable deductions, tax reliefs, and applicable tax rates (OECD, 2023). The digitalization of this process enables taxpayers and tax authorities to conduct tax assessment activities electronically, thereby improving efficiency, accuracy, transparency, and compliance within the tax administration system (Olumoh, 2024). Previously, personal tax assessments were conducted through manual procedures involving physical submission of income declarations, review of supporting documents, manual tax computations, and face-to-face interactions between taxpayers and tax officials. These processes were often characterized by delays, computational errors, administrative bottlenecks, excessive paperwork, and opportunities for discretionary practices. The increasing need for efficient tax administration and improved taxpayer services has led governments worldwide to adopt technology-based innovations that automate personal tax assessment processes and facilitate digital interactions between taxpayers and tax authorities (Etale et al., 2021; Kato & Oredein, 2023). E-processing of personal assessments allows taxpayers to submit income information electronically through online tax portals, after which tax liabilities are automatically calculated using pre-programmed tax rules and statutory provisions. The system enables taxpayers to review assessments, receive notifications, make corrections where necessary, and access assessment records electronically.

E-payment of taxes and revenue generation

Recent studies indicate that in cases where taxpayers have access to simple, safe electronic payment options, in which they can clear liabilities without many steps, clear notification and effective documentation, then this serves as an actual push towards compliance behavior as a result of the process itself being less opaque and burdensome (Hesami et al., 2023; Belahouaoui & Attak, 2024). Electronic payment of taxes (e-payment) refers to the use of digital platforms and electronic channels to remit tax liabilities directly to government accounts without the need for physical cash transactions or visits to tax offices. E-payment systems utilize internet banking, mobile banking applications, payment gateways, debit and credit cards, point-of-sale terminals, and other electronic channels to facilitate tax payments. As a major component of technology-based innovations administration, e-payment systems have gained widespread acceptance among tax authorities globally due to their potential to improve efficiency, transparency, compliance, and revenue generation (OECD, 2023; Nasir, 2015).

The relationship between e-payment of taxes and revenue generation is based on the ability of digital payment platforms to simplify tax payment processes, reduce compliance costs, and improve tax collection efficiency. Traditional tax payment systems are often characterized by long queues, cumbersome procedures, delays in processing, and opportunities for revenue leakages through manual handling of funds. E-payment systems eliminate many of these challenges by providing taxpayers with convenient, secure, and timely channels for meeting their tax obligations (Onuselogu & Onuora, 2021). Consequently, the ease associated with using technology-based innovations for payments encourages greater compliance and contributes to increased tax revenue. One of the most significant ways through which e-payment influences revenue generation is by enhancing voluntary tax compliance. Taxpayers are more likely to comply with tax obligations when payment procedures are simple, accessible, and less time consuming. Electronic payment systems allow taxpayers to make payments at any time and from any location, thereby reducing the burden associated with traditional payment methods (Do et al., 2022). Increased convenience reduces compliance barriers and promotes higher rates of tax remittance, leading to improved revenue collection.

E-processing of VAT returns and revenue generation

The emerging evidence is that electronic submissions of VAT returns are significant in determining the ability of businesses to adhere to tax laws and understandably enough the correlation with tax compliance does present itself in the current research (Kamil, 2022; Hakizimana & Santoro, 2023). The adoption of electronic VAT administration has become a key component of tax modernization programmes aimed at improving compliance, enhancing administrative efficiency, and increasing government revenue generation (OECD, 2023; Falana et al., 2024). The relationship between e-processing of VAT returns and revenue generation is based on the capacity of digital systems to improve VAT compliance, reduce administrative inefficiencies, and minimize tax leakages. VAT is one of the most important sources of government revenue in many countries, including Nigeria. However, effective VAT administration depends on the timely and accurate submission of returns by taxable persons. Electronic VAT processing simplifies compliance procedures and encourages taxpayers to meet their obligations more efficiently, thereby contributing to increased revenue collection (Adegbite & Fasina, 2019). One major way through which e-processing of VAT returns enhances revenue generation is by improving compliance levels among taxpayers. Traditional VAT filing systems often involve extensive paperwork, lengthy processing periods, and frequent calculation errors. Electronic systems automate many of these processes, making VAT filing easier, faster, and more accurate (Nguyen et al., 2024). As taxpayers experience fewer compliance burdens, voluntary compliance tends to increase, resulting in higher VAT collections and improved government revenue. Furthermore, e-processing of VAT returns improves the accuracy and reliability of tax information. Digital platforms often contain built in validation mechanisms that detect computational errors, incomplete submissions, and inconsistencies in taxpayer records before returns are submitted.

E-filing PAYE returns and revenue generation

The introduction of electronic filing systems for PAYE returns is part of broader tax administration reforms designed to improve efficiency, transparency, compliance, and revenue mobilization. Through e-filing platforms, employers can submit payroll information, employee tax deductions, and remittance schedules electronically, thereby reducing reliance on manual processes and enhancing tax administration effectiveness (OECD, 2023). Since personal income tax collected through PAYE constitutes a

significant source of internally generated revenue for many governments, efficient management of PAYE returns is essential for sustainable revenue generation. Electronic filing systems simplify compliance procedures for employers and facilitate timely submission of payroll tax information, thereby increasing the effectiveness of tax collection mechanisms (Kiabel, 2021). One major way through which e-filing of PAYE returns contributes to revenue generation is by improving employer compliance. Traditional manual filing systems often expose tax administration processes to delays, computational errors, incomplete submissions, and record management challenges. Electronic filing systems automate these processes, making it easier for employers to submit accurate payroll information and comply with statutory requirements (Qadri & Darmawan, 2021). Improved compliance increases the accuracy and completeness of PAYE remittances, thereby enhancing government revenue. Electronic filing of PAYE returns also promotes timely remittance of payroll taxes. Digital platforms often include automated reminders, real-time submission capabilities, and integrated payment systems that encourage employers to meet filing deadlines. Timely filing and remittance reduce tax arrears and improve cash flows to government, thereby contributing positively to revenue generation (Etale et al., 2021). Furthermore, timely reporting enables tax authorities to monitor compliance more effectively and address discrepancies before they escalate into significant revenue losses. Another important contribution of e-filing of PAYE returns is the improvement of data accuracy and record management. Electronic systems reduce human errors associated with manual computations and documentation. Built-in validation mechanisms ensure that payroll information is accurately captured before submission, thereby minimizing inconsistencies in employee tax records (Nguyen et al., 2024. Electronic records create verifiable audit trails that enable tax authorities to track deductions and remittances more effectively.

E-personal assessments and revenue generation

Electronic personal assessment (e-personal assessment) refers to the use of digital platforms and electronic tax administration systems to facilitate the assessment, computation, and management of personal income tax obligations of individual taxpayers. Through e personal assessment systems, taxpayers can electronically declare income, calculate tax liabilities, submit supporting information, receive assessment notices, and monitor their tax status without physically visiting tax offices. As part of broader tax digitalization initiatives, e-personal assessment seeks to improve tax administration

efficiency, increase taxpayer compliance, and enhance government revenue generation (Kato & Oredein, 2023). The relationship between e-personal assessment and revenue generation is based on the ability of digital assessment systems to simplify tax administration, improve compliance, and strengthen monitoring of individual taxpayers. Personal income tax represents a significant source of government revenue, particularly for state governments in Nigeria. Consequently, efficient assessment and collection of personal income taxes are essential for sustainable revenue mobilization. Electronic personal assessment systems improve the administration of personal income tax by automating assessment processes, reducing errors, and facilitating timely tax compliance (Kiabel, 2021). One of the major ways through which e-personal assessment contributes to revenue generation is by enhancing taxpayer compliance. Traditional manual assessment systems are often characterized by delays, inaccuracies, and administrative bottlenecks that discourage voluntary compliance. Electronic assessment platforms simplify tax procedures by allowing taxpayers to complete assessments remotely and receive instant feedback on tax obligations (Mandasari, 2024). The convenience associated with digital assessment encourages taxpayers to comply with tax regulations, resulting in increased tax collections and improved revenue generation.

Technology Acceptance model

Technology Acceptance Model (TAM), proposed by Davis in 1989, explains how users adopt and accept new technology. The model suggests that perceived usefulness and perceived ease of use influence users' attitude towards technology, which in turn affects their intention to actual use of the technology (Davis, 1989). In the context of tax compliance, TAM suggests that taxpayers' adoption of digital tax systems depends on their perception of the system's usefulness and ease of use. If taxpayers perceive the system as useful, easy to use, and beneficial, they are more likely to adopt it and comply with tax regulations (Kamil, 2022; Inegbedion, 2025). In Nigeria, taxpayers are more likely to use digital tax systems if they perceive them as useful in simplifying tax compliance, reducing costs, and increasing convenience (Akinyosoye et al., 2025; Alahira et al., 2024). The ease of use of these systems, including factors like user-friendly interfaces and clear instructions, also plays a crucial role in determining adoption rates. Tax authorities can leverage TAM to improve adoption rates by focusing on the perceived usefulness and ease of use of digital tax systems (Adelakun, 2023; Mandasari, 2024). This can be achieved by providing clear benefits to taxpayers, such as faster processing times, reduced paperwork, and

improved customer support (Adebayo et al., 2022; Ariyibi et al., 2024. In Nigeria, tax authorities can promote digital tax systems through awareness campaigns, training programs, and partnerships with professional bodies to increase adoption and compliance (Adegbite & Fasina, 2019; Iheduru & Ajaero, 2018).

Institutional theory

Institutional Theory, proposed by DiMaggio and Powell in 1983, explains how institutions like tax authorities adopt innovations to gain legitimacy and improve performance, influencing tax compliance. The theory entails that institutions adopt similar structures and practices due to coercive, mimetic, and normative pressures, leading to isomorphism. In the context of tax administration, Institutional Theory suggests that tax authorities adopt technology-based innovations like e-filing and digital payment systems to enhance compliance and efficiency. This adoption is driven by pressures to modernize, improve transparency, and respond to global trends in tax administration (Adebayo et al., 2022; Adelakun, 2023). In Nigeria, the adoption of technology-based innovations like e-payment of tax and processing of VAT returns is a response to institutional pressures to improve tax compliance and revenue generation. The use of technology enhances transparency, reduces corruption, and increases taxpayer convenience, ultimately improving compliance. The adoption of technology also enables tax authorities to cope with the complexities of the digital economy, ensuring that taxes are collected efficiently and effectively. This is particularly relevant in Nigeria, where the informal sector is significant, and technology can help bridge the tax compliance gap (Adegbite & Fasina, 2019; Akinyosoye et. al., 2025

Diffusion of innovation theory

This theory which was propounded by Everest Rogers in 1962 seeks to explain the how, why and when, and at what rate new ideas, and technology spreads through a population. The theory stipulates that innovation doesn't happen spontaneously across the population. Rather innovation adoption follows a specific and predictable pattern. This pattern is distributed, or diffused across different groups, and multiple stages, where each group is attracted to and adopts an innovation at a specific stage. This theory is used to explain the relationship between tax revenue generation and innovative based technology from the point of view of the fact innovative based technology being a new idea allows IFRS to explore different ways of improving its dwindling revenues from various sources.

The application of this theory stems from the fact that the revenue generating agency has consistency being innovative in an attempt to improve its service delivery to Nigerians.

METHODOLOGY

Research design

The study adopted a survey research design, and this design was suitable for this study because the data used were obtained from primary sources. The data for both the independent variable (E-tax) and dependent variable were obtained from primary sources through questionnaires administered on selected personnel of FIRS and some tax practitioners in AkwaIbom State, Abia State and Rivers States.

Population of the study

The population of this study comprised all staff of Federal Inland Revenue Service (FIRS) now known as Nigerian Revenue Service (NRS) office in AkwaIbom, Abia and Rivers state in Nigeria. According to the information from the Human Resource Department of Nigerian Revenue Service, there are 240 staff members in the three states as at 2024 financial year

Sample size and sample size determination

The sample size of this study was one hundred and fifty (150) FIRS officials across different sections of the office in AkwaIbom, Abia and Rivers States. This was obtained using Taro Yaman formula as given below;

$$n = \frac{N}{\{1+N(e)^2\}}$$

Where:

(n) = sample size

(N) = population size

(e) = level of precision (sampling error), usually 0.05 for 95% confidence $n = \frac{240}{\{1+240(0.05)^2\}}$

$n = \frac{240}{\{1+0.6\}}$ $n = 150$

Sampling technique

The study adopted a proportionate stratified sampling technique to ensure adequate representation of respondents from the three states. The population of 240 respondents comprised 84 from AkwaIbom State, 65 from Abia State, and 91 from Rivers State. A sample size of 150 was determined and proportionately allocated to each stratum using:

$$nh = \frac{Nh}{N} \times n$$

Where:

(nh) = sample size for each stratum

(Nh) = population of each stratum

(N) = total population (240)

(n) = total sample size (150)

The proportional allocation yielded 53 respondents from AkwaIbom State, 41 respondents from Abia State, and 56 respondents from Rivers State, giving a total sample size of 150 respondents. This approach ensured that each state was represented in the sample according to its proportion in the population. This is presented in table 3.1 below.

Table 1: Sample size

State	Population	Calculation	Sample Size
AkwaIbom	84	(84/240 x 150)	53
Abia	65	(65/240 x 150)	41
Rivers	91	(91/240 x times 150)	56
Total	240		150

Source: Author's computation (2026)

Sources of data and method of data collection

The study adopted a primary source of data,through structured questionnaire based on a 5-point Likert scale. The questionnaire was developed using Google Forms and the survey link was electronically distributed to the respondents through appropriate online platforms, including email and social media channels. The online administration enabled respondents from the selected offices of the Nigeria Revenue Service (NRS) in AkwaIbom, Abia, and Rivers States to complete the questionnaire conveniently and anonymously.

A total of 150 Google Form questionnaire links were distributed electronically to the targeted respondents emails across the selected NRS offices in AkwaIbom, Abia, and Rivers States. The emails of the respondents were gotten from the Director, Human Resources Department. Completed responses received within the stipulated data collection period constituted the dataset used for the analysis.

Validity and Reliability of Data

Validity of the research instrument was ensured through content validity and construct validity. Content validity was established by subjecting the questionnaire to expert review by supervisors and scholars in accounting and tax experts to confirm alignment with the study objectives. Construct validity was ensured by adapting measurement items from established literature and ensuring that each item reflects the theoretical meaning of the construct it represents

Reliability of the research instrument was assessed to ensure consistency and stability in the measurement of the study variables. Given that the study relies on multi-item Likert-scaled constructs to measure strategic inventory management practices and operational performance, internal consistency reliability was most appropriate. To achieve this, the researcher conducted a preliminary pilot test of the questionnaire prior to the main survey administration. Data obtained from the pilot test were subjected to Cronbach's Alpha reliability analysis, a Cronbach's Alpha coefficient of 0.70 and above was considered acceptable for the study, indicating satisfactory internal consistency. This procedure ensured that the research instrument is reliable and suitable for generating valid empirical evidence for the study.

Method of data analysis

The primary data collected were analyzed using descriptive statistics tools of percentages, mean and standard deviation while inferential statistics to be used in conducting the data analysis will be multiple regressions. This was conducted using Statistical Package for Social Sciences software (SPSS) and presented by use of tables.

Model specification

The model for this study was adapted from Akinyosoye et al. (2025) but modified to suit the content of this present study. The simple regression models for the different variables based on the hypotheses are stated as shown thus;

$TRG = \beta 0 + \beta 1EPT + \varepsilon$……..(1)

$TRG = \beta 0 + \beta 1EPVAT + \varepsilon$……(2)

$TRG = \beta 0 + \beta 1EFPR + \varepsilon$……...(3)

$TRG = \beta 0 + \beta 1EPA + \varepsilon$…….(4)

However, the econometric model that incorporates all the variables based on the model of Akinyosoye et al. (2025) which was adapted to suit the purpose of this study is as presented thus: $TRG = \beta 0 + \beta 1EPT + \beta 2EPVAT + \beta 3EFPR + \beta 4EPA + \varepsilon$……..(5)

Where:

TRG = Tax Revenue Generation (Measure of tax compliance)

EPT = E-Payment of Taxes

EPVAT = E-Processing of VAT Returns

EFPR = E-filing of PAYE Returns

EPA = E-Personal Assessment

$\beta 0$ = Intercept or Constant $\beta 1$, $\beta 2$, $\beta 3$, $\beta 4$ = Coefficients of the independent variables which were obtained from the results of data analysis.

ε = Error term

Decision criterion

The hypotheses were tested at the 5% level of significance ($\alpha = 0.05$). The null hypotheses (H_0) were rejected if the p-values were less than 0.05 ($p < 0.05$) and the absolute calculated t-value (|t-cal|) was greater than the critical t-value of 1.96 ($|t| > 1.96$). Conversely, the null hypothesis failed to be rejected if the p-value is greater than or equal to 0.05 and the absolute calculated t-value (|t-cal|) was less than the critical t-value of 1.96 ($|t| < 1.96$).

RESULTS

Data presentation

The questionnaires were administered to the respondents identified and the summary is as shown in table

Table 2: Summary of questionnaire administered

Questionnaire	Number of questionnaires	Percentage (%)
Administered	150	100.00
Completed and returned	144	96.00
Not completed and returned	4	2.68
Rejected	2	1.32
Total	150	100.00

Source: Field survey (2026)

Table 2 shows that a total of 150 questionnaires were administered to selected personnel of FIRS in the course of the study. Out of the administered questionnaire, 144(96%) were correctly completed and returned, 4(2.64%) were not completed and returned while 2(1.32%) were not correctly completed, hence, were rejected.

Data analysis

Analysis of respondents' demographics

Respondents' demographics were the focus of data collection in the first section of the research questionnaire administered.

Table 3: Gender of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	67	43.1	43.1	43.1
Valid	Female	77	56.9	56.9	100
	Total	144	100.0	100.0	

Source: Researchers Computation (2026)

Table 3 shows that the respondents were made up of 217(63.1%) male and 127(36.9%) female.

Table 4: Gender of Respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
	Male	67	43.1	43.1	43.1
Valid	Female	77	56.9	56.9	100
	Total	144	100.0	100.0	

Source: Researchers Computation (2026)

The result in table 4 shows that 57(31.1%), 46(39.5%), 28(16.9%) of the respondents were between the ages of 21-30 years, 31-40 years and 41-50 years while 13(12.5%) were above 50 years of age respectively.

Table 5 : Highest educational qualification of respondents

		Frequency	Percent	Valid Percent	Cumulative Percent
VALID	SSCE	10	5.8	27.9	27.9
	ND/NCE	19	20.1	20.1	48.0
	HND/B.SC	59	46.2	46.2	94.2
	MASTERS & ABOVE	56	27.9	5.8	100.0
	TOTAL	144	100.0	100.0	

Source: Researcher's computation (2026)

The results in table 5 shows that 10(5.8%) and 19(20.1%) of the respondents were SSCE and ND/NCE holders while 59(46.2%) and 56(27.9%) had HND/B.Sc and Masters' Degree/above respectively.

Descriptive statistics of variables

The descriptive statistics result is as presented in table 6 below;

Table 6: Descriptive statistics results

	N Statistic	Mean Statistic	Std Deviation Statistic	Skewness Statistic	Std Error	Kurtosis Statistic	St Error
Tax Revenue Generation	144	4.2914	.90286	-1.740	.131	3.437	.262
E-filing of Returns	144	4.2050	.74218	-.1.102	.131	.914	.262
Online TIN Registration	144	4.1834	.76522	-1.047	.131	.886	.262
Online Tax Clearance Certificate	144	4.1177	.80135	-.973	.131	.742	.262
E-personal Assessment	144	4.0682	.83419	-.886	.131	.651	.262

Source: Researcher's computation (2026) using SPSS 25.0

The result shows that for the independent variables, e-payment of taxes, e-processing of VAT returns, e-filing of PAYE returns and e-personal assessment, the mean values obtained for all the responses were 4.2414, 4.2951, 4.1410, 4.2050, 4.1834, 4.1177 and 4.0682 respectively. This shows the average scores of all the responses regarding these

variables and indicates that respondents generally agreed that the four technology-based innovation variables are relevant to tax revenue generation in Nigeria.

Analysis of Variance

Table 7: ANOVA

MODEL	SUM OF SQUARES	DF	MEAN SQUARE	F	SIG
Repression	207.461	7	29.637	55.8	
Residual	72.136	136	.530	72	.0006
TOTAL	279.597	143			

a. Dependent Variable: TAX_REVENUE_GENERATION

b. Predictors: (Constant),

E_PERSONAL_ASSESSMENT,

E_FILING_OF_PAYE_RETURNS,

E_PROCESSING_OF_VAT_RETURNS,

E_PAYMENT_OF_TAXES.

Source: Researcher's computation (2026) using SPSS 25.0

The result shows F-statistic and probability values of 55.872 and 0.000 respectively. This indicates that the independent variables- e-payment of taxes, e-processing of VAT returns, e-filing of PAYE returns and e-personal assessment have a combined significant effect on tax revenue generation by FIRS in Nigeria.

Test of Hypotheses

This analysis was conducted to test the relationship between the dependent variables and the independent variable in this study. In line with this, each hypothesis was tested based on the regression results obtained.

Table 8: Coefficients

	UNSTANDARDIZED COEFFICIENTS		UNSTANDARDIZED COEFFICIENTS		
MODEL CONSTANT	B	STD ERROR	BETA	T	SIG
E-filing of Returns	1.065	.244		4.358	.000
Online TIN Registration	.053	.046	.040	1.161	.246
Online TAX Clearance Certificate	.111	.077	.084	1.447	.149

a. Dependent Variable: REVENUE GENERATION

b. Source: Researchers computation (2026) using SPSS 25.0

The T-statistics and p-values as revealed in table above were employed in the test of hypotheses stated in the previous section at 5% significance level.

Hypothesis one

Ho: E-payment of taxes has no significant effect on tax revenue generation in Nigeria.

In line with the decision rule of the study, the null hypothesis one of this study was rejected and the alternate accepted because the p-value of 0.000 shown in table is less than 0.05 ($p < 0.05$)

The null hypothesis is further rejected because the t-cal value of 4.318 is greater than the critical value of 1.96. This implies that e-payment of taxes has significant effect on tax revenue generation in Nigeria.

Hypothesis two

Ho: E-processing of VAT returns has no significant effect on tax revenue generation in Nigeria.

In line with the decision rule of the study, the null hypothesis two of this study was rejected and the alternate accepted because the p-value of 0.001 shown in table is less than 0.05 ($p<0.05$). The null hypothesis is further rejected because the t-cal value of 3.607 is greater than the critical value of 1.96. This implies that e-processing of VAT returns has significant effect on tax revenue generation in Nigeria.

Hypothesis three

Ho: E-filing of PAYE returns has no significant effect on tax revenue generation in Nigeria.

In line with the decision rule of the study, the null hypothesis three of this study was rejected and the alternate accepted because the p-value of 0.005 shown in table is less than 0.05 ($p<0.05$).

The null hypothesis is further rejected because the t-cal value of 2.842 is greater than the critical value of 1.96. This implies that e-filing of PAYE returns has significant effect on tax revenue generation in Nigeria.

Hypothesis four

Ho: E-personal assessment has no significant effect on tax revenue generation in Nigeria.

In line with the decision rule of the study, the null hypothesis seven of this study was rejected and the alternate accepted because the p-value of 0.027 shown in table is less 156 than 0.05 (p $p<0.05$).

The null hypothesis is further rejected because the t-cal value of 2.217 is greater than the critical value of 1.96. This implies that e-personal assessment has significant effect on tax revenue generation in Nigeria.

DISCUSSION

E-payment of taxes and tax revenue generation

The study found that e-payment of taxes has a significant positive effect on tax revenue generation in Nigeria, with a coefficient of 0.284 and a p-value of 0.000. This result places e payment within the payment-remittance and traceability grouping of technology-based innovations. E-payment has a direct connection with revenue generation because it affects the actual movement of tax funds from taxpayers to the tax authority. The result is consistent with studies that report positive links between electronic tax payment systems, compliance and revenue performance. Tivde (2024) found that tax revenue collection increased significantly after the introduction of electronic taxation platforms in Nigeria, while Falana et al. (2024) reported that digital payment platforms had positive and statistically significant effects on tax compliance in the informal sector. Similarly, Hesami et al. (2023), Li et al. (2020), Belahouaoui and Attak (2024), and Gomes (2025) emphasized

that digital payment and electronic record systems reduce compliance costs, improve traceability and make revenue monitoring more efficient.

E-processing of VAT returns and tax revenue generation

The study found that e-processing of VAT returns has a significant positive effect on tax revenue generation in Nigeria, with a coefficient of 0.219 and a p-value of 0.001. This result belongs to the return-processing and assessment automation grouping. VAT is a transaction-based tax that requires regular filing, accurate documentation and timely remittance; therefore, electronic processing of VAT returns can influence revenue generation by reducing errors and improving the monitoring of taxable transactions. This finding agrees with extant literature which shows that electronic VAT systems improve filing accuracy, reduce manual processing errors and strengthen the ability of tax authorities to track VAT obligations. Studies such as Mathenge and Abdul (2021), Kamil (2022), Hakizimana and Santoro (2023), Sheng (2025) and Gomes (2025) indicate that e processing and e-filing systems improve VAT compliance when they are supported by reliable infrastructure, taxpayer education and user-friendly platforms.

E-filing of PAYE returns and tax revenue generation

The study found that e-filing of PAYE returns has a significant positive effect on tax revenue generation in Nigeria, with a coefficient of 0.176 and a p-value of 0.005. This variable also falls under the return-processing and assessment automation grouping, but it has a special employer-based compliance dimension because PAYE returns are filed by employers on behalf of employees. The significance of the result shows that digital payroll tax reporting contributes meaningfully to tax revenue generation. The result is supported by extant literature which emphasizes that electronic filing systems improve compliance where tax obligations are frequent, structured and capable of being validated against third-party records. Studies such as Kamil (2022), Hakizimana and Santoro (2023), Belahouaoui and Attak (2024), Gomes (2025), Iqbal et al. (2025) and Martins and Picoto (2020) suggest that e-filing systems improve timeliness, reduce filing errors and enhance traceability. In the context of PAYE, this is particularly important because payroll taxes require regular remittance and accurate reporting of employee earnings, deductions and allowances.

E-personal assessment and tax revenue generation

The study found that e-personal assessment has a significant positive effect on tax revenue generation in Nigeria, with a coefficient of 0.142 and a p-value of 0.027. This result is part of the assessment automation grouping because e-personal assessment reduces manual assessment barriers and helps individual taxpayers compute, validate and submit personal income tax obligations electronically. The finding is consistent with studies that show that automated or electronic assessment systems improve voluntary compliance by reducing taxpayer confusion, lowering procedural costs and improving the accuracy of tax information. Hesami et al. (2023) reported that pre filling of returns and electronic invoicing reduce compliance and administration costs, while Zulaikhah (2025), Gomes (2025), Iqbal et al. (2025) and Martins and Picoto (2020) emphasized that digital support tools can simplify assessment procedures and improve taxpayer compliance. The present finding supports these studies because personal assessment becomes more effective when taxpayers can interact with a guided electronic system rather than relying entirely on manual assessment processes.

Summary, Conclusion and Recommendations

The study found that e-payment of taxes has a significant positive effect on tax revenue generation ($\beta = 0.284$, $p = 0.000$). This implies that electronic payment platforms simplify tax remittance procedures, reduce leakages associated with manual collections, and enhance accountability in revenue administration. The implication is that increasing the adoption of electronic payment systems can strengthen revenue mobilization and improve the efficiency of tax administration.

The findings showed that e-processing of VAT returns has a significant positive effect on tax revenue generation ($\beta = 0.219$, $p = 0.001$). This result implies that digital processing of VAT returns enhances monitoring, reduces filing errors, improves compliance among VAT-registered entities, and ultimately contributes to increased VAT collections.

The study revealed that e-filing of PAYE returns has a significant positive effect on tax revenue generation ($\beta = 0.176$, $p = 0.005$). This indicates that electronic submission of PAYE returns improves employer compliance, reduces filing delays, and enhances the accuracy of payroll tax records. The implication is that digital PAYE administration

strengthens the collection of employment-related taxes and contributes positively to government revenue.

The study found that e-personal assessment has a significant positive effect on tax revenue generation ($\beta = 0.142$, $p = 0.027$). This finding implies that electronic assessment systems simplify personal income tax administration, reduce assessment 166 errors, improve taxpayer convenience, and encourage voluntary compliance. Consequently, effective implementation of e-personal assessment systems can enhance tax collections from individual taxpayers.

CONCLUSION

The findings of study have shown that technology based innovations jointly enhance tax revenue generation in Nigeria. Although e-payment of taxes, e processing of VAT returns, e-filing of PAYE returns and e-personal assessment significantly enhance tax revenue generation in Nigeria. Therefore, it was concluded that technology based innovations enhances tax revenue generation and strengthens tax compliance when the various digital tax administration platforms are implemented together and supported by adequate taxpayer awareness, infrastructure and enforcement mechanisms.

Recommendations

The NRS should strengthen secure e-payment platforms by integrating banks, mobile payment channels and online portals in order to improve the speed and traceability of tax payments.

The NRS should automate VAT return processing further and ensure that VAT-registered taxpayers are trained on how to file, validate and submit VAT returns electronically.

The NRS should simplify e-filing of PAYE returns for employers by providing clear payroll templates, help-desk support and periodic reminders to improve timely PAYE filing and remittance.

The NRS should develop a user-friendly e-personal assessment platform with taxpayer education, automated guidance and error checks to encourage accurate personal income tax assessment and compliance.

Suggestions for further studies

It was recommended that further research should be conducted in the following areas:

1. Investigate the challenges faced by taxpayers in adopting e-payment systems, e-processing of VAT returns, e-filing of PAYE returns and e-personal assessment.
2. Explore the impact of the four technology-based innovation variables on tax revenue generation in the informal sector.
3. Examine the effectiveness of technology-based innovations in tax administration across different countries and different tiers of government in Nigeria.

Contributions to knowledge

This study contributes to knowledge in several ways.

1.This study provides empirical evidence on the relationship between the four technology-based innovation variables and tax revenue generation in Nigeria

2.The study demonstrates that, e-payment of taxes, e-processing of VAT returns, e-filing of PAYE returns and e-personal assessment have significant relationship with tax compliance and revenue generation in Nigeria.

3.The study's findings offer valuable insights for policymakers and tax administrators seeking to leverage technology to modernize tax administration and boost revenue generation.

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