JOURNAL OF OCCUPATION AND TRAINING
FACULTY OF VOCATIONAL AND TECHNOLOGY EDUCATION
ALVAN IKOKU UNIVERSITY OF EDUCATION, OWERRI
VOL. 10 NO. 1 ISSN:2354-2756 SEPTEMBER , 2026

ICT INNOVATION IN NIGERIAN TAX ADMINISTRATION AND TAX REVENUE MOBILIZATION

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Abstract
This study examines the effect of ICT innovation in Nigerian tax administration on tax revenue mobilization. Specifically, it investigates the extent to which ICT innovation has influenced oil tax revenue, non-oil tax revenue, and total tax revenue in Nigeria. The study employs an ex-post facto research design and uses secondary quantitative data from the Federal Inland Revenue Service (FIRS) Annual Reports and Performance Reviews. Quarterly tax revenue data for 2013–2024 were analyzed. The study comprises 48 quarterly observations, enabling a comparative assessment of tax revenue performance before and after the implementation of major ICT-driven tax administration reforms. Descriptive statistics, trend analysis, and comparative analysis were used to analyze the data. The findings reveal statistically significant increases in non-oil tax revenue (NOTAX), oil tax revenue (OTAX), and total tax revenue (TTAX) following the adoption of digital tax administration platforms. The results suggest that ICT innovation has enhanced tax administration efficiency, improved revenue collection, and strengthened the government's capacity to mobilize tax revenue. The study concludes that ICT innovation is a critical determinant of fiscal efficiency and sustainable revenue generation in Nigeria.

Keywords: *ICT Innovation, Tax Administration, Tax Revenue Mobilization, Finance Act 2019, TaxPro-Max, Digital Taxation, Nigeria.*

Introduction

Information and Communication Technology (ICT) innovation has become a critical driver of public sector transformation, particularly in tax administration and revenue mobilization. Across both developed and developing economies, governments have increasingly adopted digital technologies to modernize tax systems, improve compliance, enhance transparency, reduce administrative inefficiencies, and strengthen domestic revenue generation. The integration of ICT into tax administration has led to the development of electronic tax filing systems, digital payment platforms, taxpayer databases, automated compliance monitoring mechanisms, and integrated revenue management systems designed to improve the effectiveness of tax collection processes (Ogidan, 2021).

According to Aduloju (2022), tax reforms have become increasingly important due to globalization, digitalization, and the need for the government to expand revenue sources beyond traditional sectors. In Nigeria, the need to improve tax revenue mobilization has become important due to fluctuations in oil revenue, growing public expenditure, and the

need to achieve fiscal sustainability. Historically, the Nigerian tax system has faced numerous challenges, including tax evasion, corruption, poor record management, weak compliance mechanisms, administrative inefficiencies, and a large informal sector. These challenges have limited the government's ability to generate adequate revenue from taxation and have increased dependence on oil-related income.

Consequently, the government has implemented several tax reforms aimed at broadening the tax base, strengthening tax administration, and improving revenue generation through digital innovation and technological advancement. To address the challenges of taxing digital activities, the Nigerian government has implemented several tax reforms through the Finance Acts of 2019 and subsequent amendments, introducing the concept of Significant Economic Presence (SEP) for taxing non-resident digital companies (Erimwinorose & Abe-David, 2025). These reforms established provisions for taxing non-resident digital companies, expanded the scope of Value Added Tax (VAT) on digital transactions, and promoted the adoption of digital tax administration platforms such as TaxPro-Max.

Collectively, these measures aim to strengthen tax compliance, improve the efficiency of tax administration, and align Nigeria's tax system with international best practices in the taxation of the digital economy. The reforms further modernized tax administration and aligned Nigeria's tax framework with global developments in digital taxation (Aduloju, 2022). The Finance Act 2019 also introduced measures to strengthen revenue generation through digital taxation, expand the Value Added Tax (VAT) framework, and modernize tax administration processes. These reforms reflected global efforts to address the taxation challenges associated with digital economic activities and to ensure that businesses deriving significant economic benefits from a country's market contribute fairly to government revenue. To improve tax administration efficiency and support the implementation of digital tax reforms, the Nigeria Revenue Service (NRS), formerly known as the Federal Inland Revenue Service (FIRS), introduced TaxPro-Max in 2021 as an integrated electronic tax administration platform. TaxPro-Max was designed to automate key tax processes, including taxpayer registration, electronic filing of tax returns, online tax payments, issuance of Tax Clearance Certificates, taxpayer account management, and compliance monitoring. The platform represents one of the most significant ICT-driven innovations in Nigeria's tax administration system, providing a centralized digital infrastructure for tax collection and administration. The introduction of TaxPro-Max has improved tax compliance, reduced manual processing, enhanced transparency, minimized opportunities for tax-related fraud, and strengthened revenue collection mechanisms. Through automated taxpayer identification, integrated taxpayer databases, and digital payment systems, the platform has enhanced tax authorities' ability to detect non-compliance, monitor tax obligations, and expand the tax net. Consequently, ICT innovation has become an important tool for improving the efficiency of tax administration and enhancing tax revenue mobilization in Nigeria.

The relationship between ICT innovation and tax revenue mobilization can be explained by the Ability-to-Pay Theory of Taxation, which posits that taxpayers should contribute to government revenue according to their economic capacity. The adoption of digital tax administration systems enhances tax authorities' ability to identify taxable individuals and organizations, accurately assess tax liabilities, and ensure that taxpayers contribute fairly based on their income-generating capacity. ICT innovations, therefore, support the equitable and efficient implementation of tax policies while strengthening government revenue generation. Despite the growing adoption of digital technologies in tax administration, challenges such as inadequate digital infrastructure, unstable internet connectivity, cybersecurity threats, low digital literacy, and power supply constraints continue to affect the effectiveness of ICT-based tax systems in Nigeria.

Nevertheless, ongoing tax reforms and technological innovations demonstrate the government's commitment to modernizing tax administration and improving revenue

mobilization through digital transformation. Given the growing importance of ICT innovation in public revenue management, it is essential to examine its impact on the efficiency of tax administration and tax revenue mobilization in Nigeria.

Existing literature has extensively examined the role of ICT in improving tax administration, enhancing taxpayer compliance, and increasing tax revenue in Nigeria. Previous studies have emphasized the importance of electronic tax systems, digital taxpayer databases, online tax filing platforms, and automated tax administration processes in strengthening revenue collection and reducing tax evasion (Adeyeye, 2019; Ajape, Afara & Uthman, 2017). These studies generally conclude that ICT innovation improves administrative efficiency and contributes positively to tax revenue mobilization. Similarly, several studies have examined the implications of the Finance Act 2019 for tax administration, digital taxation, Value Added Tax (VAT) administration, and revenue generation in Nigeria. These studies focused largely on the legal and policy dimensions of the Act, particularly its provisions relating to digital taxation, Significant Economic Presence (SEP), and the expansion of the tax base (Halliday, 2021).

Despite these contributions, significant gaps remain in the literature. First, most earlier studies were conducted before the introduction of TaxPro-Max in 2021 and therefore do not adequately capture the effects of Nigeria's recent digital tax administration reforms. Second, most existing studies focus on tax administration efficiency, compliance, and legal frameworks, without empirically examining the direct relationship between ICT-driven tax innovations and tax revenue mobilization in the post-Finance Act 2019 era. Third, there is limited empirical evidence assessing the combined effect of the Finance Act 2019 and ICT-based tax administration innovations such as TaxPro-Max on tax revenue mobilization in Nigeria. Therefore, this study seeks to fill this gap by empirically examining the effect of ICT innovation on tax revenue mobilization in Nigeria, with particular emphasis on the implementation of the Finance Act 2019 and the introduction of TaxPro-Max in 2021. The study contributes to the literature by providing evidence on how recent digital tax administration reforms influence oil and non-oil tax revenue generation and total tax revenue in Nigeria.

Statement of The Problem

Tax revenue remains one of the most important sources of government financing for economic development, infrastructure provision, public service delivery, and fiscal sustainability. Despite being Africa's largest economy, Nigeria continues to generate low tax revenue relative to its economic potential. The country's tax-to-GDP ratio remains among the lowest globally, reflecting persistent challenges in tax administration, a weak compliance culture, tax evasion, revenue leakages, a large informal sector, and overreliance on oil revenue (Yashim et al., 2021). These challenges have significantly constrained the government's capacity to generate adequate domestic revenue for sustainable national development.

Historically, Nigeria's tax administration was characterized by manual processes, fragmented taxpayer records, inefficient monitoring mechanisms, poor data management, and limited technological integration. These weaknesses created opportunities for tax evasion, administrative inefficiencies, corruption, and revenue losses, thereby undermining effective tax revenue mobilization. In response to these challenges, the Nigerian government introduced several tax reforms to modernize tax administration and enhance revenue. A major milestone was the enactment of the Finance Act 2019, which amended several tax laws, expanded the tax base, strengthened digital taxation provisions, introduced the Significant Economic Presence (SEP) principle for non-resident digital companies, and promoted the modernization of tax administration processes. The Act was designed to improve tax compliance, increase non-oil revenue generation, and align Nigeria's tax system with emerging global economic realities.

Furthermore, the Nigeria Revenue Service (NRS), formerly known as the Federal Inland Revenue Service (FIRS) introduced TaxPro-Max in 2021 as an integrated electronic tax administration platform to automate taxpayer registration, tax filing, online payment processing, and the issuance of Tax Clearance Certificates. The platform was expected to improve efficiency, transparency, taxpayer compliance, and revenue collection through ICT.

Despite these reforms and technological innovations, Nigeria continues to face significant challenges in revenue mobilization. Tax compliance remains relatively low, revenue leakages persist, and the country's tax revenue performance remains below expectations. Challenges such as inadequate digital infrastructure, low digital literacy, unstable internet connectivity, cybersecurity risks, weak institutional capacity, and resistance to technological change continue to undermine the effectiveness of ICT-based tax administration systems. Although previous studies have examined tax reforms, digital taxation, electronic tax administration, and revenue generation in Nigeria, much of the literature focuses on the legal implications of the Finance Act 2019, tax compliance, or the operational efficiency of ICT systems.

Empirical evidence remains limited regarding the extent to which ICT innovations in tax administration, particularly the implementation of TaxPro-Max following the Finance Act 2019 reforms, have contributed to tax revenue mobilization in Nigeria. Existing studies, such as Okesola (2020) and Aduloju (2022), examine these reforms independently rather than assessing their combined effect on tax revenue performance.

Consequently, there remains insufficient empirical evidence on whether recent ICT-driven tax administration reforms have significantly improved tax revenue mobilization. Against this background, this study seeks to examine the effect of ICT innovation in Nigerian tax administration on tax revenue mobilization, with particular emphasis on the Finance Act 2019 and the introduction of TaxPro-Max in 2021.

Objectives of The Study

The main objective of this study is to examine tax reform and the growth of the Nigerian digital economy.

The specific objectives are to:

1. To examine the extent to which ICT innovation has influenced oil tax revenue generation in Nigeria.
2. To examine the extent to which ICT innovation has influenced non-oil tax revenue generation in Nigeria.
3. To assess the extent to which the adoption of ICT innovation has influenced total tax revenue generation in Nigeria

Research Questions

1. To what extent has ICT innovation influenced oil tax revenue generation in Nigeria?
2. To what extent has ICT innovation influenced non-oil tax revenue generation in Nigeria?
3. To what extent has the adoption of ICT innovation influenced total tax revenue generation in Nigeria?

Hypothesis

$H0_1$: ICT innovation has no significant influence on oil tax revenue generation in Nigeria.

$H0_2$: ICT innovation has no significant influence on non-oil tax revenue generation in Nigeria.

$H0_3$: The adoption of ICT innovation has no significant influence on total tax revenue generation in Nigeria.

Literature Review

Conceptual Review

ICT Innovation and Tax Revenue Mobilization

Information and Communication Technology (ICT) innovation involves the development, adoption, and application of digital technologies to improve organizational

processes, service delivery, communication, and decision-making. It uses computer systems, software applications, internet-based platforms, telecommunications networks, data analytics, cloud computing, and artificial intelligence (Arinze, 2024).

In tax administration, ICT innovation encompasses the deployment of electronic tax filing systems, online tax payment platforms, digital taxpayer databases, automated compliance monitoring systems, electronic tax clearance certification, and integrated tax administration platforms (Agbo, 2022). These technologies automate tax processes, improve record management, enhance transparency, reduce administrative costs, minimize human errors, and strengthen tax compliance and revenue mobilization. Okesola (2020) observes that digital technologies have transformed business structures by reducing dependence on physical presence and increasing cross-border electronic transactions. The growth of digital services has significantly contributed to job creation, financial inclusion, and investment opportunities in Nigeria.

Tax revenue mobilization is the process of generating, collecting, and managing tax revenue from individuals, businesses, and other taxable entities to finance government expenditure and support economic development. It encompasses the policies, administrative mechanisms, and institutional frameworks employed by tax authorities to maximize tax collection while ensuring compliance with tax laws and regulations. The adoption of digital technologies in tax administration has transformed traditional tax collection processes by promoting efficiency, transparency, accountability, and taxpayer compliance (Haruna et al., 2026). The growth of ICT has also encouraged electronic governance and digital public administration. The adoption of electronic tax systems such as TaxPro-Max demonstrates the increasing integration of ICT into public financial management.

According to KPMG (2022), Nigeria's tax reforms reflect the government's commitment to harmonizing tax administration with global digital economic realities and improving fiscal sustainability. ICT innovation in taxation encompasses electronic tax filing (e-filing), electronic payment systems (e-payment), taxpayer identification systems, integrated tax administration platforms, digital databases, and automated compliance monitoring mechanisms. Ajape, Afara, & Uthman (2017). However, the borderless nature of digital activities has complicated traditional tax systems, making it difficult for tax authorities to determine where value is created and where taxes should be paid (Aliu, Ajao & Tijani, 2025).

In Nigeria, efforts to modernize tax administration through ICT have intensified in recent years, particularly with the introduction of electronic tax administration systems by the Nigerian Revenue Service (NRS). One of the most significant innovations is TaxPro-Max, an integrated digital tax platform launched in 2021 to facilitate taxpayer registration, tax filing, online payment, and the issuance of electronic Tax Clearance Certificates. The platform was introduced to simplify tax processes, reduce administrative bottlenecks, and improve tax compliance. Several studies have highlighted the positive relationship between ICT innovation and tax revenue mobilization.

Adebisi and Gbegi (2013) observed that adopting electronic tax systems improved tax administration efficiency and reduced tax evasion. While Ajape, Afara, & Uthman (2017) found that electronic taxation enhanced revenue generation, it had little impact on tax administration. Their study emphasized that digital technologies broaden the tax base and reduce revenue leakages. The authors noted that digital tax platforms enable tax authorities to maintain accurate taxpayer records and strengthen enforcement mechanisms, thereby increasing tax revenue. Recent studies have also examined TaxPro-Max's role in improving tax administration. KPMG (2022) reported that the platform has enhanced tax compliance, simplified tax procedures, and supported revenue mobilization by automating key tax processes. Through centralized taxpayer data management and integrated payment systems,

TaxPro-Max has improved tax authorities' capacity to identify non-compliant taxpayers and monitor tax obligations more effectively.

Despite these achievements, challenges such as inadequate digital infrastructure, unstable internet connectivity, cybersecurity threats, low digital literacy, and power supply constraints continue to hinder the full realization of ICT-driven tax administration in Nigeria. These challenges may limit taxpayer participation and affect the efficiency of digital tax systems. ICT innovation plays a significant role in enhancing tax revenue mobilization by improving tax administration efficiency, increasing taxpayer compliance, reducing tax evasion, and strengthening revenue collection mechanisms.

However, sustained investment in digital infrastructure and capacity building is necessary to maximize the benefits of ICT innovation in Nigeria's tax system.

Finance Act and Digital Taxation in Nigeria

The Finance Act 2019 introduced significant amendments to Nigeria's tax laws to modernize the fiscal framework and address challenges associated with the rapidly expanding digital economy. A major innovation was the introduction of the Significant Economic Presence (SEP) principle, under which non-resident companies providing digital services to customers in Nigeria may become liable to Companies Income Tax even without a physical presence in the country (Ango & Ibrahim, 2020; Haruna et al., 2026). The Act amended Section 13 of the Companies Income Tax Act (CITA), expanding the tax nexus to cover foreign digital businesses engaged in activities such as online advertising, data transmission, digital marketplaces, streaming services, cloud computing, online consultancy, and software subscriptions.

According to Ogidan (2021), this represented a significant shift in Nigeria's international tax regime by recognizing economic activity conducted digitally as a basis for taxation. The Act also increased the Value Added Tax (VAT) rate from 5% to 7.5%, provided tax exemptions for small businesses with annual turnover below ₦25 million, and encouraged the use of electronic tax administration. These measures were intended to broaden the tax base, improve compliance, and strengthen revenue mobilization. The Finance Act 2021 further strengthened this framework by refining provisions relating to digital businesses and non-resident persons and enhancing the taxation of digital transactions (Bello, 2022). The reforms sought to improve tax compliance, align domestic taxation with international developments, and enhance the administration of VAT on electronically supplied services. Collectively, the Finance Acts established a broader legislative foundation for taxing economic activities conducted through digital channels and improving Nigeria's capacity to mobilize tax revenue. Against this legislative background, the Federal Inland Revenue Service (FIRS) introduced TaxPro-Max in 2021 as a technology-enabled platform to implement and administer the evolving tax framework. The platform provides electronic services for taxpayer registration, tax-return filing, payment, issuance of Tax Clearance Certificates (TCCs), and compliance monitoring. By replacing several manual processes with an integrated digital system, TaxPro-Max has improved the efficiency and transparency of tax administration and supported revenue collection (KPMG, 2022). Its centralized taxpayer database also reduces duplicate records, improves information management, and minimizes errors associated with manual processing. TaxPro-Max further facilitates electronic tax payments through designated banks and other digital channels, making compliance more convenient and potentially encouraging timely filing and payment. Its automated taxpayer identification and data-management capabilities enhance the tax authority's ability to identify non-compliant taxpayers and strengthen compliance monitoring and enforcement.

However, the platform's effectiveness remains constrained by inadequate internet infrastructure, technical failures, limited digital literacy, cybersecurity risks, unreliable electricity supply, and insufficient awareness among some taxpayers. Small business owners and other taxpayers with limited technological skills may struggle to access and navigate the system. In addition, integrating TaxPro-Max with other government databases remains

technically complex and may affect the completeness and reliability of taxpayer information. Addressing these challenges is therefore necessary to maximize the benefits of digital tax administration and strengthen voluntary compliance and revenue mobilization in Nigeria.

Theoretical Review

The Ability-to-Pay Theory of Taxation: This theory underpins this paper. Adam Smith first developed it in 1776, and Arthur Cecil Pigou propounded it in 1920. The theory holds that taxation should be based on the taxpayer's capacity to bear the tax burden rather than on the benefits received from government services. Under this theory, individuals and organizations with higher income or wealth should pay more taxes than those with lower income. The theory underpins progressive taxation systems used in many countries. Tax reforms influenced by the Ability-to-Pay Theory aim to promote fairness, equity, and social justice in taxation.

In Nigeria, reforms such as tax exemptions for small businesses under the Finance Act 2019 reflect this theory. The exemption of companies with annual turnover below ₦25 million from Companies Income Tax was intended to reduce the burden on small businesses and encourage entrepreneurship. This reform aligns with the Ability-to-Pay Theory because it reduces the tax burden on small businesses and startups that may lack sufficient financial strength, while ensuring larger, more profitable companies bear greater tax responsibilities. The Ability-to-Pay Theory is relevant to this study because it promotes equitable taxation based on taxpayers' financial capacity, thereby supporting sustainable revenue mobilization and fiscal stability. The theory also emphasizes transparency and accountability in tax administration. ICT innovations, such as TaxPro-Max, enhance transparency, reduce corruption and administrative inefficiencies, and improve tax compliance. Consequently, the theory provides a strong foundation for tax reform and ICT-driven modernization of Nigeria's tax system.

The Optimal Tax Theory: Developed by James Mirrlees in 1971, examines how governments can design tax systems that maximize social welfare while minimizing economic distortions and inefficiencies. It argues that tax systems should balance revenue generation with economic growth. Excessive taxation may discourage investment, innovation, and productivity, while inadequate taxation may reduce the government revenue needed to provide public goods and services. Tax reforms inspired by the Optimal Tax Theory aim to establish efficient tax structures that encourage investment, entrepreneurship, and economic development.

In Nigeria, reforms such as digital tax administration, reducing multiple taxation, and tax incentives for small businesses are intended to improve tax compliance without discouraging business activities or technological innovation. The theory is particularly relevant to the digital economy because governments must balance taxing digital transactions with promoting ICT innovation and technological advancement. It emphasizes the need for efficient, equitable, and growth-oriented tax systems that generate adequate revenue without discouraging innovation, investment, and digital entrepreneurship.

Empirical Review

Haruna et al. (2026) examined how Information and Communication Technology (ICT) indicators and recent digital tax reforms influenced tax revenue mobilization in Nigeria from 2010 to 2023. Using panel data from four purposively selected states, the study employed fixed-effects regression models to account for within-state variation and unobserved heterogeneity, with robust standard errors clustered at the state level. The findings showed that mobile subscriptions have a positive and statistically significant effect on tax revenue, while internet penetration has a marginal negative effect and broadband usage is statistically insignificant. The study concluded that integrating ICT development with digital tax reforms is essential to enhancing tax revenue in Nigeria. Consequently, the

authors recommended that the government strengthen ICT development alongside digital tax reforms to improve revenue generation from Nigeria's digital economy. However, a gap remains, as the study primarily focused on the effect of ICT indicators on overall tax revenue. The current study extends the scope by examining the influence of ICT innovation on oil tax revenue, non-oil tax revenue, and total tax revenue generation in Nigeria.

Yashim et al. (2021) examined the effect of tax reforms on Nigeria's economic growth using quarterly time-series data from 2019 to 2021. The study adopted an ex-post facto research design and used Value Added Tax (VAT) and Capital Gains Tax (CGT) as proxies for tax reforms, while Real Gross Domestic Product (RGDP) served as a proxy for economic growth. The population comprised 121 manufacturing firms listed on the Nigerian Stock Exchange. Data were analyzed using Auto-Regressive Distributed Lag (ARDL) and Ordinary Least Squares (OLS) in EViews 10. The findings revealed that VAT reform has a positive and significant relationship with economic growth, whereas Capital Gains Tax reform has no significant effect on economic growth. The study recommended improving CGT administration to reduce tax evasion and avoidance.

However, the study focused primarily on the relationship between tax reforms and macroeconomic growth indicators, whereas the current study focuses on ICT innovation in tax revenue mobilization and extends the analysis to 2024.

Similarly, Omesi and Appah (2021) examined the effect of electronic taxation on revenue generation in Nigeria using a pre- and post-analysis approach. Their findings showed a significant increase in company income tax and value-added tax revenue after adopting electronic tax administration systems. The study concluded that digital tax processes reduced loopholes associated with manual tax administration and improved revenue collection efficiency. Agbo (2022) also reported that deploying ICT tools, such as e-filing, e-assessment, e-payment systems, and digital taxpayer databases, improved revenue collection and the efficiency of tax administration within the Federal Inland Revenue Service (FIRS), now the Nigeria Revenue Service (NRS). The study emphasized that ICT innovation enabled tax authorities to automate operations, expand taxpayer coverage, and improve service delivery.

Arinze (2024) examined the impact of digital innovation on the Nigerian economy, with particular emphasis on ICT's role. The analysis used secondary data from diverse, reliable databases covering the period 2004–2014. The findings revealed that digitalization has significant potential to drive economic growth and development in Nigeria. The study therefore recommended stronger collaboration among the government, private sector, and non-governmental organizations to ensure the equitable distribution of the benefits of digital innovation across the country. The study focused primarily on technological infrastructure, digital inclusion, social connectivity, and community development, with limited attention to ICT innovation's role in tax administration and revenue mobilization.

In addition, it relied on descriptive secondary data covering 2004–2014. This study addresses these gaps by employing a quantitative approach to examine the effect of ICT innovation on total tax revenue mobilization in Nigeria.

Methodology

Research Design

This study employed an ex-post facto research design. This design is appropriate because it uses existing historical data to examine the relationship between the independent variable (ICT-driven tax adoption) and the dependent variables: oil tax revenue (OTAX), non-oil tax revenue (NOTAX), and federal tax revenue (TTAX). The study uses secondary quantitative data covering 2013 to 2024. Data were sourced from the Nigerian Revenue Service (NRS), Annual Reports and Performance Reviews published online. The study used NRS's online quarterly tax revenue data from 2013 to 2024. Given the nature of the study, all observations for the specified 12-year period (2013–2024) were included in the analysis,

covering 144 monthly observations or 48 quarterly observations, enabling a robust comparative analysis between the pre-period (2013–2018) and the post-period (2019–2024).

Model Specification

To evaluate the effect of ICT adoption, the study adopts a comparative statistical model, where the variables are expressed as follows:

$Y_t = \alpha + \beta_1 (ICT_t) + \mu t$

Where:

Y_t = Tax revenues (OTAX, NOTAX, TTAX)

α = Intercept

β_1 = Coefficient of ICT adoption

ICT_t = Dummy variable (0 for pre-adoption 2013–2018, 1 for post-adoption 2019–2024).

μt = Error term

Method of Data Analysis

The analysis was conducted using the following techniques:

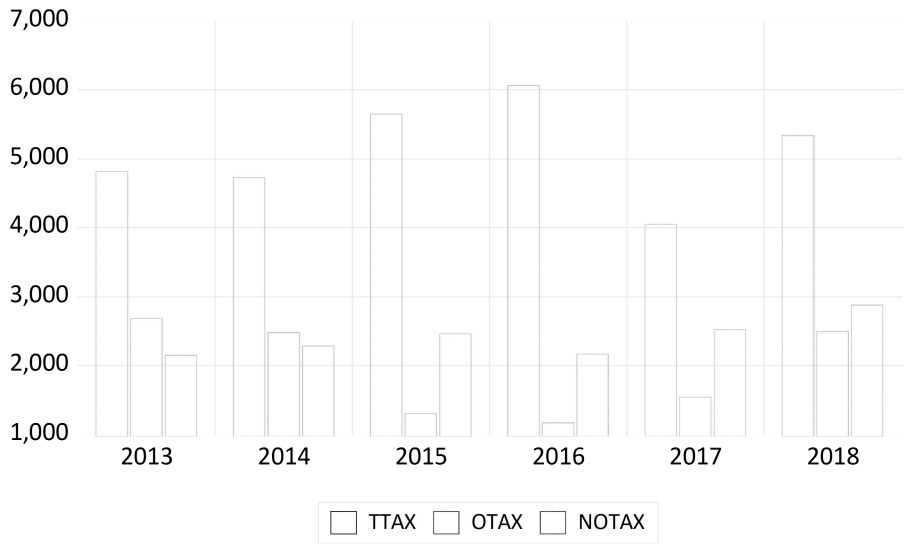
1. **Descriptive Statistics:** To provide a summary of the mean, median, standard deviation, skewness, and kurtosis of the variables.
2. **Trend Analysis:** To visually inspect the fluctuations in tax revenue over the 12-year period.
3. **Comparative Analysis (Independent Samples t-test):** To determine whether the difference in mean tax revenue between the pre-period and post-period is statistically significant.

Results

Visual Analysis of the Chart

Figure 1

Figure 1 illustrates revenue trends before the adoption of ICT innovations in TaxPro Max and the 2019 Finance Act (2013–2018).



TTAX: This represents the Total Federal Tax Revenue. Analysis shows that it is the highest bar each year, indicating that it accounts for the bulk of total revenue. It fluctuates significantly, peaking around 2016.

OTAX: The oil tax bar fluctuated downward from 2013 to 2016. This visualizes the volatility of oil-dependent revenue.

NOTAX: Non-oil tax performance shows relatively consistent performance compared to the other two. It remains stable even when oil revenue (OTAX) drops significantly in 2016 and 2017.

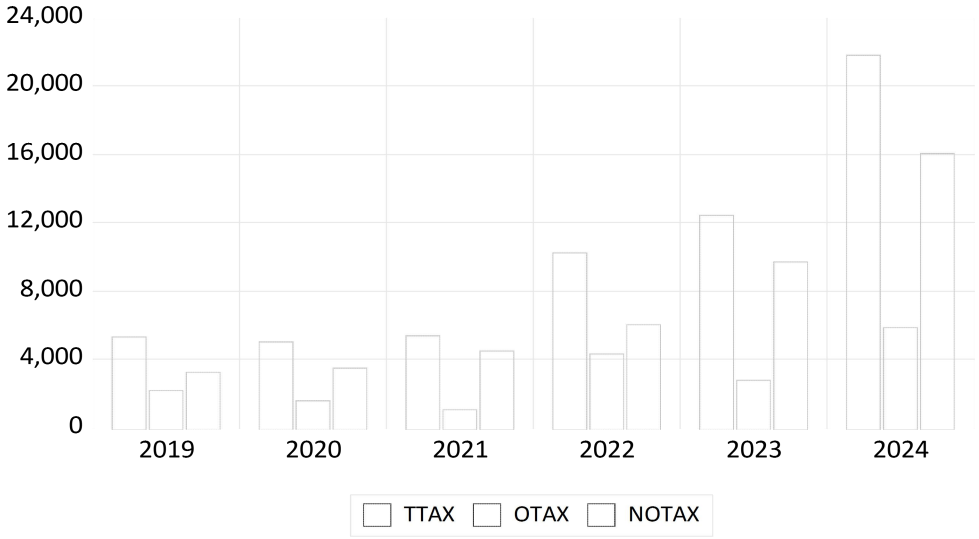
The chart shows a period of significant fiscal instability, particularly in the oil sector (OTAX), which trended downward from 2013 to 2016. The variability in TTAX underscores the inherent risks of over-reliance on oil-based revenue. In contrast, NOTAX

Figure 2 below illustrates revenue trends associated with the adoption of ICT innovations in TaxPro Max and the 2019 Finance Act (2019–2024).

- Both TTAX and NOTAX show a consistent upward trend, notably from 2022 onward.
- NOTAX grows significantly over time, nearly catching up to or surpassing TTAX levels from the previous period. This visually confirms a substantial positive impact of ICT on non-oil tax mobilization**.**
- TTAX reaches its highest point in 2024, strongly suggesting that the system is currently generating significantly more revenue than in the pre-adoption period.

Visual Analysis of the Chart of Figure 2

Figure 2



Paired Samples Statistics Descriptive Statistics

Table 1 Paired Samples Statistics in Respect to the Mean of the Pre- and Post-Period

Variable	Pre-Period Mean (1)	Post-Period Mean (2)	Observed Change
OTAX (Oil Tax)	481.51	719.41	Increase of 49%
NOTAX (Non-Oil)	598.42	1769.70	Increase of 196%
TTAX. (Total Tax)	1272.61	2489.11	Increase of 96%

Source: SPSS 27

Based on the Paired Samples Statistics in Table 1, the descriptive statistics highlight a marked shift in tax revenue performance following the 2019 Finance Act and the implementation of the TaxPro Mas digital tax platform. The mean value of NOTAX rose from 598.42 to 1769.70, suggesting that adopting information technology significantly improved the efficiency of non-oil revenue collection.

- **Significant Growth:** The most dramatic improvement is in NOTAX (Non-Oil Tax), which nearly tripled in the post-adoption period. This strongly supports the argument that ICT innovations (TaxPro Max) are highly effective at capturing non-oil revenue.
- **Oil Tax Contribution:** While OTAX has also increased, its growth rate is lower than that of non-oil taxes. This suggests that although technology improves overall collection, oil tax revenue may be subject to external volatility (such as global crude prices) that technology cannot fully control.
- **Overall Impact:** The Total Tax (TTAX) almost doubled, providing strong empirical evidence for the hypothesis.

Furthermore, the increase in TTAX from a mean of 1272.61 in the pre-adoption period to 2489.11 in the post-adoption period provides preliminary evidence that technological

modernization has been a critical driver of federal revenue growth. These results provide a foundation for rejecting the null hypotheses, as the data indicate a clear positive deviation in revenue post-2019.

Pair Samples Correlations

The Paired-Samples Correlations table shows the strength and direction of the linear relationship between the variables before (1) and after (2) the adoption of ICT innovations. The correlation table shows how the variables relate to one another.

Table 2 Pair Samples Correlations of the Pre and Post Period

Pair	Relationship	Correlation	Significance
Pair 1 OTAX (Oil Tax)	Pre vs. Post	0.061	0.777
Pair 2 NOTAX (Non-Oil)	Pre vs. Post	0.535	0.007
Pair 3 TTAX. (Total Tax)	Pre vs. Post	0.02	0.925

Source: SPSS 27

Interpretation of the Results:

This ranges from -1 to +1. A higher positive number indicates that as the Pre value increases, the Post value tends to increase as well. Pair 2 (NOTAX) is the most significant: With a correlation of 0.535 and a Sig. value of 0.007 (which is < 0.05), there is a moderate, statistically significant positive relationship between pre- and post-adoption non-oil tax data. This suggests that revenue collection patterns in the non-oil sector remained somewhat consistent or grew predictably before and after ICT adoption.

Pair 1 (OTAX) and Pair 3 (TTAX) are not significant: The Sig. values (0.777 and 0.925) are well above 0.05. This indicates no statistically significant linear relationship between the pre- and post-adoption periods for these categories. In summary, the Paired Samples Correlation analysis (Table X) shows that the relationship between pre- and post-adoption revenue is statistically significant only for Non-Oil Tax ($r=0.535$, $p=0.007$). This suggests that technological innovations in the non-oil sector have created a more stable or consistent revenue mobilization trajectory compared with the oil sector and total revenue, where the lack of significant correlation ($p > 0.05$) implies that other exogenous factors beyond ICT adoption likely exerted greater influence on these categories over the studied periods.

The Paired Samples Test analysis

Table 3: Test of Significance using the Paired-Samples Test table

Pair	T-statistics	P-Value	Remark
Pair 1 OTAX (Oil Tax)	-2.273	0.033	Statistically Significant
Pair 2 NOTAX (Non-Oil)	-4.885	0.000	Highly Statistically Significant
Pair 3 TTAX. (Total Tax)	-3.468	0.002	Highly Statistically Significant

Source: SPSS 27

Interpretation

Non-Oil Tax (NOTAX): The p-value of .000 is exceptionally strong. It indicates that adopting ICT innovation has had a strong, statistically significant positive effect on non-oil tax revenue mobilization.

Total Tax (TTAX): The p-value of .002 indicates that overall federal revenue has increased significantly and systematically, and that this increase is directly linked to the period of technological adoption.

Oil Tax (OTAX): The p-value of .033 indicates that innovations also had a statistically significant effect on OTAX.

The paired-samples t-test results (Table 3) indicate that revenue mobilization differs significantly across all categories between the pre-adoption period (2013–2018) and the post-adoption period (2019–2024).

Specifically, the NOTAX category recorded the most significant improvement ($t = -4.885$, $p < .05$). Similarly, the TTAX and OTAX categories showed statistically significant growth following the adoption of ICT innovations ($p = .002$ and $p = .033$, respectively). These findings provide strong empirical evidence to reject the null hypotheses, confirming that the digitalization of tax administration through ICT has effectively enhanced federal revenue mobilization in Nigeria.

This Paired Samples Effect

While the t-test (previous table) establishes whether a significant difference exists, the paired-samples effect size analysis quantifies how large or important that difference is relative to the observed difference.

Understanding the Metrics

Cohen's d: This is the most common measure of effect size. It shows the magnitude of the difference between pre- and post-adoption groups in standard deviation units.

Interpretation guide for Cohen's d: The decision is taken based on the criterion:
0.2: Small effect, 0.5: Medium effect, 0.8 and above: Large effect

Table 4 Paired Samples Effect Results

Pair	Variable	Cohen's d Point Estimate	Remark
Pair 1	OTAX (Oil Tax)	-0.464	Medium Effect
Pair 2	NOTAX (Non-Oil)	-0.997	Large Effect
Pair 3	TTAX. (Total Tax)	-0.708	Medium-to-Large Effect

Source: SPSS 27

The NOTAX Result (-0.997): This is nearly -1.0, indicating a very large effect. This confirms that adopting ICT innovations had a substantial impact on non-oil tax mobilization.

The TTAX Result (-0.708): A value of 0.7 indicates a strong, medium-to-large effect. It confirms that the technological shift led to a meaningful overall increase in federal tax revenue.

The OTAX Result (-0.464): An effect size of 0.46 indicates a medium effect. This remains positive and meaningful, confirming that technology helped improve oil tax collection. Beyond statistical significance, the effect size analysis (Table 4.3) demonstrates the substantive impact of ICT adoption. The Cohen's d value for NOTAX (-0.997) indicates a large effect size, suggesting that the digital transformation of the tax system was a primary driver of the massive growth in non-oil revenue.

Similarly, the TTAX effect size (-0.708) reflects a substantial practical improvement in total federal tax mobilization. These findings reinforce the conclusion that technological innovation is a critical policy instrument for enhancing national revenue. This study's findings are consistent with those of Arinze (2024), who reported that the digitalization of Nigeria's tax system has significantly improved revenue generation.

The findings also align with those of Agbo (2022) and Omesi and Appah (2021), who observed that the transition from manual to digital tax administration systems has enhanced fiscal efficiency, strengthened tax administration, and improved the government's capacity to generate sustainable revenue. These studies suggest that adopting ICT-driven tax innovations reduces revenue leakages, enhances tax compliance, and promotes more effective revenue mobilization.

Discussion of Findings

The study investigated the impact of ICT innovations associated with the Nigerian Finance Act 2019 reforms and the adoption of the TaxPro-Max platform in 2021 on tax

revenue mobilization. The findings revealed statistically significant increases in non-oil tax revenue (NOTAX), oil tax revenue (OTAX), and total tax revenue (TTAX) following the adoption of digital tax platforms. The effect was particularly pronounced in the non-oil sector, which recorded an approximately 196% increase in mean revenue after adopting digital tax platforms.

Furthermore, the effect size analysis confirmed that the observed changes were not only statistically significant but also of substantial practical importance to Nigeria's fiscal capacity. The findings are consistent with the Ability-to-Pay Theory, which posits that taxpayers should contribute to government revenue according to their economic capacity. Digital technologies such as TaxPro-Max can strengthen tax authorities' capacity to identify taxpayers, monitor taxable transactions, improve information availability, and detect underreporting and tax evasion. The substantial increase in non-oil tax revenue therefore suggests that ICT-enabled tax administration can better identify and capture previously under-taxed economic activities, enabling tax liabilities to more closely reflect taxpayers' actual economic capacity.

The findings also support Optimal Tax Theory**,** which emphasizes designing and administering taxation to generate adequate government revenue while minimizing administrative costs, compliance burdens, and economic distortions. The significant increases in NOTAX, OTAX, and TTAX following digitalization suggest that improved tax administration can enhance revenue mobilization without relying exclusively on higher tax rates. Through electronic registration, filing, payment, taxpayer information management, and compliance monitoring, TaxPro-Max can improve administrative efficiency and reduce revenue leakages.

The findings further align with Haruna et al. (2026**)**, who found that ICT indicators and their interaction with digital tax reforms significantly influence tax revenue mobilization in Nigeria. The findings are also broadly consistent with Yashim et al. (2021)**,** who concluded that effective tax reforms are important for improving Nigeria's revenue profile and economic stability and recommended improvements in tax administration to address tax evasion and avoidance. Generally, the findings indicate that the effectiveness of Nigeria's tax reforms depends not only on introducing appropriate tax policies but also on the technological capacity to implement and administer them.

Conclusion

This research concludes that the adoption of ICT innovation is a critical determinant of fiscal efficiency in Nigeria. By reducing human intervention, automating filing, and broadening the tax base, digital transformation has successfully mitigated the volatility historically associated with Nigeria's revenue streams. The transition from manual to digital systems has fundamentally reshaped the federal government's ability to mobilize revenue.

Recommendations

Based on the findings, the following are recommended:

1. **Sustaining Digital Infrastructure:** The FIRS must continue to invest in and upgrade the TaxPro-Max system to ensure high-level cybersecurity and system uptime.
2. **Expanded Digital Coverage:** Efforts should be intensified to integrate informal-sector businesses into the digital tax net, as the "large effect" on NOTAX demonstrates the model's success in this area.
3. **Continuous Capacity Building:** Tax officials and taxpayers require ongoing training to maximize the effectiveness of these digital tools, ensuring that adoption leads to sustained compliance.

Suggestion For Further Study

1. Future studies may conduct comparative analyses of ICT adoption and its effectiveness in tax administration between federal and state revenue agencies in Nigeria to identify best practices and implementation challenges.
2. Future studies may explore how ICT-based tax systems influence taxpayer attitudes, perceptions, and compliance behaviour, particularly among small and medium-sized enterprises (SMEs) and self-employed individuals.

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Appendixes

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference Lower	Upper			
Pair 1	OTAX 1 - OTAX 2	-237.90083	512.63673	104.64153	-454.36834	-21.43333	-2.273	23	.033
Pair 2	NOTAX 1 - NOTAX 2	-1171.28208	1174.60850	239.76596	-1667.27575	-675.28841	-4.885	23	.000
Pair 3	TTAX 1 TTAX 2 - V6	-1216.49250	1718.68180	350.82445	-1942.22818	-490.75682	-3.468	23	.002

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	OTAX 1	481.5067	24	174.47797	35.61517
	OTAX 2	719.4075	24	492.79504	100.59137
Pair 2	NOTAX 1	598.4208	24	153.47980	31.32893
	NOTAX 2	1769.7029	24	1249.51306	255.05578
Pair 3	TTAX 1 TTAX 2	1272.6146	24	667.08209	136.16756
	V6	2489.1071	24	1597.47468	326.08315

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	OTAX 1	481.5067	24	174.47797	35.61517
	OTAX 2	719.4075	24	492.79504	100.59137
Pair 2	NOTAX 1	598.4208	24	153.47980	31.32893
	NOTAX 2	1769.7029	24	1249.51306	255.05578
Pair 3	TTAX 1 TTAX 2	1272.6146	24	667.08209	136.16756
	V6	2489.1071	24	1597.47468	326.08315

Paired Samples Effect Sizes

			Standardizer[a]	Point Estimate	95% Confidence Interval Lower	Upper
Pair 1	OTAX 1 - OTAX 2	Cohen's d	512.63673	-.464	-.881	-.038
		Hedges' correction	521.18863	-.456	-.867	-.037
Pair 2	NOTAX 1 - NOTAX 2	Cohen's d	1174.60850	-.997	-1.482	-.498
		Hedges' correction	1194.20352	-.981	-1.458	-.490
Pair 3	TTAX 1 TTAX 2 - V6	Cohen's d	1718.68180	-.708	-1.150	-.253
		Hedges' correction	1747.35315	-.696	-1.132	-.249