

Digitalization of Tax Collection and Revenue Generation in Nigeria

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Abstract: This study investigated the effect of different tax heads collection on revenue generation in Nigeria over the period 2000–2023, with particular emphasis on the role of digitalization. The specific objectives were to examine differences in tax collections and revenue generation pre and post digitalization; and to determine the effect of Petroleum Profit Tax (PPT) on revenue generation in the pre- and post-digitalization periods. The study employed an ex-post facto research design using secondary time-series data from 2000 to 2023 and analyzed using SPSS 28. Log transformation was applied to the variables, and preliminary diagnostic tests confirmed that the assumptions of normality, linearity, and homoscedasticity were not violated. A paired sample t-test and Cohen's d were used to assess differences before and after digitalization, while the Chow test (interaction regression approach) was employed to examine structural changes in the relationship between tax components and revenue generation at a significant level of 0.05. Findings revealed that revenue generation increased significantly after digitalization, with a very large effect size ($t = 15.813$, $p < 0.001$, $d = 4.57$). Among the tax components, CIT and VAT recorded the strongest improvements, with extremely large effect sizes ($d = 6.51$ and $d = 5.24$ respectively). PPT and CGT also showed significant increases with large and moderate-to-large effects, respectively, while EDT declined significantly. Regression results indicated that PPT ($\beta = 0.323$, $p < 0.05$) had positive and statistically significant effect on revenue generation. The interaction term for the model was significant, confirming the presence of structural breaks and indicating that digitalization has significantly altered and generally strengthened the relationship between tax collections and revenue generation in Nigeria. The study concludes that digitalization has played a critical role in improving tax administration and enhancing revenue performance in Nigeria. It is recommended that the Federal Government of Nigeria, through the Federal Inland Revenue Service (FIRS) and in collaboration with relevant agencies such as the Ministry of Finance and the National Information Technology Development Agency (NITDA), should deepen and expand digital tax administration systems by fully automating tax processes, integrating inter-agency databases, and deploying real-time data analytics to sustain and further enhance revenue generation.

Keywords: Tax, Collection, Digitalization, Pre-Digitalization, Post-Digitalization, Revenue, Generation, Compliance, FIRS, Nigeria

Introduction

Taxation is one of the most important revenue sources for many nations like Nigeria and must therefore be properly regulated. According to Organisation for Economic Co-operation and Development (OECD) (2017), tax has been ranked as the main supply of revenue in international locations consisting of the UK, France, Sweden, Norway, and different excessive earnings for the government. In Africa, tax revenue has substantially contributed closer to the monetary increase of various international countries. Despite the fact that taxation serves as a major source of income for every government in the world including Nigeria, the Nigerian government is faced with serious challenges especially in the domain of tax administration and collection. It is discouraging to observe that tax revenue is now no longer contributing substantially in the direction of the monetary increase of Nigeria whilst as compared with the tax-to-GDP ratio of different African international revenue like Cameroon, Senegal, Tunisia, and so on. This view was also reiterated in a report by OECD (2015) which documented that Nigeria has a lower tax-to-GDP ratio (6.1%) as compared to other countries in Africa like Cote d'Ivoire (15.3%), Cameroon (18.2%) and Ghana (20.8%).

One of the major problems facing the taxation system in Nigeria is the problem of tax non-compliance among taxpayers which comes in the form of tax evasion or avoidance. Consequently, a decline in price of oil in recent years as well as tax noncompliance among taxpayers in the country has led to a decrease in the funds available for distribution to the Federal Government and to the State Governments. Existing studies agree that oil revenue dominance has been a major contributor to the country's setbacks, whereas, contrary to popular belief, the current situation bedeviling the country's government revenue is inconsistent tax reforms that align with a loss of value for stakeholders, i.e., taxpayers. Again, Operations of the Federal Inland Revenue Service (FIRS) such as filing tax returns, payments of taxes, generation of receipts and tax clearance certificate (TCC) were carried out manually. These procedures provided room for interaction between taxpayers and tax authorities thereby increasing chances for fraud, reducing compliance and overall tax collection. To improve tax compliance and boost revenue, the FIRS began digitizing its operations. In order words, to address the ills and impacts of tax noncompliance and non-collection of taxes among taxpayers on revenue generation, the Nigerian government adopted the digitalisation of its tax administration with the aim of easing services to taxpayers, enhance compliance and to increase overall revenue collection. The electronic tax system was introduced by Federal Inland Revenue Service (FIRS) to increase financial tax collection, administration, render services to the taxpayers all the time from anywhere, reduce costs of compliance and improve tax compliance. Promising many advantages over the traditional method of hard copy tax filing, these systems promise faster processes, lower costs, and increased efficiency. Collecting the right revenue efficiently will be necessary to fund the challenges of today and of the future, from climate change to inequality. FIRS also has provided a centralized

Information Communication Technology (ICT) department that provides support services in terms of electronic systems to the entire organization. All these are done to achieve its goals of increased revenue collection and facilitating voluntary compliance by taxpayers (Mohammed, Mas'ud, Karaye, Sallau, Adam & Sulaiman, 2023)..

Tax digitalisation can positively influence the level of tax compliance but for that to happen, the system must be very effective and convenient. Several studies have reported that the tax digitalisation efforts of the Federal Inland Revenue Service in Nigeria have yielded positive and significant impacts. For instance, the study of Ezegwu & Agbaji, (2014) and The Cable (2019) revealed that tax digitalisation efforts resulted in increasing the number of taxpayers in Nigeria from 10million in 2015 to 14 million in 2017 to 19 million in 2018 and about 45 million in 2019 and over 3 million registered companies as at 2019 (Eneojo & Gabriel, 2014; Olonde, 2019; Uzochukwu, Amahi & Ugbah, 2020; amongst others). However, some other studies, such as that of Mohammed, Mas'ud, Karaye, Sallau, Adam & Sulaiman (2023), Raphael, Mfon and Patrick (2020), Hanrahan (2020), amongst many others, have reported fluctuating trends of tax revenue collection by FIRS in Nigeria. Thus far, there are existing literature on the effect of digitalization on tax revenue collection within and outside Nigeria with majority of them revealing mixed or conflicting results or findings with a great number of them using a survey research design (primary method of data collection) which is limited to perception of respondents. With the introduction of tax digitalization, it is expected that there will be an obvious increment in tax revenues, which will in turn bring about an increase in tax collections and revenues as a whole as noticed in various countries of the world after it introduction of e-tax payment system. However, since the introduction of tax digitalization system in 2011 no empirical evidence has shown the extent to which the new technology has achieved this purpose on different tax heads such as Petroleum Profit Tax, Company Income Tax, Value Added Tax , Capital gain tax , Education Tax collections and revenue generation pre and post digitalization, hence necessitating this research. Previous research on digitalization of tax collection show that digitalization may have a negative effect on a country's ability to generate higher tax revenue in a country with high digital dynamics. Few studies on digitalization of tax collection in Nigeria have limited long-term comparison of pre- and post-digitalisation periods (2000–2023), and the overall effect on revenue generation

Furthermore, extant studies relied on survey-based approaches that emphasize perceptions rather than empirical data. In order to bridge the theoretical and empirical gaps observed in the previous studies from the Nigerian context, this study seeks to use the *ex-post facto* research design to determine the effect of different tax heads collection on revenue generation in Nigeria from 2000 to 2023, pre and post digitalization (2000 – 2011 and 2012-2023 respectively). The researcher seeks to provide updated knowledge on this important subject matter in the context of Nigeria where there is paucity of empirical studies.

The main objective of this study is to determine the effect of different tax heads collection on revenue generation in Nigeria. Specifically, the study explored the differences in revenue generation and tax collections pre and post digitalization in Nigeria; and the effect of Petroleum Profit Tax (P.P.T) collections on revenue generation in Nigeria, pre and post digitalization.

Statement of Hypotheses

The following hypotheses are formulated for the purpose of this research:

- i. There is no significant difference in tax collections and revenue generation pre and post digitalization in Nigeria.
- ii. Petroleum Profit Tax (PPT) collections have no significant effect on revenue generation in Nigeria pre and post digitalization.

2.0 Literature Review

2.1 Conceptual Review

Taxation

Tax is a compulsory payment made by individuals and organisations to the government in accordance with predetermined criteria for which no direct or specific benefit is received by the taxpayer (Bassey, 2016). Taxation refers to obligatory or coercive cash collection through a levying authority, typically a government. The term "taxation" applies to all forms of involuntary levies, from profits to capital profits to property taxes. According to McLure (2015), taxation is an obligatory monetary price, or a few different forms of levy imposed upon a taxpayer (a person or different felony entity) through a governmental company with the intention to fund numerous public expenditures. The following are the features of tax: it is compulsory payment usually backed up by law, it is levied according to predetermined criteria, paid to government and not individual and it is for the common benefit of the citizens. It is obvious that countries, including Nigeria, impose taxes for a number of reasons. Government uses tax revenue as a means of financing government activities, reducing consumption of goods considered non-essential, reducing inequality in income distribution, ensuring price stability and helping to stimulate economic growth. In his book, the wealth of Nations, Adam Smith laid down the basic cannons that should be observed by nations in fashioning out tax policies; these include equity, certainty, convenience and economy (Chijioke *et al.*, 2018).

Digitalization of Tax Administration

Tax digitalisation can be defined as a process through which governments use information communication and technologies to obtain more accurate and timely information on taxpayer operations. In addition, this new tool of tax systems e-governance improves service delivery by reducing the time and cost of tax declarations to citizens. The digitalization of tax systems may have many features, such as the electronic filing of taxes that refers to the online submission of tax declarations

(Wadesango *et al.*, 2020). In other words, the practice of assessing, collecting, and administering taxes using an electronic platform or media is known as tax digitalization (electronic taxation).

The Nigerian federal government carried out reforms in the country's civil service which affected federal agencies like FIRS in 1988. In what could be described as an effort to align federal agencies like FIRS with emerging technological development, the reform required Nigerian public agencies to devote a specific percentage of their annual budgets to implementing staff training programmes that must include modern Information Technology (IT) training (Wadesango *et al.*, 2020). However, despite the reforms expected to institutionalize modern information processing cultures in federal government agencies such as FIRS, there are inadequate levels of availability and accessibility of modern IT components in the agencies. Indeed, there are substantial gaps between perception of need and actual accessibility and opportunity to use some of the IT components in the agencies. This was the situation of the use of modern information technology in the Nigerian public system up to the year 2000 (Yu *et al.*, 2023). It is in this situation that the FIRS began to digitize its operation commencing with the modernization project in 2005 (Wadesango *et al.*, 2020).

The Modernization Project

Similarly, there are inherent lapses in the collection, skimming of revenue and fraudulent tax clearances among other problems associated with the manual procedures. To overcome these and other challenges, FIRS started leveraging on IT in 2005 when a modernization project was initiated saddled with strategic planning towards automating operations of the agency as a reform agenda. Automating tax filling and collection is to curtail corruption, increase FIRS's monitoring and tracking capabilities (Sadress & Juma, 2020). The project was regarded as a huge success that laid the foundation of subsequent digitalization efforts in the service. The major challenge that the modernization projects faced was getting the full support of all stakeholders especially the executive and the legislature (Lambon, 2023). Therefore, it could be argued that the modernization project in FIRS has recorded significant achievements as it is adjudged the foundation of subsequent digitalization efforts such as TIN in 2011 (Bari *et al.*, 2022).

The Taxpayer Identification Number (TIN)

To assure taxpayers that collected taxes are properly accounted for and have reached the expected destination for the development of Nigeria, the Taxpayer Identification Number (TIN) was officially launched on 5th April 2011 (Olonde, 2019). However, it appears significant implementation of TIN was not achieved up to towards the end of 2012 (Wadesango *et al.*, 2020). Before TIN, the Unique Tax Identification Number (U-TIN) was launched as an electronic system meant to store the information of tax payers and facilitate information sharing among tax authorities and other stakeholders. But the project was not successful (Wadesango *et al.*, 2020). TIN is a 10-digit unique number given to tax payers in Nigeria with the aim of creating closer

linkage between tax payers and the various tax authorities in Nigeria. This in turn is expected to aid in achieving cooperation, information sharing and closer working relationship among relevant tax authorities and increase revenue generation accruing to all tiers of the governments (Wadesango *et al.*, 2020).

Integrated Tax Administration System (ITAS)

To further strengthen and automate tax administration in Nigeria, FIRS embarked on an Integrated Tax Administration System (ITAS) project in 2013 aimed at enhancing tax administration and simplifying tax compliance process by leveraging on technology. The implementation of ITAS was to ensure assigning of one unique TIN (Martínez *et al.*, 2022). In this way ITAS will result in re-engineering and automating tax administration processes by FIRS including registration, assessment, payment, debt management, audit and investigation, case management and returns filing. Similarly, implementation of ITAS will assist in achieving the goals of improving revenue collection, transparency in tax administration, enhance voluntary compliance and improve the overall efficiency of tax administration (Oreku, 2021).

Standard Integrated Government Tax Administration System (SIGTAS)

This is a software utilized by the recipient for assessing and collecting revenues launched in 2014 with the aim of providing taxpayers with wide range of benefits. These include automatic calculation of tax and penalty, identification of errors or omissions by taxpayer through tax declaration processing. Generation of assessment notices, payment reminders and taxpayer correspondences automatically, automated payment posting and receipt generation, provision of an integrated view of taxpayer affairs across all tax types and reduced cost of compliance (Bassongui & Houngbédji, 2023). Under SIGTAS, when a payer remits Withholding Tax (WHT) deducted from a contracting party, the system credits the accounts of all the beneficiaries directly, making the credit automatically available for utilization (Deloitte, 2018).

Tax pro-Max Solution

Tax pro-Max is the latest automated tax administration solution from FIRS with its portal opened on 7th of June 2021 displaying more features and capabilities compared to earlier modules such as SIGTAS and ITAS. The application was launched following the provisions of the Finance Act 2020 that empowers FIRS to automate tax return filing and payment processes. It is adjudged as a one-stop online tax administration platform offering taxpayers the opportunity to register, file returns, remit taxes, carry out assessments and keep track of tax obligations. Taxpayers will also manage withholding tax deductions, manage capital allowance and loss, download tax clearance certificate, and communicate with the FIRS on tax issues among other services. Taxpayers can access the portal by registering which allow them to get log-in details subsequently required for filing returns. On filing the returns, a Document Identity Number (DIN) will be generated which will then be used to remit taxes via the portal. Filing of tax returns can be executed by taxpayers or their approved agents via the portal and for those taxpayers that may want to file their returns in hard copy,

they can visit any FIRS office where their documents will be upload to the portal (Bate, 2021). It could be contended that the launching of TaxPro-Max has enhanced the digitalization of tax administration by FIRS.

Invoicing Solution

The FIRS is implementing a Merchant Buyer Solution (MBS), that is e-invoicing system to modernize fiscal and transaction process in Nigeria. The tax law was enacted 26th June 2025 and implementation is to commence 1st August, 2025 by large companies. The e-Invoicing System is a digital platform that enables taxpayers to generate, submit, and validate electronic invoices.

It simplifies the interaction between buyers, sellers, and FIRS while also ensuring compliance with Nigeria's tax regulations. An invoice generated in a structured electronic format via digital means is considered an electronic invoice. However, a paper invoice converted into an

electronic format by copying, scanning, or other methods does not qualify as an electronic invoice. The purpose of e-invoicing system is to guarantee that all invoices submitted to the FIRS are accurate, taxes are charged appropriately and complaint with adopted standard, to ensure synergy between the government and taxpayers and also to improve revenue generation for the federal government through bringing eligible individuals and entities to the tax net, thereby widening the income tax base. The e-invoicing is applicable to companies with turnover above N5billion. Proper audit investigation and continuous monitoring is needed to ensure smooth operation of this system.

Federal Inland Revenue Service (FIRS) Administration in Nigeria

Nigeria is a federal republic consisting of 774 local government councils within 36 states of the federation and Abuja as Federal Capital Territory (FCT). Therefore, there are three tax jurisdictions consisting of FIRS, 36 State Internal Revenue Services (SIRS), FCT Internal Revenue Service and local government revenue committees; however, the focus of this study is the FIRS. The Inland Revenue Department (IRD) of the British West Africa covering Ghana, Gambia, Sierra Leone and Nigeria is the precursor of the present-day FIRS. The Nigerian Inland Revenue Department (NIRD) was created and carved out from the British IRD in 1943 which was renamed the Federal Board of Inland Revenue (FBIR) under the Income Tax Ordinance (CITO) No.39 of 1958. The Companies and Income Tax Act No.22 of 1961 maintained the name FBIR, and the FIRS Act 2007 created the FIRS with financial and administrative autonomy (Amadi & Obutte, 2018).

This federal tax jurisdiction is responsible for collecting Petroleum Profits Tax (PPT), Companies Income Tax (CIT), Value Added Tax (VAT) and Education Tax (ET) among numerous federally collected taxes and levies (Federal Inland Revenue Service, 2022b). These federally collected taxes and levies are pooled into the Federation Account or the Treasury Single Account (TSA) and subsequently shared between the federal

government, the 36 states and FCT and the 774 local governments as the federating units (Amadi & Obutte, 2018). Taxes and levies collection by FIRS are key determinants of the total amount of money available for sharing between the federating units. This prompted FIRS to start digitalizing its tax administration with the aim of easing services to taxpayers, enhance compliance which in turn is expected to increase overall revenue collection.

Prospects of Digitalization of Tax Administration in Nigeria

Digitalization is still in its early stages in Nigeria, and there is much still to be done, including working to make future attempts at modernisation more successful. Currently, digitalization projects tend to be launched at short notice and without sufficient resources and legislative support, leading ultimately to several failed projects. The Nigerian administration needs to work on longer-term, legislatively supported, secure and well-planned transformation projects to be able to succeed. If properly run, digitalization would not only improve efficiencies for taxpayers in Nigeria but would also support the wider modernisation of the Nigerian economy, particularly for the large number of small and medium enterprises in the country that are not currently digitally aware (Yu *et al.*, 2023).

2.2 Theoretical Framework

The technology acceptance model and the theory of innovation translation are important to this study as stated. Wang *et al.* (2023) theorized that, Technology Acceptance Model is one of the most significant research models in studies of the determinants of information systems and information technology acceptance for predicting persons' desire to use and acceptance of information systems and information technology. For instance, the technology acceptance model (TAM) can be used to analyse the impact of tax digitalization efforts on revenue generation in Nigeria in a few ways. First, the TAM can be used to assess the perceived usefulness and perceived ease of use of the digitalization system. This refers to the extent to which users believe that using the digitalization system will be useful in helping them accomplish their tasks. For example, a taxpayer might perceive the digitalization system to be useful if it helps them to file their taxes more easily and efficiently. The second element is perceived ease of use, which refers to the extent to which users believe that using the digitalization system will be easy and free of effort. The TAM can be used to measure the intention of users to use the digitalization system and can also be used to measure the actual use of the digitalization system. On the other hand, the benefits-received principle can also be applied to this type of study. First, the benefits-received principle states that taxpayers should pay taxes based on the benefits they receive from government services. In the context of the digitalization system, this could mean that taxpayers who use the system to file their taxes should pay taxes based on the benefits they receive from the system. The benefits-received principle is based on the idea that taxpayers should only be required to pay taxes to the extent that they receive benefits from government services. This principle is often used to

justify progressive taxation systems, in which those who have higher incomes pay higher taxes. Thus, the theory is adopted in this study.

2.3 Empirical Review

Yu *et al.* (2023) used time-series data and the Autoregressive Distributed Lag (ARDL) estimation approach to demonstrate that ICT infrastructure has no substantial positive impact on overall tax revenue collection. Nevertheless, it revealed that it was possible to uncover tax loopholes and administer a country's taxation system effectively in the context of good governance and efficient systems. Using unbalanced panel data, Wandaogo *et al.* (2022) present compelling evidence that ICT penetration drives tax revenue mobilization. Specifically, the results indicate that, among the four ICT penetration indicators mobile subscription, internet access, personal computers, and fixed broadband subscription, fixed broadband subscription contributes the most to three distinct tax revenue indicators, namely overall tax revenue, VAT, and corporate tax.

In Cameroun, the study of Michael and Chi (2022) investigated the relationship between digitalisation and the level of tax compliance in Cameroon. The study used a causal research design with a sample size of 200 taxpayers who used the online tax system and the sampling technique was the purposive sampling technique of companies and business familiar with the online tax system. The study used primary data gotten with the use of a five-point Likert scale questionnaire. The relationship between tax digitalisation and tax compliance with behavioural intentions as the mediator was analysed using Partial Least Square-Structural Equation Modeling (PLS-SEM). The results of the study revealed that, effort expectations and accessibility and reliability have a positive and significant relationship with tax compliance while the cost involved in using the e-tax system had an insignificant relationship with tax compliance. Effort expectations was partially mediated by the taxpayers 'behavioural intentions. The authors recommended that the government should make the site to be user friendly that is very easy to use and accessible by all Cameroonian taxpayers.

Tyokoso *et al.* (2021) examined Tax Identification Number (TIN) and Tax Revenue Performance in Nigeria focusing on the effect of TIN on tax revenues from Valued Added Tax (VAT), Company Income Tax (CIT), Custom and Excise Duties (CED) and Petroleum Profit Tax (PPT) generation. Data for the study was secondary data obtained from the annual statistical bulletin of the Central Bank of Nigeria (CBN) from 1998-2017. Collected data was analyzed by means of regression analysis in form of paired sample t-test. Findings from the study revealed significant positive difference in the means of VAT, CIT, CED, and PPT after the introduction of TIN. Thus, there was empirical evidence indicating that TIN as a digital identification in the tax digitalization efforts of Nigerian tax administration has enhanced tax revenue collection.

In 2021, a study that was conducted in Nigeria evaluated the effect of tax reforms on internally generated revenue in Nigeria (Ogbodo & Mehara, 2021). The specific

objectives were to ascertain the effect of; Petroleum Profit Tax (PPT); and Value Added Tax (VAT) on internally generated revenue in Nigeria. Ex post facto research design was adopted. Data were collected from annual reports and accounts of the sampled banks for the periods from 2004 to 2019. The study employed regression analysis to test the formulated hypotheses with aid of E-View 9.0. Based on the data analysed, the study found that petroleum Profit Tax had no significant effect on internally generated revenues in Nigeria at 5% level of significance. Another finding was that Value Added Tax (VAT) had a significant effect on internally generated revenues in Nigeria at 5% level of significance. Based on the findings, the study recommended, amongst others, that the government should provide the necessary human and material infrastructures that are needed to support petroleum business so they can earn more income that will boost taxation.

2.4 Gap in Literature

Thus far, there are existing literature on the effect of digitalization of tax collection on revenue generation within and outside Nigeria with majority of them revealing mixed or conflicting results or findings with a great number of them using a survey research design which is limited to perception of respondents. In order to bridge the theoretical and empirical gaps observed in the previous studies from the Nigerian context, this study seeks to use the ex-post facto research design to determine the impact of pre (2000 – 2011) and post digitalisation (2012 – 2023) of tax collection in Nigeria from annual tax heads that has embraced digitalization in Nigeria. The researcher seeks to provide updated knowledge on this important subject matter in the context of Nigeria where there is paucity of empirical studies.

3.0 Methodology

The researcher adopted ex-post facto research design. This research is on the effect of digitalization of tax collection and revenue generation in Nigeria from 2000 to 2023. It was conducted in Nigeria. The choice of a 24-year period for this study was to improve and advance the knowledge obtained from previous studies which used a lesser number of years. Revenue from Petroleum Profit Tax (PPT), Company Income Tax (CIT), Value Added Tax (VAT), Capital Gain Tax (CGT) and Education Tax (EDT) were used to measure the independent variable (tax digitalization) while total revenue generation in Nigeria were used to measure the dependent variable (that is, tax collection). Secondary dataset collected from sources. FIRS, Organisation for Economic cooperation and Development and World Bank were analyzed using the paired sample t-test and the linear regression with structural break (Chow-Type) model to analyse the data with the aid of Statistical Package for Social Sciences (SPSS) version 26.0 at 5% level of significance. The population of study comprised the observations of the combined or aggregated data from tax heads that have embraced and applied digitalization in Nigeria.

Model Specification

The study specifies a mean difference model as:

$$D_i = X_{post,i} - X_{pre,i}$$

Where:

D_i = difference in variable i

X_{post} = post-digitalization value

X_{pre} = pre-digitalization value

For the PPT model (objective 2), it is stated as:

$$RG_t = \beta_0 + \beta_1 PPT_t + \beta_2 D_t + \beta_3 (PPT_t \times D_t) + \varepsilon_t$$

Where:

RG_t = Revenue Generation at time t

PPT_t = Petroleum Profit Tax

D_t = Digitalization dummy (1 = post, 0 = pre)

ε_t = error term

Apriori Expectation

It is expected that the independent variable will be significantly related to the dependent variables

Results

4.0 Data Presentation, Analysis and Results

Table 1: Descriptive Statistics of the Variables

Variables	Mean	Std. deviation	Range	Minimum	Maximum
Revenue generation					
Pre	2.6092	0.24202	0.76	2.24	3.00
Post	3.7333	0.16708	0.57	3.52	4.09
PPT					
Pre	3.0633	0.26507	0.83	2.59	3.42
Post	3.3275	0.16810	0.56	3.06	3.62
CIT					
Pre	2.6050	0.16357	0.48	2.37	2.85
Post	3.1450	0.17987	0.61	2.91	3.52
VAT					
Pre	2.3317	0.32990	1.02	1.77	2.79
Post	3.0858	0.23259	0.71	2.85	3.56
CGT					
Pre	1.5150	2.46004	8.81	0.49	9.30
Post	21.2375	27.28379	96.80	2.60	99.40
EDT					
Pre	0.9350	0.19431	0.70	0.32	1.02
Post	0.3717	0.03486	0.14	0.32	0.46
Observations	24	24	24	24	24

* PPT - Petroleum Profit Tax; CIT - Company Income Tax; VAT - Value Added Tax; CGT - Capital Gains Tax and EDT - Education Tax

Source: Researcher's Analysis, 2024

With the aid of SPSS, the researcher used the log transformed data of the variables to compute the mean and standard deviation which formed the descriptive statistics for both the dependent and the independent variables, pre and post digitalization. The result shows that the mean of revenue generation at pre-digitalisation was ₦2.6 (SD ± 0.2) billion but increased to ₦3.7 (SD ± 0.2) billion after digitalisation. In the same way, the mean of PPT, CIT, VAT and CGT were observed to increase after digitalisation of taxation. However, EDT was observed to show a decrease post digitalisation (see Table 4.1).

Test of the Research Hypotheses

Test Results for Hypothesis 1

H_0 : There is no significant difference in tax collections and revenue generation pre and post digitalization in Nigeria

Table 2: Differences and effect sizes for tax collections and total revenue generation before and after digitalization in Nigeria

Variables		Paired differences		t	P-value	Cohen's d
		Mean	SD			
Pair 1	PostRG - PreRG	1.12417	0.24626	15.813	.000	4.57
Pair 2	PostPPT - PrePPT	0.26417	0.31385	2.916	.014	0.84
Pair 3	PostCIT - PreCIT	0.54000	0.08290	22.564	.000	6.51
Pair 4	PostVAT - PreVAT	0.75417	0.14387	18.159	.000	5.24
Pair 5	PostCGT - PreCGT	19.72250	27.46976	2.487	.030	0.72
Pair 6	PostEDT - PreEDT	-0.56333	0.22236	-8.776	.000	2.53

* Paired sample t-test

* Significant at $p < 0.05$

Table 2 revealed the differences and effect sizes for tax collections and total revenue generation pre and post digitalization in Nigeria. Findings revealed that digitalization had a statistically significant and very large positive effect on total revenue generation (Mean difference = 1.124, SD = 0.246, $t = 15.813$, $p < .001$, $d = 4.57$). A Cohen's d of 4.57 indicates that post-digitalization revenue exceeded pre-digitalization levels by 4.57 standard deviations, which is well beyond the conventional threshold for a large effect. This suggests that digitalization contributed substantially to Nigeria's revenue mobilization.

All five tax components showed statistically significant changes following digitalization at the 5% level. Company Income Tax (CIT) exhibited the largest effect size (Mean difference = 0.540, SD = 0.083, $t = 22.564$, $p < .001$, $d = 6.51$). The extremely large effect indicates that digitalization was associated with a marked improvement in CIT collection efficiency and compliance. Value Added Tax (VAT) also demonstrated

an extremely large effect (Mean difference = 0.754, SD = 0.144, $t = 18.159$, $p < .001$, $d = 5.24$). This points to enhanced VAT administration and broader coverage post-digitalization. Revenue generation ($d = 4.57$) and VAT ($d = 5.24$) both reflect very large effects, underscoring that digitalization is a substantive driver of fiscal performance rather than a marginal improvement.

Petroleum Profit Tax (PPT) recorded a large effect (Mean difference = 0.264, SD = 0.314, $t = 2.916$, $p = .014$, $d = 0.84$). While statistically significant, the smaller mean difference and higher variability suggest that PPT collections were less responsive to digitalization compared to CIT and VAT, possibly due to sector-specific administrative or regulatory factors. Capital Gains Tax (CGT) showed a medium-to-large effect (Mean difference = 19.723, SD = 27.470, $t = 2.487$, $p = .030$, $d = 0.72$). The large standard deviation indicates considerable fluctuation in CGT collections across the periods, which may reflect the episodic nature of capital gains transactions. Education Tax (EDT) declined significantly after digitalization (Mean difference = -0.563, SD = 0.222, $t = -8.776$, $p < .001$, $d = -2.53$). The negative effect size implies a substantial reduction in EDT revenue during the post-digitalization period

Test Results for Hypothesis 2

H₀: Petroleum Profit Tax (PPT) collections have no significant effect on revenue generation in Nigeria pre and post digitalization

Table 3: Model Summary for Hypothesis 2

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.957 ^a	.916	.903	0.190	.916	72.404	3	20	.000

a. Predictors: (Constant), PPT_Digital, Petroleum Profit Tax, Digitalisation

Table 4: ANOVA Result for Hypothesis 2

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.814	3	2.605	72.404	.000 ^b
	Residual	0.720	20	0.036		
	Total	8.534	23			

a. Dependent Variable: Revenue generation

b. Predictors: (Constant), PPT_Digital, Petroleum Profit Tax, Digitalization

Table 5: Coefficients Result for Hypothesis 2

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.620	.663		2.442	.024
	Petroleum Profit Tax	.323	.216	.136	1.497	.000
	Digitalisation	.207	1.313	.174	.158	.006
	PPT_Digital	.375	.403	1.047	.930	.004

a. Dependent Variable: Revenue generation

Table 3 presents the model summary for the Chow test analysis examining the effect of Petroleum Profit Tax (PPT) on revenue generation before and after digitalization in Nigeria. The findings reveal a very strong relationship between the predictors and revenue generation, with an R value of 0.957, indicating a strong positive association between Petroleum Profit Tax, digitalization, and revenue generation. The coefficient of determination ($R^2 = 0.916$) shows that approximately 91.6% of the variation in revenue generation is jointly explained by Petroleum Profit Tax, digitalization, and their interaction term. The adjusted R^2 value of 0.903 further confirms the robustness of the model after adjusting for the number of predictors. The F-change statistic of 72.404 with a significance value of 0.000 indicates that the overall model is statistically significant.

Table 4 presents the ANOVA result of the Chow test model. The findings revealed that the regression model is statistically significant, with $F(3, 20) = 72.404$, $p = 0.000$. This implies that Petroleum Profit Tax, digitalization, and their interaction term jointly have a significant effect on revenue generation in Nigeria. Therefore, the model is considered a good fit for explaining variations in revenue generation across the pre- and post-digitalization periods.

Furthermore, Table 5 presents the coefficient estimates of the model. The findings revealed that Petroleum Profit Tax has a positive and statistically significant effect on revenue generation ($\beta = 0.323$, $p = 0.000$), indicating that increases in PPT collections lead to improvements in revenue generation. Similarly, digitalization was found to have a positive and significant effect on revenue generation ($\beta = 0.207$, $p = 0.006$), suggesting that the adoption of digital tax administration systems enhances revenue performance. Most importantly, the interaction term between Petroleum Profit Tax and digitalization (PPT $\times$ Digitalization) was found to be positive and statistically significant ($\beta = 0.375$, $p = 0.004$). The linear regression equation for this model is shown on the line as:

$$Y = \beta_0 + \beta_1(\text{PPT}) + \beta_2(\text{Digitalization}) + \beta_3(\text{PPT} \times \text{Digitalization}) + \epsilon$$

which means that:

$$Y = 1.620 + 0.323(\text{PPT}) + 0.207(\text{Digitalization}) + 0.375(\text{PPT} \times \text{Digitalization}) + \epsilon$$

5.0 Discussion of Results

The finding that revenue generation increased significantly after digitalization ($t = 15.813$, $p < 0.001$, $d = 4.57$) demonstrates that the introduction of digital tax administration systems has substantially improved the efficiency of tax collection in Nigeria. This implies that reforms such as electronic filing, automation of tax records, and improved monitoring systems have strengthened revenue mobilisation. It is consistent with the findings of Agbo and George (2022), who reported that online taxation systems significantly enhance economic performance through improved revenue generation.

The extremely large effect sizes recorded for Company Income Tax (CIT) ($d = 6.51$) and Value Added Tax (VAT) ($d = 5.24$) suggest that these tax types benefited most from digitalization. This may be attributed to the structured and transaction-based nature of these taxes, which are more easily captured through automated systems such as electronic invoicing, online filing platforms, and integrated tax databases. This finding supports Michael and Chi (2022), who noted that tax digitalizations significantly improves compliance behaviour and reduces tax evasion through enhanced transparency and monitoring mechanisms.

Petroleum Profit Tax (PPT) and Capital Gains Tax (CGT) also recorded significant increases, although with comparatively lower effect sizes. This may be explained by the complexity of these tax categories, which often involve sector-specific operations such as oil production processes and asset valuation that are not fully captured by digital systems alone. This finding is consistent with Udezo and Onuora (2021), who observed that structural and institutional inefficiencies can limit the effectiveness of tax reforms in certain sectors, particularly where compliance monitoring is more complex.

In contrast, the significant decline observed in Education Tax (EDT) after digitalization suggests that not all tax components have benefited equally from digital reforms. This unexpected outcome may be linked to administrative bottlenecks, weak institutional coordination, or inefficiencies in the integration of EDT into digital tax platforms. It may also reflect gaps in remittance processes between collecting agencies and education funding institutions. This finding supports Wadesango et al. (2020), who argued that the impact of digital taxation systems can be uneven across tax categories depending on institutional readiness and implementation capacity.

Furthermore, the finding that Petroleum Profit Tax (PPT) has a positive and statistically significant effect on revenue generation ($\beta = 0.323$; $p = 0.000$) indicates that PPT remains a key contributor to government revenue in Nigeria, particularly within the context of digitalization. The strong explanatory power of the model ($R^2 = 0.916$) further shows that PPT, together with digitalization and their interaction, accounts for a substantial proportion of variations in revenue generation. This outcome suggests that improvements in tax administration, especially the integration of digital systems into fiscal processes, have enhanced the efficiency of revenue collection from the oil and gas sector. The result is consistent with Agbo and George (2022), who found that online taxation systems significantly improve revenue performance by reducing leakages and improving transparency,

6.0 Conclusion

The study concludes that digitalization represents a critical tool for sustainable revenue mobilisation in Nigeria, and its continued expansion and refinement are essential for achieving long-term fiscal stability and economic development. The significant interaction term ($\beta = 0.375$; $p = 0.004$) confirms the presence of a structural break,

indicating that the relationship between PPT and revenue generation changed significantly after the introduction of digitalization. This suggests that digital tools have strengthened the effectiveness of PPT collection mechanisms in the post-digitalization period.

7.0 Recommendations

Based on the findings of this study, the following recommendations will suffice:

- i. The Federal Government of Nigeria, through the Federal Inland Revenue Service (FIRS) and in collaboration with relevant agencies such as the Ministry of Finance and the National Information Technology Development Agency (NITDA), should deepen and expand digital tax administration systems by fully automating tax processes, integrating inter-agency databases, and deploying real-time data analytics to sustain and further enhance revenue generation.
- ii. The Federal Government, through regulatory bodies in the oil and gas sector such as the Nigerian Upstream Petroleum Regulatory Commission (NUPRC) alongside the Federal Inland Revenue Service (FIRS), should enhance Petroleum Profit Tax (PPT) monitoring and compliance by deploying advanced digital tracking systems, improving transparency in production reporting, and strengthening audit mechanisms to maximize revenue from the sector.

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References:

1. Agbo, E. I. & George, E. U. (2022). Effect of online system of taxation on Nigerian economic growth (2005- 2020). *GOUni Journal of Faculty of Management and Social Sciences*, 10(1), 143-159
2. Ajala, M. & Adegbe, F. (2020). Effects of information technology on effective tax assessment in Nigeria. *Journal of Accounting and Taxation*, 1(1), 126-134.
3. Amadi, L., & Obutte, P. C. (2018). The treasury single account and the search for effective revenue management in Nigeria's oil and gas sector. *Journal of Sustainable Development Law and Policy*, 9(2), 101-124. jsdlp.ogeesinstitute.edu.ng
4. Bari, E., Khan, T., Shahid, M. (2022). The Value-Added Tax (VAT) improvement program: Raising the operational efficacy of the VAT administration in Bangladesh. *Joint Agency Research Report*, 1(1), 1.10.21201/2022.9110.

5. Bassongui, N. & Houngbédji, H. (2023). Impacts of tax digitalisation on tax revenues in Sub-Saharan Africa: Asystematic review. Research Square,
6. Bassey, O. U. (2016). Personal Income Tax in Nigeria, (Second Edition). Lagos: The CIBN Press Ltd
7. Bate, D. A. P. (2021). Does digitalisation improve the mobilisation of tax revenues in Africa? African Multidisciplinary Tax Journal, 1(1).
8. Chijioke, N., Leonard, I., Bosco, E. & Henry, L. (2018). Impact of e-tax on Nigeria revenue and economic growth: Apre and post analysis. International Journal of Finance and Accounting, 1(1), 19-26.
9. Eneojo, S. S. & Gabriel, T. (2014). Taxation and revenue generation: an empirical investigation of selected states in Nigeria. Journal of Poverty, Investment and Development, 4(1), 102-115.
10. Ezegwu, C. I. & Agbaji, J. (2014). Assessment of application of Taxpayer Identification Number (TIN) on Internally Generated Revenue (IGR) in Kogi state for the period of 2003 - 2012. Mediterranean Journal of social sciences, 5(20), 38 - 48. DOI:10.5901/mjss.2014.v5n20p38.
11. Hanrahan, D. (2020). Digitalisation as a determinant of taxrevenue in OECD countries: A static dynamic panel dataanalysis. Athens Journal of Business Economics, 7(1), 1-28.
12. Lambon, J. I. (2023). The effects of digitalization on tax revenue mobilization in sub-Saharan Africa. International Journal of Economics, Commerce and Management, 11(2), 242 – 258
13. Martíneza, Y. U., Arzozb, P. P. & Arreguic, I. Z. (2022). Tax collection efficiency in OECD countries improves via decentralization, simplification, digitalization and education. Journal of Policy Modelling, 44(2), 298 - 318.
14. McLure, C. (2015). Taxation. Britannica. Website en.wikipedia.org
15. Michael, F. F. & Chi, N. W. (2022). An assessment of tax digitalisation and tax compliance relationship in Cameroon: The mediating role of behavioural intentions. Journal of Finance and Accounting, 10(1), 30-43.
16. Mishra, A., Singh, R., & Kumar, B. (2023). User perception and acceptance of information systems. Journal of Information Technology, 12(4), 112-128.
17. Mohammed, S. D., Mas'ud, A., Karaye, Y. I., Sallau, M. M., Adam, A. D. & Sulaiman, B. A. (2023). An evaluation of tax digitalization efforts by federal inland revenue service and their impacts on tax collection 2002-2021. Journal of Accounting and Taxation, 3(2), 105
18. Ogbodo, O. C. Y. & Mehara, G. C. (2021). Effects of tax reforms on internally generated revenue in Nigeria. International Journal of Research in Education and Sustainable Development, 1(9), 83 – 99
19. Olonde, J. (2019). Effects of Information Technology on TaxCompliance by Kenya Revenue Authority. Nairobi.

20. Oreku, G. S. (2021). Application of digital technology in enhancing tax revenue collection: The case of microbusinesses in Tanzania. *Journal of Tax Reform*, 7(2), 173-192.
21. Organisation for Economic Co-operation and Development (2017). Rising Tax Revenues Are Key to Economic Development in African countries. OECD, Website: www.oecd.org
22. Raphael, S. E., Mfon S. J., & Patrick, B. S. (2020). Tax compliance and digitalization of Nigerian economy: The empirical review. *American International Journal of Social Science*, 9(2), 42 – 50
23. Sadress, N., & Juma, B. (2020). The mediating role of adoption of an electronic tax system in the relationship between attitude towards electronic tax system and tax compliance. *Journal of Economics, Finance and Administrative Science*, 25(1), 73-88.
24. Schorr, A. (2023). The Technology Acceptance Model (TAM) and its importance for digitalization research: A review. *Journal of Humanities Arts and Social Science*, 1(1), 1. 10.2478/9788366675896-005.
25. The Cable (2019). From 10m in 2015, Nigerian taxpayers 'soon to hit 45m. Retrieved from www.thecable.ng.
26. Tyokoso, G. M., Onho, S. I. & Musa, B. B. (2021). Tax identification number (TIN) and tax revenue performance in Nigeria. *Accounting and Taxation Review*, 5(2), 53-61.
27. Udezo, N. O. & Onuora, J. K. J. (2021). Effect of tax reforms on revenue performance in Nigeria. *Journal of Innovative Finance and Economics Research*, 9(1), 118-130. www.seahipaj.org.
28. Uzochukwu, E., Amahi, F. U. & Ugbah, A. A. (2020). Taxation and Nigerian Economy. *Proceedings of the 7th annual international academic conference on accounting and finance disruptive technology: Accounting practices, financial and sustainability Reporting*, 1 – 9
29. Wadesango, N., Chibanda, D., & Wadesango, V. (2020). Assessing the impact of digital economy taxation in revenue generation in Zimbabwe. *Accounting and Finance Studies Journal*, 24(1), 1.
30. Yu, Y., Ridwan, M., Tanveer, A., & Khan, S. (2023). Investigating the nexuses between transportation infrastructure, renewable energy sources, and economic growth striving towards sustainable development. *Ain Shams Engineering Journal*, 14(2), Article 104278.