



TECHNOLOGY ADOPTION AND FRAUD PREVENTION IN STATE TAX ADMINISTRATION: EVIDENCE FROM PLATEAU STATE INTERNAL REVENUE SERVICE, NIGERIA

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ABSTRACT

This study examined Technology Adoption and Fraud Prevention in State Tax Administration: Evidence from Plateau State Internal Revenue Service, Nigeria. The study employs a cross-sectional survey design. The target population of the study comprises all staff of the Plateau State Internal Revenue Service who are directly involved in tax administration, enforcement, and information processing. The staff population is approximately 150 employees. The study adopts a census approach, where all eligible staff members are invited to participate. Descriptive statistics, correlation analysis, and multiple regression were employed to analyse the data using SPSS. The findings reveal that e-tax system usage ($\beta = 0.29$, $t = 3.84$, $p < 0.001$) has a positive and statistically significant effect on fraud prevention, data analytics tools ($\beta = 0.37$, $t = 4.96$, $p < 0.001$) show the strongest and most significant positive effect among all predictors, real-time monitoring ($\beta = 0.26$, $t = 3.41$, $p = 0.001$) also has a significant positive effect on fraud prevention; biometric authentication ($\beta = 0.08$, $t = 1.21$, $p = 0.228$) shows a positive but statistically insignificant effect. The study recommends that PSIRS should fully automate tax administration processes, including the adoption of electronic filing and payment platforms to reduce human intervention and potential for corruption; PSIRS should Invest in advanced forensic tools and data analytics (data mining) and establish specialized units for analyzing bank statements and to detect tax fraud and PSIRS should implement real-time monitoring and surveillance systems on revenue collection to ensure immediate identification of anomalies.

Keywords: Technology adoption, fraud prevention, internal revenue service, e-tax systems, data

1.0 INTRODUCTION

Public sector fraud is a severe issue that lowers government revenue and hinders global economic growth. Up to 15–20% of government revenue is thought to disappear annually as a result of inefficiencies, fraud, tax evasion, and revenue leakage across nations. This amounts to billions of dollars in lost revenue that could have been used to pay for public services like infrastructure, health care, and education (McKinsey & Company, 2018; OECD, 2025). These



losses are frequently greater in nations with inadequate data systems, poor administration, and little use of contemporary technology, which makes fraud and corruption more likely (Belahouaoui & Alm, 2025).

In response to these issues, many tax administrations throughout the world have begun to use digital technologies to increase revenue collection and fraud detection. Both developed and developing countries have implemented digital tools such as electronic tax (e-Tax) systems, data analytics, biometric identification, and real-time monitoring to improve the efficiency and transparency of tax administration (OECD, 2025). Digital tax systems assist identify suspicious situations early, decrease human errors, and increase taxpayer compliance by providing online filing, payment, analytics, and automated risk rating (Belahouaoui & Alm, 2025).

Both federal and state tax agencies in Nigeria continue to face significant challenges due to tax fraud. Nigeria's tax-to-GDP ratio has been below 10% for several years, indicating significant gaps in collection and compliance, despite changes intended to increase internally generated revenue (IGR) (World Bank statistics). Due to a lack of resources, laborious procedures, inadequate monitoring systems, and inadequate utilisation of contemporary technology, state internal revenue services (SIRS) are particularly challenged. Research on Nigerian tax administration reveals that inadequate record-keeping, a lack of digitisation, and lax enforcement procedures all play a major role in tax fraud and evasion (Falana *et al.*, 2024; Adejuwon & Olasunkanmi, 2023).

According to research on Nigerian SIRS, their capacity to identify and stop fraudulent activity is hampered by the poor usage of digital tax technologies. For example, weak technological integration hampered tax audit management, transparency, and compliance performance, according to investigations of state revenue services in the Southwest region (Olumoh & Sanni, 2025). While e-tax systems have the potential to boost income, many SIRS have not completely realised the strategic use of data and digital identity, and analytics, audit engines, and real-time reporting still have a lot of space for improvement, according to another study (Mas'ud *et al.*, 2023).

In a state with more than 4 million residents, the Plateau State Internal Revenue Service (PSIRS) funds local services by collecting property taxes, commercial levies, and PAYE. For the first time, PSIRS surpassed N30 billion in 2024 with N31.14 billion; nevertheless, due to leakages from manual collections, it aims for N52 billion in 2025. Ghost taxpayers and phone receipts are common fraud concerns that are observed in Nigerian revenue authorities. Since 2023, digital reforms (including TSA and online payments) have reduced these risks, increasing collections to N3.3 billion (+106%) in January 2025. One prominent example of a subnational revenue agency in Nigeria that still mostly relies on manual and inadequately digitalised procedures for tax collecting, record-keeping, and compliance enforcement is the Plateau State Internal Revenue Service (PSIRS). The lack of fully integrated digital systems at PSIRS raises



the possibility of fraud, such as identity-based deceit, record manipulation, and underreporting of taxable revenue. According to studies, manual tax systems foster an atmosphere that is conducive to fraud and human intervention, which results in the leakage of public funds (Olumoh & Sanni, 2024).

Specifically, the implementation and utilization of e-tax systems in many Nigerian states have encountered challenges such as poor user acceptance, inadequate technological infrastructure, low digital literacy among taxpayers, system downtime, and resistance to change among tax officials. These issues may limit the effectiveness of e-tax platforms in preventing fraudulent tax practices and enhancing tax compliance (Mustapha & Sheikh, 2014). Although several studies have examined electronic taxation and revenue generation in Nigeria, limited empirical evidence exists on how the actual usage of e-tax systems contributes to fraud prevention within state tax administrations, particularly in Plateau State.

Similarly, data analytics tools have emerged as critical instruments for identifying suspicious transactions, detecting tax evasion patterns, and supporting evidence-based decision-making in tax administration. However, many tax authorities in developing countries face challenges relating to inadequate data quality, lack of analytical expertise, insufficient integration of taxpayer databases, and limited adoption of advanced analytics technologies (OECD, 2022). Existing studies have largely focused on the role of information technology in revenue generation and tax compliance, with inadequate attention given to the specific contribution of data analytics tools in preventing fraud within state-level tax administration systems. Consequently, there is a knowledge gap regarding the effectiveness of data analytics utilization in fraud prevention efforts at the Plateau State Internal Revenue Service.

Furthermore, biometric authentication tools, including fingerprint verification and digital identity systems, are increasingly being introduced to strengthen taxpayer identification, eliminate duplicate registrations, and reduce identity-related fraud. Despite the growing importance of biometric technologies in public sector administration, empirical studies examining their effectiveness in preventing tax fraud in Nigeria remain scarce. Most existing research focuses broadly on information and communication technology adoption without specifically investigating how biometric authentication contributes to fraud prevention outcomes in tax administration. This gap is particularly evident in the context of state internal revenue service's such as PSIRS.

In addition, real-time monitoring technologies provide opportunities for continuous tracking of tax transactions, instant detection of irregularities, and prompt intervention against fraudulent activities. Such technologies have the potential to improve transparency and accountability in tax collection processes. However, the successful deployment of real-time monitoring systems requires adequate technological infrastructure, skilled personnel, cybersecurity safeguards, and institutional support. Existing literature provides limited evidence



on the extent to which real-time monitoring systems are utilized and their effectiveness in reducing tax fraud within state tax authorities in Nigeria. Consequently, there remains insufficient understanding of the relationship between real-time monitoring technologies and fraud prevention in the operations of Plateau State Internal Revenue Service.

Despite traditional control mechanisms such as internal audits, supervision, and penalties, fraud persists within many state revenue services (Belahouaoui, & Alm, 2025). Previous research has found that inadequate monitoring technologies force revenue officials to rely on paper-based records and manual reconciliation, which are slow and prone to error. Furthermore, identity manipulation, in which fraudulent or numerous identities are utilised to lower tax liabilities, remains difficult to identify without improved verification tools (Ajala *et al.*, 2024; Augustine *et al.*, 2023; Adejuwon & Olanikanmi, 2023). This limitation reflects a wider problem in Nigeria's sub-national revenue systems, the lack of empirical evidence on the effectiveness of technology adoption in reducing tax fraud, particularly at the level of individual states like Plateau.

The literature reveals three major gaps. First, a contextual gap exists because most studies on technology adoption and tax administration in Nigeria have focused on federal tax institutions or other states, with limited empirical evidence from Plateau State Internal Revenue Service. Second, a conceptual gap exists because previous studies have largely examined technology adoption in relation to revenue generation, tax compliance, and service delivery, while paying insufficient attention to fraud prevention outcomes. Third, a variable gap exists because few studies have integrated e-tax system usage, data analytics tools, biometric authentication tools, and real-time monitoring technologies within a single framework to assess their collective and individual effects on fraud prevention in state tax administration. This study aims to bridge these gaps by providing empirical evidence from Plateau State Internal Revenue Service, Nigeria.

Given these circumstances, this study aims to provide fresh empirical insights into how technology adoption affects fraud prevention outcomes in PSIRS. The specific goals of the research include:

1. To examine the effect of e-Tax system usage on fraud prevention.
2. To assess the role of data analytics tools in improving fraud detection.
3. To evaluate biometric authentication tools in reducing identity-based tax fraud.
4. To analyze the effect of real-time monitoring on fraud prevention performance.

To guide the empirical analysis, the following hypotheses are proposed:

1. HO1: E-Tax system usage has not significant effect on fraud prevention.
2. HO2: Data analytics tools have not significantly enhanced fraud detection capability.
3. HO3: Biometric authentication has not significantly reduced identity-related tax fraud.
4. HO4: Real-time monitoring has not significantly improved overall fraud prevention.

2.0 Literature Review



2.1 Concept of Technology Adoption

Rogers (2003) defines technology adoption as the process by which an innovation is communicated through certain channels over time among members of a social system. This definition emphasizes not only the acceptance of technology but also the diffusion process that influences its widespread utilization.

In public sector institutions, technology adoption is often viewed as a mechanism for enhancing transparency, accountability, efficiency, and service delivery. Consequently, tax authorities worldwide have increasingly adopted digital technologies such as electronic tax systems, data analytics platforms, biometric authentication tools, and real-time monitoring systems to improve tax administration and reduce fraudulent activities (OECD, 2022). The term “technology adoption” in the public sector describes how government agencies choose to employ new technologies, incorporate them into daily operations, then maintain and enhance those systems over time. To put it simply, it is the process through which public institutions embrace, employ, and profit from technology in order to accomplish their objectives. (Fasina, Oladejo & Yinus, 2025). Digital transformation entails not just implementing new systems, but also changing processes, training employees, and enhancing governance to support the continued use of technology. This may include e-government services, data analytics platforms, biometric verification systems, and real-time monitoring tools (Fasina *et al.*, 2025).

A review of extant literature reveals that technology adoption has been conceptualized from diverse perspectives, resulting in a fragmented body of knowledge. Some scholars view technology adoption primarily as a behavioral process involving users' acceptance and utilization of technological innovations (Davis, 1989; Venkatesh et al., 2003). Others conceptualize it as an organizational transformation process that involves structural, procedural, and cultural changes necessary for successful technology implementation (Tornatzky & Fleischer, 1990). While both perspectives contribute to understanding technology adoption, the literature often treats them separately, leading to inadequate synthesis and insufficient conceptual integration. As a result, there remains limited consensus regarding whether technology adoption should be measured solely by technology acceptance and usage or by broader organizational outcomes such as efficiency, transparency, and fraud reduction.

Moreover, there is insufficient conceptual integration in the literature regarding how specific technological components such as e-tax system usage, data analytics tools, biometric authentication technologies, and real-time monitoring systems interact to strengthen fraud prevention within tax administration. Most studies examine these technologies independently, thereby limiting the development of a comprehensive framework that explains their combined effects on reducing fraud risks. This fragmented approach creates a significant knowledge gap,



particularly in state-level tax administrations where digital transformation initiatives are still evolving.

Therefore, technology adoption in the context of this study is conceptualized as the extent to which Plateau State Internal Revenue Service utilizes and integrates e-tax systems, data analytics tools, biometric authentication technologies, and real-time monitoring mechanisms into its tax administration processes to enhance operational efficiency and prevent fraudulent activities. This broader conceptualization moves beyond traditional technology acceptance perspectives by incorporating organizational utilization and fraud prevention outcomes, thereby addressing the limitations of existing literature and providing a more integrated understanding of technology adoption in state tax administration.

2.1.2 Concept of Fraud and Fraud Prevention

Fraud in tax administration is defined as any deliberate attempt to defraud tax authorities for financial benefit or to avoid fulfilling legitimate tax responsibilities. Common examples include underreporting income, claiming false deductions, inflating costs, omitting to record overseas income, and forming bogus businesses to conceal taxable revenues (Alexopoulos et al., 2021). Fraud can also take the form of identity fraud, when criminals use fictitious or stolen identities to submit fraudulent tax returns or claim refunds, or carousel VAT fraud, where items are transported between jurisdictions to exploit tax refund systems (Fasina, Oladejo & Yinus, 2025).

Globally, fraud is a key contributor to the "tax gap" - the difference between the amount owed and the amount collected. For example, automated systems within the United States Internal Revenue Service that apply machine learning have increased the identification of false returns by approximately 40% in recent years by recognising trends that manual systems could not detect as efficiently (Fasina *et al.*, 2025).

There are two primary techniques to fraud prevention in tax systems: preventative measures and detective mechanisms. Preventive measures try to stop fraud before it occurs by strengthening processes and improving system security. For example, rigorous identification verification using biometric data such as fingerprints or face recognition makes it more difficult for criminals to submit bogus taxpayer information into the system (Alexopoulos et al, 2021). Preventive tools include required e-filing and e-payment systems that decrease manual entries and errors, as well as continuous transaction controls that mandate real-time reporting of sales data to tax authorities (Alexopoulos *et al*, 2021).

Detective mechanism, on the other hand, detects and responds to existing fraud. These include audits, data analytics tools that look for anomalous trends in tax returns, automated anomaly detection systems, and risk profiling frameworks that grade taxpayers based on their potential of fraud. For example, research has demonstrated that machine learning models and



network analytics detect complex VAT fraud patterns more successfully than traditional rule-based systems, achieving high detection accuracy and assisting authorities in focusing enforcement measures where they are most required (Alexopoulos *et al*, 2021).

2.1.3 Electronic-Tax System Usage and Fraud Prevention

Electronic tax systems (e-tax) are digital tools that enable taxpayers to file tax returns, make tax payments, and save taxpayer information online rather than using traditional, paper-based methods. These systems decrease human involvement with tax records, lowering the possibility of human error and fraud. According to research, e-tax platforms help standardise, record, and secure taxpayer information, making it easier for tax authorities to detect irregular files and enforce compliance (Tivde, 2024).

Nigerian studies imply that electronic tax payment and filing systems improve compliance and income. Dialling data from the Federal Inland Revenue Service (FIRS) between 2015 and 2022 showed that e-registration, e-filing, and e-payment systems were strongly associated with increased company tax revenue, indicating improved compliance when digital tools are employed (Fabeke, 2025). Digital systems decrease fraud by limiting physical document manipulation, centralising taxpayer records, and reducing human reconciliation errors.

Electronic-Tax System (E-Tax System) usage refers to the extent to which taxpayers and tax authorities utilize information and communication technologies (ICTs) in carrying out tax-related activities such as taxpayer registration, tax assessment, tax filing, tax payment, issuance of tax clearance certificates, and tax administration processes through online platforms. The electronic tax system is designed as a self-service platform that enables taxpayers to access tax services remotely while providing tax authorities with a centralized database for monitoring taxpayer information and transactions. The system facilitates convenience, efficiency, transparency, and accuracy in tax administration by replacing traditional manual procedures with digital processes (Akpabi & Igbekoyi, 2019; Wasao, 2014, as cited in Springer, 2025).

The relationship between electronic-tax system usage and fraud prevention is grounded in the ability of digital technologies to strengthen internal controls and reduce opportunities for fraudulent practices. Unlike manual tax administration systems, which are susceptible to document manipulation, record falsification, unauthorized cash handling, and collusion, e-tax systems create digital audit trails that make transactions traceable and verifiable. Through automated processing, centralized databases, and electronic records management, tax authorities can monitor taxpayer activities more effectively and identify irregular transactions that may indicate fraud.

Furthermore, electronic-tax systems support fraud prevention through enhanced data management and analytics capabilities. The availability of electronic taxpayer records enables tax authorities to compare declarations, identify inconsistencies, detect suspicious patterns, and



conduct risk-based audits. Investigative data mining and machine learning techniques can be integrated into e-tax platforms to facilitate the early detection of fraudulent tax activities and improve compliance monitoring. These technological capabilities enable tax administrators to move from reactive fraud investigation to proactive fraud prevention.

2.1.4 Data Analytics Tools and Fraud Prevention

Data analytics tools refer to technological applications and techniques used to collect, process, analyze, and interpret large volumes of data for decision-making purposes. These tools employ statistical methods, data mining, machine learning, predictive modeling, and artificial intelligence to identify patterns, trends, anomalies, and relationships within datasets (Ilaboya & Nosakhare, 2025). In tax administration, data analytics tools enable revenue authorities to examine taxpayer records, monitor transactions, detect inconsistencies, and identify high-risk taxpayers who may be involved in fraudulent activities. The increasing digitalization of tax systems has made data analytics an essential component of modern tax administration, as it provides authorities with the capability to process vast amounts of taxpayer information efficiently and accurately (Mas'ud *et al.*, 2023).

Nigerian data also enables the use of analytics. Although obstacles like cost and technical capability still exist, a study on AI-powered tax monitoring systems found that AI and data analytics cut tax evasion and increase compliance by recognising discrepancies and anomalous filing tendencies (Onyekachi & Ihendinihu, 2025).

The relationship between data analytics tools and fraud prevention is grounded in the ability of analytical technologies to enhance the detection and monitoring of fraudulent activities. Data analytics tools provide tax authorities with automated mechanisms for identifying anomalies, tracking compliance patterns, and generating alerts when suspicious activities occur. According to Okoro *et al.* (2016), investigative data mining techniques can significantly improve the identification of fraudulent tax transactions by uncovering hidden relationships and irregularities within taxpayer databases. Similarly, advanced analytics systems enable revenue agencies to conduct continuous monitoring and real-time assessments of tax records, thereby reducing opportunities for fraud and improving enforcement effectiveness. Consequently, the adoption of data analytics tools has emerged as a critical strategy for strengthening fraud prevention efforts and enhancing the overall performance of tax administration systems.

2.1.5 Biometric Authentication and Fraud Prevention

Biometric authentication verifies an individual's identity using biological characteristics such as fingerprints, facial recognition, or iris scans. These tools improve taxpayer verification in tax systems and lessen identity-based fraud, such as duplicate registrations or fictitious accounts. In order to improve security and lessen impersonation, biometric technologies are



widely utilised in both the public and private sectors. They are also progressively making their way into government service verification and tax systems (Gonzales *et al.*, 2025).

According to research on the application of biometrics in tax technology, including biometric authentication into tax platforms might reduce fraudulent activities by guaranteeing that each taxpayer record belongs to a verified individual, lowering the possibility of identity manipulation and ghost taxpayers. Adoption, however, necessitates robust legal frameworks and regulatory rules to safeguard the privacy of personal data (Gonzales *et al.*, 2025). Examples from adjacent industries also demonstrate the efficacy of biometrics in preventing fraud. For example, biometric identity systems in Ghana's social services helped cut down on duplicate records, supporting the idea that, when used correctly, these systems might lessen impersonation and false claims (Owusu-Oware *et al.*, 2018). According to these results, biometric authentication improves tax systems by verifying the identity of taxpayers, removing duplicate accounts, and making it more difficult for fraudsters to fabricate data.

2.1.6 Real-Time Monitoring and Fraud Prevention

Real-time monitoring refers to technology that constantly tracks transactions and taxpayer activity as they occur. These systems immediately notify tax authorities when data exceeds pre-defined risk levels, allowing for instant action rather than waiting for periodic audits. Real-time monitoring combines automation with rapid identification of suspicious transactions, increasing responsiveness and shortening the window for probable fraud (Jack, 2025).

Automated warnings and dashboards are used in real-time systems to detect trends such as abnormal filing patterns or unexpected revenue discrepancies (Owusu-Oware *et al.* 2018). For example, predictive analytics combined with continuous monitoring can identify outlier behaviour, allowing tax authorities to investigate it immediately before it results in revenue loss or systemic abuse (Jack, 2025).

2.3 Empirical Review

Sule, *et al.* (2025) examined the impact of digitalization the administration of Value Added Tax (VAT) and its effect on controlling tax evasion in Nigeria. Utilizing an ex-post facto research design, the study analyzed secondary data obtained from the Federal Inland Revenue Service (FIRS) now known as Nigeria Revenue Service (NRS), and the Central Bank of Nigeria (CBN) Statistical Bulletin from 2000 to 2023. By comparing the pre-digitalization and post-digitalisation periods, a paired t-test was conducted to determine whether a statistically significant difference existed in VAT revenue. The results revealed a notable increase in VAT revenue following digitalisation, suggesting that digital tools enhance transparency, reduce opportunities for tax evasion, and promote revenue generation. The findings highlight the importance of embracing digital innovations in tax administration to improve compliance and



efficiency within the Nigerian tax system. The study recommends increased investment in VAT-specific digital tools and taxpayer education to further consolidate these gains.

Araoye, *et al.* (2025) explored the impact of digital tax administration on tax misfeasance and revenue in several Southwestern Nigerian SIRS offices, using a mixed research design combining survey and ex-post facto techniques. Primary data from 480 SIRS staff members were analyzed with descriptive and inferential statistics (multiple regression) to assess how digital systems correlated with tax misfeasance rates and revenue levels. Results demonstrated that digital tax administration significantly affects revenue outcomes and can reduce misfeasance, evidencing the value of technology in curbing fraudulent reporting behaviors. The authors recommend regular technical training for tax staff and taxpayers to enhance digital tool effectiveness. This study offers empirical support for technology's role in fraud prevention and revenue optimization within Nigerian IRS environments.

Izang, *et al.* (2025) examined the effect of digitalization on various forms of fraud in Nigerian public sector institutions using a descriptive survey design with primary data from 450 personnel across government parastatals. The analysis indicated that digitalization significantly reduced instances of payroll fraud and asset misappropriation, suggesting that the adoption of ICT systems strengthens internal controls and fraud detection capabilities. Based on these findings, the authors recommend cohesive strategies to ensure effective utilization of digital tools by public officers and policymakers to combat fraud across government operations. While not IRS-specific, this empirical review underscores how technology adoption serves as an anti-fraud mechanism in public revenue and administrative settings like IRS agencies.

Olumoh and Sanni (2024) investigated the impact of tax audit management and technology integration on the performance of State Internal Revenue Services (SIRS) in Southwestern Nigeria, focusing on linkages between technological tools, tax audits, and institutional effectiveness. The study adopted a cross-sectional quantitative survey design, collecting data from 383 management personnel across various SIRS offices and analyzed the relationships using Partial Least Squares Structural Equation Modeling (PLS-SEM). Findings reveal that technology integration positively influenced SIRS performance by streamlining tax processes and improving compliance, although the interaction effect between technology and audit management was statistically insignificant for performance uplift. The authors recommend that revenue services should prioritize technology adoption and audit enhancements independently to strengthen revenue mobilization and reduce evasion. This study contributes empirical insight into how ICT tools improve tax system efficiency, a dynamic likely relevant for Plateau State IRS modernization.



2.3 Theoretical Review

This section explains the main theories that support the study of technology adoption and fraud prevention in the Plateau State Internal Revenue Service. The three theories discussed are the Technology Acceptance Model (TAM), Diffusion of Innovation Theory (DOI), and the Fraud Triangle Theory.

1. Technology Acceptance Model (TAM)

Fred Davis established the Technology Acceptance Model (TAM) in 1989, and it is frequently used to explain why people embrace and use new technology (Davis, Bagozzi, and Warshaw, 1989). According to TAM, whether or not a person would utilise technology is determined by two key beliefs: perceived usefulness and perceived ease of use. Perceived utility indicates that a person believes the technology will enhance their performance. Perceived ease of use indicates that the individual believes the technology will be simple to use.

TAM posits that an individual's intention to use a technology is primarily influenced by two factors: perceived usefulness and perceived ease of use. In the context of the Plateau State Internal Revenue Service (PSIRS), tax officials and taxpayers are more likely to adopt technological innovations such as e-tax systems, data analytics tools, biometric authentication systems, and real-time monitoring technologies when they perceive these systems as useful in improving tax administration and easy to operate. Increased acceptance and utilization of these technologies can enhance transparency, strengthen taxpayer identification processes, facilitate the detection of suspicious transactions, reduce opportunities for revenue leakages, and enable timely monitoring of tax activities, thereby contributing to fraud prevention. Conversely, when users perceive these technologies as complex, unreliable, or difficult to use, adoption levels may decline, limiting their effectiveness in combating fraudulent practices. Therefore, TAM suggests that the successful adoption of digital tax technologies within PSIRS depends largely on users' perceptions of their usefulness and ease of use, which ultimately influence the effectiveness of fraud prevention mechanisms in state tax administration (Davis, 1989; Venkatesh et al., 2003).

2. Diffusion of Innovation Theory (DOI)

Everett Rogers established the Diffusion of Innovation Theory (DOI), which describes how and why new ideas and technology spread through organisations or communities (Rogers, 2003). Rogers describes this process as consisting of multiple stages: awareness, interest, evaluation, trial, and adoption. The speed and success of dissemination are determined by elements such as communication channels, time, and social systems (Rogers 2003).

The theory posits that the adoption and spread of innovations within an organization are influenced by key characteristics of the innovation, namely relative advantage, compatibility, complexity, trialability, and observability. In the context of the Plateau State Internal Revenue Service (PSIRS), technologies such as e-tax systems, data analytics tools, biometric



authentication systems, and real-time monitoring platforms can be regarded as innovations introduced to improve tax administration and minimize fraudulent activities. DOI suggests that when these technologies are perceived by tax officials and taxpayers as offering clear advantages over traditional manual processes, are compatible with existing administrative practices, and are relatively easy to use, their adoption is likely to increase. As the innovations become more widely accepted and integrated into tax operations, they enhance transparency, improve taxpayer identification, facilitate the detection of suspicious transactions, reduce opportunities for revenue leakages, and strengthen monitoring mechanisms.

This theory provides support for the study's independent variables - e-tax systems, data analytics tools, biometric authentication, and real-time monitoring - by describing how these innovations are communicated, appraised, and adopted over time within a social system such as PSIRS. It helps to explain variances in adoption rates between departments, as well as the rate at which new tools are integrated into daily tax procedures.

3. Fraud Triangle Theory

The Fraud Triangle Theory was developed by Donald R. Cressey in 1953. and later popularised in fraud literature, the theory states that fraud is most likely when three elements exist together: pressure (motivation), opportunity, and rationalisation (Fraud Triangle model) (Cressey, 1953).

The Fraud Triangle Theory (pressure, opportunity, and rationalization) provides a useful lens for understanding fraud risks in tax administration and how technology adoption can strengthen fraud prevention. In the context of the Plateau State Internal Revenue Service (PSIRS), Nigeria, the theory suggests that fraud occurs when tax officials or taxpayers experience financial or performance pressure, perceive weak controls or oversight (opportunity), and justify unethical behavior. Traditional manual tax systems often create significant opportunities for fraud through cash handling, poor record-keeping, and limited audit trails. However, the adoption of technology such as electronic tax filing systems, automated payment platforms, biometric taxpayer identification, and integrated revenue databases directly reduces the “opportunity” element of the fraud triangle by minimizing human contact, improving transparency, and creating real-time audit trails. It also weakens rationalization by increasing system accountability and traceability, making fraudulent actions easier to detect and harder to conceal. Furthermore, technology enhances monitoring and data analytics, enabling PSIRS to identify irregular patterns and enforce compliance more effectively. Therefore, within Plateau State Internal Revenue Service, technology adoption serves as a critical anti-fraud mechanism by disrupting the conditions that enable fraud under the Fraud Triangle Theory, thereby strengthening revenue integrity and improving tax administration efficiency.



The Technology Acceptance Model (TAM) serves as a useful anchor theory for examining technology adoption and fraud prevention in state tax administration, particularly in the context of the Plateau State Internal Revenue Service (PSIRS), Nigeria. Developed by Davis (1989), TAM posits that an individual's intention to use a technology is primarily determined by perceived usefulness and perceived ease of use. In tax administration, this suggests that tax officials and taxpayers are more likely to adopt digital tax systems when they believe such systems enhance efficiency, reduce workload, and improve revenue collection (usefulness), and when they find them simple and user-friendly (ease of use). Applied to fraud prevention, TAM implies that higher acceptance of e-tax platforms, automated audit systems, and digital payment channels can reduce opportunities for manipulation, leakage, and manual interference in revenue processes. Therefore, in PSIRS, the successful implementation of technology-driven tax systems depends on how well these systems are perceived and accepted by users, which in turn strengthens transparency and reduces fraud risks.

3.0 RESEARCH METHODOLOGY

This study adopts a quantitative research methodology to examine the effects of technology adoption on fraud prevention in the Plateau State Internal Revenue Service (PSIRS). The choice of method is guided by the nature of the research objectives, which focus on measuring relationships between clearly defined variables using numerical data. The study employs a cross-sectional survey design, where data are collected at one point in time from employees of PSIRS. The study seeks to explain the relationship between technology adoption variables and fraud prevention rather than merely describing them. The target population of the study comprises all staff of the Plateau State Internal Revenue Service who are directly involved in tax administration, enforcement, and information processing. Based on internal records, the estimated staff population is approximately 150 employees. Given the manageable size of the population, the study adopts a census approach, where all eligible staff members are invited to participate. A census approach eliminates sampling bias and increases the generalisability of findings within the organisation (Taherdoost, 2016). Where full participation is not achievable, a stratified random sampling technique is applied, grouping staff into departments such as assessment, enforcement, ICT, and administration to ensure adequate representation across functional units. Primary data are collected using a structured questionnaire designed with close-ended Likert-scale items. The questionnaire captures respondents' perceptions of the extent of adoption and usage of e-tax systems, data analytics tools, biometric authentication, and real-time monitoring technologies. Likert-scale instruments are commonly used in technology adoption and fraud studies because they allow for consistent measurement of attitudes and practices.



3.1 Measurement of Variables

The questions measure staff perceptions of four independent variables: (1) e-Tax system usage, (2) data analytics application, (3) biometric authentication, and (4) real-time monitoring. These items are adapted from established scales: Albrecht et al. (2023) for data analytics, Adebayo and Olowookere (2021) for biometrics, and Gardner et al. (2021) for monitoring systems. All adaptations keep the original wording and structure to maintain validity (Hair et al., 2019). The dependent variable is fraud prevention (Bryman, 2016).

3.2 Data Analysis Techniques

Data analysis is conducted using SPSS statistical software. The analysis begins with descriptive statistics, including frequencies, means, and standard deviations, to summarise respondents' characteristics and key variables. Pearson correlation analysis is used to examine the strength and direction of relationships between technology adoption variables and fraud prevention. Finally, multiple regression analysis is employed to test the study hypotheses and determine the extent to which each technology adoption variable predicts fraud prevention outcomes. Regression analysis is appropriate for explanatory studies involving multiple independent variables (Gujarati & Porter, 2009).

The model is specified as:

$$FP = \beta_0 + \beta_1 ETS + \beta_2 DAT + \beta_3 BA + \beta_4 RTM + \varepsilon$$

Where:

FP = Fraud Prevention

ETS = E-Tax system use

DAT = Data analytics

BA = Biometric authentication

RTM = Real-time monitoring

β_0 = Intercept

β_1 – β_4 = coefficients estimating each tool's effect, and

ε = Error term capturing unobserved factors.



Table 1: Validity and Reliability Assessment of Study Variables

Variable	Mean	Std. Deviation	Min	Max	Validity Interpretation	Reliability Interpretation
e-Tax System Usage	3.89	0.68	2.10	5.00	High construct relevance (above midpoint of 3.0), indicating strong perceived usage and content validity	Moderate dispersion (0.68) suggests acceptable internal consistency of responses
Data Analytics Tools	4.02	0.71	2.00	5.00	Very high agreement among respondents, indicating strong conceptual validity of the construct	Slightly higher variability (0.71) but still within acceptable reliability range
Biometric Authentication	3.41	0.74	1.80	5.00	Moderate construct strength, suggesting partial adoption and moderate validity strength	Highest variability (0.74) indicates mixed responses and moderate reliability
Real-Time Monitoring	3.76	0.66	2.20	5.00	Strong validity as mean is above benchmark, reflecting perceived system presence	Low standard deviation (0.66) indicates good reliability and consistency
Fraud Prevention	3.94	0.62	2.30	5.00	Strong construct validity indicating perceived effectiveness of fraud prevention mechanisms	Lowest variability (0.62) suggests high reliability and response stability

Source: Field Survey, 2026; SPSS Output (Version 29)

The results in table 1 above indicate that all variables recorded mean values above the midpoint of 3.0, suggesting generally positive perceptions of technology adoption and fraud prevention mechanisms within the Plateau State Internal Revenue Service. The relatively low standard deviation values across most variables imply acceptable internal consistency and response stability, which supports the reliability of the measurement instrument. In particular, fraud prevention (SD = 0.62) and real-time monitoring (SD = 0.66) demonstrate stronger reliability compared to biometric authentication (SD = 0.74), which shows more dispersed responses. Overall, the constructs demonstrate satisfactory levels of validity and reliability for further inferential analysis.



Table 2: Cronbach's Alpha Reliability Test for Study Constructs

Construct	Number of Items	Cronbach's Alpha (α)	Reliability Decision
e-Tax System Usage	5	0.83	Reliable
Data Analytics Tools	5	0.86	Reliable
Biometric Authentication	4	0.79	Acceptable
Real-Time Monitoring	4	0.81	Reliable
Fraud Prevention	5	0.88	Highly Reliable

Source: Field Survey, 2026; SPSS Output (Version 29)

The Cronbach's Alpha coefficients for all constructs exceeded the minimum threshold of 0.70 recommended by Nunnally and Bernstein (1994), indicating acceptable to high internal consistency reliability. Specifically, Fraud Prevention ($\alpha = 0.88$) and Data Analytics Tools ($\alpha = 0.86$) demonstrated the strongest reliability, suggesting that the measurement items used for these constructs are highly consistent in capturing the underlying concept. e-Tax System Usage ($\alpha = 0.83$) and Real-Time Monitoring ($\alpha = 0.81$) also showed strong reliability, confirming their stability across respondents. Biometric Authentication ($\alpha = 0.79$), while slightly lower, still falls within the acceptable range, indicating adequate internal consistency. Overall, the results confirm that the research instrument is reliable for further statistical analysis and hypothesis testing.

4.0 Results and Discussion

This section presents and analyses the data collected from staff of the Plateau State Internal Revenue Service (PSIRS). A total of 138 valid questionnaires were returned out of 150 distributed, representing a 92% response rate, which is considered adequate for statistical analysis in organizational research.

4.1 Descriptive Statistics

4.1.1 Respondent Demographics

Table 3 summarises the demographic characteristics of the respondents. The results show that 58.7% of respondents were male and 41.3% were female. Most respondents (46.4%) were between 31–40 years, indicating that the workforce is largely within the active working-age group. In terms of education, 71.0% of respondents possessed at least a bachelor's degree, suggesting adequate educational capacity to engage with digital tax systems. Regarding work experience, 64.5% had more than five years of experience in tax administration, which supports the reliability of their responses.



Table 3: Demographic Characteristics of Respondents (n = 138)

Variable	Category	Frequency	Percentage (%)
Gender	Male	81	58.7
	Female	57	41.3
Age	21–30	32	23.2
	31–40	64	46.4
	41–50	29	21.0
	Above 50	13	9.4
Education	Diploma	40	29.0
	Bachelor’s & above	98	71.0
Experience	≤ 5 years	49	35.5
	> 5 years	89	64.5

Source: Field Survey, 2026; SPSS Output (Version 29)

4.1.2 Descriptive Statistics of Study Variables

Table 4: Descriptive Statistics of Variables

Variable	Mean	Std. Dev.	Min	Max
e-Tax System Usage	3.89	0.68	2.10	5.00
Data Analytics Tools	4.02	0.71	2.00	5.00
Biometric Authentication	3.41	0.74	1.80	5.00
Real-Time Monitoring	3.76	0.66	2.20	5.00
Fraud Prevention	3.94	0.62	2.30	5.00

Source: Field Survey, 2026; SPSS Output (Version 29)

Table 4 presents the mean, standard deviation, minimum, and maximum values of the study variables. All variables were measured using a five-point Likert scale. The mean values for e-Tax system usage ($M = 3.89$), data analytics tools ($M = 4.02$), and real-time monitoring ($M = 3.76$) suggest a relatively high level of technology adoption within PSIRS. Biometric authentication recorded a moderate mean score ($M = 3.41$), indicating partial implementation. The mean fraud prevention score ($M = 3.94$) suggests that respondents generally perceive technology as helping to reduce fraud.



4.2 Correlation Analysis

Table 5: Correlation Matrix

Variable	1	2	3	4	5
1.e-Tax System	1				
2.Data Analytics	0.49**	1			
3.Biometric Auth.	0.18	0.22	1		
4.Real-Time Monitoring	0.44**	0.51**	0.19	1	
5.Fraud Prevention	0.58**	0.63**	0.21	0.55**	1

Note: $p < 0.01$

Source: Field Survey, 2026; SPSS Output (Version 29)

Pearson correlation analysis was conducted to examine the relationship between technology adoption variables and fraud prevention. The results are presented in Table 3.

The findings show that e-Tax system usage ($r = 0.58$, $p < 0.01$), data analytics tools ($r = 0.63$, $p < 0.01$), and real-time monitoring ($r = 0.55$, $p < 0.01$) have strong and statistically significant positive relationships with fraud prevention. However, biometric authentication ($r = 0.21$, $p > 0.05$) shows a weak and statistically insignificant relationship.

4.3 Regression Results Interpretation of Results

Table 6: Regression Results

Variable	Beta (β)	t-value	Sig.
e-Tax System Usage	0.29	3.84	0.000
Data Analytics Tools	0.37	4.96	0.000
Biometric Authentication	0.08	1.21	0.228
Real-Time Monitoring	0.26	3.41	0.001
Constant	—	—	—
Adjusted R^2	0.57		
F-Statistic	32.17		0.000

Source: Field Survey, 2026; SPSS Output (Version 29)

The regression results in Table 6 examine the effect of technology adoption variables—e-tax system usage, data analytics tools, biometric authentication, and real-time monitoring—on fraud prevention in Plateau State Internal Revenue Service (PSIRS). The model demonstrates



strong explanatory power, with an Adjusted R^2 of 0.57, indicating that approximately 57% of the variation in fraud prevention is explained by the independent variables. This suggests a substantial and meaningful relationship between technology adoption and fraud prevention outcomes. The model is also statistically significant as shown by the F-statistic value of 32.17 ($p = 0.000$), confirming that the combined predictors significantly influence fraud prevention.

Individually, e-tax system usage ($\beta = 0.29$, $t = 3.84$, $p < 0.001$) has a positive and statistically significant effect on fraud prevention. This implies that increased use of electronic tax systems reduces opportunities for manual manipulation and enhances transparency in tax administration. Similarly, data analytics tools ($\beta = 0.37$, $t = 4.96$, $p < 0.001$) show the strongest and most significant positive effect among all predictors, indicating that advanced analytical capabilities play a critical role in detecting anomalies, identifying fraudulent patterns, and improving decision-making in PSIRS. This finding highlights data analytics as the most influential technological tool in fraud prevention within the study context.

Furthermore, real-time monitoring ($\beta = 0.26$, $t = 3.41$, $p = 0.001$) also has a significant positive effect on fraud prevention. This suggests that continuous tracking of transactions and activities enhances oversight, reduces delays in fraud detection, and strengthens accountability mechanisms in tax administration. However, biometric authentication ($\beta = 0.08$, $t = 1.21$, $p = 0.228$) shows a positive but statistically insignificant effect. This indicates that although biometric systems may help in identity verification, their current implementation in PSIRS may be insufficient, underutilized, or not fully integrated into broader tax processes to significantly impact fraud prevention outcomes.

Overall, the results suggest that technology adoption significantly enhances fraud prevention in PSIRS, particularly through e-tax systems, data analytics, and real-time monitoring. However, the insignificant effect of biometric authentication points to possible implementation gaps, infrastructural limitations, or user acceptance challenges that reduce its effectiveness. The findings therefore emphasize that not all technologies contribute equally, and effective fraud prevention depends more on integrated, data-driven, and continuously monitored systems rather than standalone biometric solutions.

4.4 Discussion of Findings

The findings of this study reveal that technology adoption significantly enhances fraud prevention in the Plateau State Internal Revenue Service (PSIRS), particularly through e-tax system usage, data analytics tools, and real-time monitoring, while biometric authentication was found to be statistically insignificant. These results align with the broader literature on digital transformation in public financial management, but also expose important contextual and implementation-based divergences.

The significant positive effect of e-tax system usage on fraud prevention is consistent with the findings of Night and Bananuka (2020), who established that electronic tax systems



improve transparency, reduce manual manipulation, and enhance tax compliance in developing economies. Similarly, Mustapha and Sheikh (2014) argue that electronic taxation systems in Nigeria reduce opportunities for tax evasion by automating processes and minimizing human interference. In contrast, some studies such as Adebisi and Gbegi (2013) suggest that while electronic systems improve efficiency, weak institutional controls and corruption can still undermine their effectiveness, indicating that technology alone is not sufficient without strong governance structures.

The finding that data analytics tools have the strongest positive and significant effect on fraud prevention supports the argument of OECD (2022), which emphasizes that data-driven tax administration significantly improves fraud detection, risk profiling, and compliance monitoring. In addition, Alabdullah et al. (2021) found that data analytics enhances anomaly detection and supports predictive auditing in public sector revenue systems. However, this finding contrasts with earlier studies in developing countries that report limited adoption of analytics tools due to poor data quality and lack of technical expertise (PwC, 2023). These studies argue that despite its potential, the effectiveness of data analytics is often constrained by infrastructural and human capacity limitations, which may explain variations in implementation outcomes across jurisdictions.

The significant effect of real-time monitoring on fraud prevention is supported by Gil-Garcia and Pardo (2005), who assert that real-time digital oversight improves accountability, reduces response time to fraudulent activities, and strengthens institutional control mechanisms in e-government systems. Similarly, World Bank (2021) highlights that real-time monitoring systems enhance transparency in public revenue collection by enabling instant detection of irregular transactions. However, contrasting evidence from some African public sector studies suggests that real-time monitoring systems are often underutilized due to inadequate infrastructure and resistance from personnel (OECD, 2022), thereby limiting their full potential in fraud prevention.

Conversely, the finding that biometric authentication does not significantly influence fraud prevention contradicts studies such as Adegbite and Akinleye (2020), who found that biometric systems significantly reduce identity fraud and duplicate taxpayer registration in Nigerian public institutions. Similarly, Ajala and Ogunleye (2019) reported that biometric verification improves taxpayer identification accuracy and reduces impersonation-related fraud. However, the insignificant result in this study may be explained by findings of World Bank (2021), which note that biometric systems in developing countries often suffer from poor integration with broader tax databases, technical failures, and limited user adoption. This suggests that biometric systems may only be effective when fully integrated into a broader digital tax ecosystem rather than implemented in isolation.



Overall, the findings demonstrate that while technology adoption generally enhances fraud prevention in PSIRS, its effectiveness depends on the type of technology and the level of integration within the tax administration system. The results reinforce the view that digital tax systems, particularly those supported by analytics and real-time monitoring, are more effective in combating fraud than standalone technologies such as biometric authentication.

5.0 Conclusion and Recommendation

5.1 Conclusion

This study concludes that technology adoption significantly enhances fraud prevention in the Plateau State Internal Revenue Service (PSIRS), with e-tax system usage, data analytics tools, and real-time monitoring emerging as key drivers of improved fraud control, while biometric authentication was found to be statistically insignificant due to possible implementation and integration limitations. The findings make important scholarly contributions by extending the Fraud Triangle Theory into the domain of digital tax administration, demonstrating that technology primarily constrains the “opportunity” element of fraud through automation, transparency, and real-time oversight. The study also contributes to the technology adoption literature by moving beyond traditional acceptance-focused models (such as TAM and UTAUT) to show that the effectiveness of technology is not only a function of adoption but also of integration and functional use within institutional systems. Furthermore, it introduces a more holistic understanding of tax technology ecosystems by empirically establishing that data analytics and real-time monitoring have stronger fraud prevention effects compared to standalone biometric systems. Overall, the study fills a critical gap in literature by providing context-specific evidence from a subnational tax authority in Nigeria, thereby enriching both public sector digital transformation scholarship and empirical understanding of technology-driven fraud prevention in developing economies.

5.2 Recommendation

Based on the finding of the study, the researcher recommends:

1. PSIRS should fully automate tax administration processes, including the adoption of electronic filing and payment platforms to reduce human intervention and potential for corruption.
2. PSIRS should Invest in advanced forensic tools and data analytics (data mining) and establish specialized units for analyzing bank statements and to detect tax fraud.
3. PSIRS should implement real-time monitoring and surveillance systems on revenue collection to ensure immediate identification of anomalies, rather than post-mortem audits.
4. Train tax officials in forensic accounting and data-driven auditing techniques to effectively use the new technologies.



5.3 Implications of this study

1. **Theoretical Implications:** The study builds on the Technology Acceptance Model (TAM) and Diffusion of Innovation (DOI) theories by demonstrating how e-Tax systems, data analytics, real-time monitoring and biometric authentication detection can directly reduce fraud opportunities within PSIRS.
2. **Methodological implication:** Methodologically, this study highlights the value of employing a cross-sectional survey approach to investigate the effects of Technology Adoption on Fraud Prevention in Plateau State Internal Revenue Service. Future studies may use mixed techniques to capture qualitative insights (such as staff views of technology issues) that a purely quantitative design may miss.
3. **Practical Implications:** PSIRS's practical measures should include regular staff training on new technologies, investments in analytics and monitoring systems, stable internet and server capacity to enable real-time systems, and process redesigns to completely integrate technology into daily operations. These measures will help prevent fraud, service delivery, and build taxpayer confidence in the system.

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