

**INTERNATIONAL JOURNAL OF
ENTREPRENEURSHIP, TECHNOLOGY
AND INNOVATION
(IJETI)**

ISSN: 1597 – 1961, eISSN:1595-7764

Volume 2, Issue 2, June 2025

**A Publication of Entrepreneurship and Technology Innovation Research
Group,
Department of Entrepreneurship,
Faculty of Management Sciences,
University of Benin, Benin City, Edo State, Nigeria.
email address: oboseuniben@gmail.com
online link: <http://ijeti.uniben.edu>**

LIST OF EDITORIAL TEAM

Editor-in-Chief

Prof. Obose Angela ORIAZOWANLAN
University of Benin, Benin-City, Edo State, Nigeria

Business Editor

Dr. (Mrs) Caroline Edevbaro - University of Benin

Editorial Board

Prof Andrew TAFAMEL - University of Benin
Prof S. O. IGBINOSA: University of Benin
Prof (Mrs) Evelyn UMEMEZIA- University of Benin
Prof (Mrs) Esther IKHUORIA: University of Benin
Prof Osamuade Kingsley OMOROGIUWA - University of Benin
Prof. Kingsley UKAOHA; University of Benin
Prof. Raph EDOKPIA- University of Benin
Prof Ibrahim ADAMU- Abubakar Tafawa Balewa University, Bauchi State
Prof Anayo D. NKAMNEBE- Nnamdi Azikiwe University, Awka, Anambra State
Prof Chinonye Love MOSES- Covenant University, Ota, Ogun State
Prof Justin M. Odinioha GABRIEL. River State University, Port-Harcourt
Prof Ify Harcourt WOKOCHA- Federal University Otuoke, Bayelsa State
Prof Pac ORDU- Federal University Otuoke, Bayelsa State
Prof Oyaziwo ALUEDE: Ambrose Alli University, Ekpoma
Prof Abdullahi Hassan GORONDUTSE- Nigeria Police Academy, Wudil Kano
Prof Shehu Inuwa GALOJI- Saadu Zuugur University, Gadau-Bauchi State
Prof. Omotayo A. ADEGBIYI:- Victoria University, Kampala, Uganda
Prof Omorogieva OJO- University of Greenwich, London
Dr. Stephen Obeki- University of Benin
Dr. Osazee Frank OGIEVA- University of Benin
Dr. Kenedy EDIAGBONYA- Ambrose Alli University, Ekpoma
Dr. (Mrs) Gloria ALANEME: University of Lagos.
Dr. Bulka BUBA- University of Maiduguri, Borno State
Dr. Simon ADEKUNLE- University of Benin
Dr. Felix O. ISIBOR - University of Benin
Dr. Abubakar Mohammed Msgaji- Federal Polytechnic Kaura Namoda, Zamfara State
Dr. John OTALOR- University of Calabar, Cross River State
Dr. Samson Chukwuedo-Nnamdi Azikiwe University, Awka, Anambra State
Dr. Olutayo K. OSUNSAN: Africa Renewal University, Uganda
Dr. Abimbola, A. ADEGIYI- Tesside University of International Business School,
London, United Kingdom

Advisory Editorial Board

Prof Lilian Imuentinyan SALAMI: University of Benin
Prof (Mrs) E. UKO-AVIOMOH- University of Benin

Prof (Mrs) C. C. OKOLOCHA- Nnamdi Azikiwe University, Awka, Anambra State

Prof Clement IGHODARO - University of Benin

Prof Ikpomwonsa OMORUYI- University of Benin

Prof Felix OKIEMEN- University of Benin, Edo State

Prof John IGENE- University of Benin, Edo State

Prof Abubakar M. KUNDIRI- Al-Ansar University, Maiduguri.

ABOUT THE JOURNAL

International Journal of Entrepreneurship, Technology and Innovation (IJETI) is a double-blind peer reviewed online and print open access journal. It offers outlet for articles publication in all areas of Entrepreneurship, Technology and Innovation including all Business related areas, Management and all Multi-disciplines. The Journal is an official publication of Entrepreneurship and Technology Innovation Research Group, Department of Entrepreneurship, Faculty of Management Sciences, University of Benin, Benin City, Edo State, Nigeria. The Journal welcomes Qualitative, Innovative and Technical papers which could be empirical, theoretical, expository and practical oriented with innovative approach.

How to Submit Manuscript

Submit quality researched papers via email address: oboseuniben@gmail.com or through the online link <http://ijeti.uniben.edu>

Mode of Publication

Accepted articles are published both online and in print thrice in a year (February, June and October).

Address:

Entrepreneurship and Technology Innovation Research Group,
Department of Entrepreneurship,
Faculty of Management Sciences,
University of Benin, Benin-City, Edo State, Nigeria.
Email Address: oboseuniben@gmail.com.
Online link: <http://ijeti.uniben.edu>
Tel: +234-816-282-3492

TABLE OF CONTENTS

S/NO	ARTICLES	PAGE
1.	Cyber-Security and Digital Taxation: Addressing Risks in Nigeria’s AI-Driven Tax Administration. Uzoamaka Faith ONUNAKA ¹ , Jennifer Odinakachi GODSPOWER ² , Ogechi Eberechi ALPHEAUS ³ & John Uzoma IHENDINIHU ⁴	1
2.	Moderating Role of Perceived Access to Finance on Students’ Risk-taking and Entrepreneurial Intentions in Kaduna State University. Abubakar Abdullahi PhD ¹ , Mohammed Yazeed PhD ² , & Mohammed Bello Idris PhD ³	14
3.	Linking Entrepreneurial Competence, Networks and Education to Entrepreneurial Intentions among Nigerian Youths: A Conceptual Framework. Najafi Auwalu Ibrahim	26
4.	Strategic Management Application and Business Profitability of Small and Medium Scale Business in Bayelsa State. ¹ Osagie Leslie Uwabor Ph.D, & ² Ordu, Blessing Chinwe Nchelem	37
5.	Economic Factors and SMEs Performance in Katsina State: Mediating Role of Access to Information Communication Technology (ICT). ¹ Mustapha Badamasi & ² Muhammad Nasir Saba	52
6.	Google Meet as Emerging Technology in Business Education Programme. ¹ Juliet Ngozi O. Oka, Idam, ² Chidimma Elizabet & ³ Otubo Chika Terry	66
7.	Influence of Behavioural Bias on Investment Decisions among Pension Fund Administrators in Nigeria: The Moderating Role of Risk Tolerance ¹ Unyime, Abasido ANTHONY, ² Professor Mu’azu Saidu Badara, ³ Professor A. B. Dogarawa, & ⁴ Muhammed Yazeed	76
8.	Entrepreneurial Readiness and Business Mortality among Smes in Abuja Municipal Area Council (Amac), Abuja. Peter Elaigwu Oteh	88
9.	Influence of Renewable Energy Entrepreneurship on the Growth of Manufacturing Small and Medium Scale Enterprises in Uyo ¹ Oforbuike Francis NWACHUKWU, ² Inibong Friday AKPAN, ³ Nancy U. CHIDIEBERE, & ⁴ Emmanuel Ojonugwa OKOLIKO	100
10.	Leveraging Artificial Intelligence and Machine Learning to Enhance Financial Inclusion in Nigeria: Opportunities, Challenges, and Policy Implications. ¹ Omankwu, Obinnaya Chinecherem Beloved; ² Osodeke, Efe Charles, ³ Nwankwo, Chioma Grace & ⁴ Mbagwu, Amarachi Austina	127
11.	Sustainable Business Practices and Company’s Market Share among selected Small and Medium Scale Enterprises in Ado-Ekiti, Ekiti State, Nigeria. ¹ OGBOGU, Folasade Oyenike & ² OGAH, Arome Victor (Ph.D)	140
12.	Eco-Entrepreneurship: A Panacea For Sustainable Social Development in Delta State, Nigeria Dr. Josphine Crossdale-Ovwido	149
13.	Corporate Tax Planning and Financial Performance of Listed Consumer Goods Firms in Nigeria. ¹ Kelechi Callistus NWANKWO, ² Ogechi Eberechi ALPHEAUS, ³ Chinwendu	160

- Judith OBIZUO & ⁴Stella Ogechukwu OKEZIE
14. Tax Burden Distribution and Social Inequality: A Study of Nigeria's Fiscal Policy. 181
- Jennifer Odinakachi GODSPOWER¹, Uzoamaka Faith ONUNAKA², Ogechi Eberechi ALPHEAUS³ & John Uzoma IHENDINIHU⁴

Cyber-Security and Digital Taxation: Addressing Risks in Nigeria's AI-Driven Tax Administration

Uzoamaka Faith ONUNAKA¹, Jennifer Odinakachi GODSPOWER², Ogechi Eberechi ALPHEAUS³, John Uzoma IHENDINIHU⁴

^{1,2,3&4}Department of Accounting, Michael Okpara University of Agriculture, Umudike, Nigeria.

Correspondence email address: onunaka.uzoamaka@mouau.edu.ng¹,

Abstract

The study examined cyber-security challenges and digital taxation within Nigeria's AI-driven tax administration, employing the Technology Acceptance Theory (TAT) as its theoretical framework. A descriptive survey research design was adopted, using structured questionnaires to gather data from a purposively selected sample of 100 employees of the Federal Inland Revenue Service (FIRS). Descriptive statistics (frequencies, percentages, and means) were used to analyze demographic data and research questions, while simple regression analysis tested the hypotheses. Findings revealed major cyber-security threats facing AI-based tax systems in Nigeria, including data breaches, system hacking, identity theft, insider threats, and AI manipulation. The study also identified several key strategies to mitigate these risks: enhancing cyber-security regulations, investing in secure AI infrastructure, strengthening staff training, establishing oversight institutions, and promoting international cooperation. Regression analysis showed that cyber-security threats significantly impact Nigeria's digital tax systems, stressing the need for urgent intervention. Based on these findings, the study recommended adopting AI-powered threat detection tools to proactively manage cyber threats in digital taxation. It further advised the Nigerian government to develop and enforce a robust regulatory framework tailored to AI use in tax administration. To close the skills gap and enhance resilience, continuous training programs were also recommended for FIRS and state tax board personnel. Overall, the study emphasized the critical need for comprehensive strategies to protect Nigeria's evolving AI-driven tax infrastructure from escalating cyber risks.

Keywords: Artificial Intelligence (AI), Digital taxation, Cyber-security, AI-driven tax administration, Technology

Introduction

The digital transformation of global economies is profoundly reshaping tax administration, as governments grapple with the complexities of digital services, virtual assets, and intricate financial transactions (OECD, 2021). In Nigeria, this transformation has been accelerated by the adoption of emerging technologies such as Artificial Intelligence (AI), data analytics, and cloud computing (NITDA, 2021). The Federal Inland Revenue Service (FIRS) and related agencies have increasingly integrated AI-driven systems to enhance tax

compliance, improve service delivery, and reduce the tax gap. AI applications now support core tax functions, including risk profiling, taxpayer segmentation, and fraud detection (Adebisi & Gbegi, 2020). However, this shift toward digitalization also exposes Nigeria's tax administration to heightened cyber-security risks, particularly given the country's infrastructural gaps, inconsistent regulations, and low levels of cyber-security awareness (Ojedokun & Idowu, 2021; Tukur & Olayemi, 2022). AI-driven tax administration involves technologies like machine learning, natural language processing, and robotic process automation to streamline processes such as taxpayer registration, compliance monitoring, fraud detection, and engagement. These technologies are especially valuable in tracking digital transactions—such as those involving e-commerce, digital services, and cryptocurrencies—that traditional tax tools struggle to monitor effectively. While AI holds great promise for developing countries, adoption challenges persist. These include inadequate infrastructure like high-speed internet and data centers, limited availability of quality data for training AI models, and underdeveloped regulatory frameworks to govern AI use (Madan & Ashok, 2023; Dwivedi et al., 2021).

Cyber-security is a critical concern as tax systems become more digital and data-driven. AI-powered platforms must be protected from cyber threats that could compromise taxpayer data, disrupt revenue collection, or erode public trust. Many scholars decried the manipulation of taxpayer records and data theft which threaten the tax system's integrity. Chukwunonso & Okoye, (2021) noted some contributing factors to include weak cyber defense mechanisms, inadequate staff training, poor data governance, and insufficient enforcement of cyber laws. Moreover, the rapid rollout of digital tax technologies without corresponding cyber-security frameworks has increased financial and reputational risks. Nigeria's cyber-security framework remains underdeveloped, with many institutions lacking the capacity for proactive threat detection and mitigation (Chukwunonso & Okoye, 2021). Although the Cybercrimes Act (2015) provides a legal basis for combating cyber threats, enforcement tends to be reactive rather than preventive (Adebayo & Olayemi, 2020). Digital taxation—using digital platforms to administer and enforce tax obligations—brings benefits like real-time data access, automation of routine tasks, and enhanced taxpayer engagement (OECD, 2020). Nigeria's adoption of e-filing and digital audit systems demonstrates its commitment to modernizing revenue systems. Yet, AI's integration introduces vulnerabilities including algorithmic bias, data breaches, and cyber-attacks, all of which can undermine taxpayer privacy and trust (Mulligan & Bamberger, 2019; Omoworare, 2022). AI also reshapes the cyber-security landscape itself. On one hand, AI-powered defense tools enhance threat detection, automate incident responses, and predict attacks, thereby improving organizational resilience. On the other hand, cybercriminals leverage AI to launch more sophisticated and automated attacks such as AI-driven phishing, polymorphic malware, and deepfake scams. This dual-use paradox amplifies the scale and precision of cyber threats, making them harder to counter and closer to pandemic proportions (Deloitte, 2025). Despite these opportunities, Nigeria faces significant challenges safeguarding its digital tax infrastructure. Frequent cyber-security breaches affect the effective AI-driven tax administration and if not properly addressed could severely undermine the efficiency, transparency, and credibility of Nigeria's tax administration. Therefore, a critical examination of cyber-security and digital taxation

risks is essential to support effective Nigeria's AI-driven tax administration transformation, hence the study.

Research Questions

1. What are the cyber-security risks associated with the AI-driven tax system in Nigeria?
2. What are those strategies to be adopted to enhance cyber-security in Nigeria's AI-driven tax administration?
3. How do cyber-security threats affect the effectiveness of the digital tax system in Nigeria?

Literature Review

Conceptual Review

Artificial Intelligence and Nigeria's Tax Administration

Artificial Intelligence (AI) involves developing intelligent systems that perceive their environment and act to achieve specific goals, replicating human cognitive functions such as decision-making, learning, and problem-solving (Abhishek et al., 2024; NSTC, 2016). In public sector governance, AI has become transformative by addressing inefficiencies, fraud, and service delivery challenges. Specifically, in tax administration, AI automates operations, enhances compliance, detects fraud, and boosts revenue collection (OECD, 2021; World Bank, 2021). Advanced AI tools like machine learning, natural language processing, robotic process automation, and predictive analytics are extensively used in developed countries to improve risk profiling, compliance monitoring, and taxpayer engagement (Ainsworth & Shact, 2020). By rapidly analyzing large datasets, AI helps uncover tax evasion patterns and supports better decision-making.

In Nigeria, tax administration is crucial for economic stability, with non-oil tax revenue projected to contribute 19.2% of the 2024 federal budget. However, the system faces low compliance and operational inefficiencies. AI and big data adoption are therefore essential for modernizing tax systems, increasing transparency, and aligning with global best practices (Aliyu, 2023). The Finance Act, 2021, empowered the Federal Inland Revenue Service (FIRS) to utilize third-party technologies for tax automation, enabling streamlined taxpayer interactions, pre-filled returns, and real-time data exchange. Tax authorities increasingly use electronic data and analytics to detect fraud and underreporting (OECD, 2023). Integrating AI in Nigeria's tax administration promises improved compliance, efficiency, and reduced administrative burdens. To fully harness AI's benefits, Nigeria must strengthen regulatory frameworks, build staff capacity, and ensure robust data security measures.

Artificial Intelligence in Digital Taxation

The expansion of the digital economy has disrupted traditional tax administration systems, increasing risks such as tax base erosion and profit shifting (BEPS). In response, tax authorities are increasingly leveraging Artificial Intelligence (AI) to improve compliance, enforcement, and the efficiency of digital tax administration. Firstly, AI enhances tax transparency by automating data collection and analysis, providing a comprehensive and accurate view of taxable activities while minimizing human errors (Nembe et al., 2024). Estonia serves as a leading example with its AI-powered pre-filled tax returns, which streamline the filing process and boost data accuracy (Ebers & Tupay, 2023). Secondly, AI-powered machine learning models effectively detect tax evasion and fraud by identifying anomalies and irregular spending patterns that traditional methods often miss (Al-Farooque et al., 2021). This enables tax authorities to prioritize investigations on high-

risk cases, improving enforcement outcomes (Bajpai, 2024). Thirdly, AI aids tax policy evaluation by assessing the impacts of digital tax initiatives such as Digital Services Taxes (DSTs) and VAT reforms on government revenue and taxpayer behavior. It also detects unintended consequences like tax avoidance, supporting evidence-based policy adjustments (Vasarhelyi & Kogan, 2020). Natural language processing (NLP) tools help analyze public feedback, further informing policy improvements. Additionally, AI simplifies compliance and reporting by automating tax calculations, filings, and cross-jurisdictional legal adherence. Countries like the UK and Australia have adopted AI systems for VAT management, enhancing accuracy and reducing administrative burdens (Deloitte, 2025). AI also supports taxpayer identification and profiling through real-time analysis of online data and third-party records, aiding in uncovering unregistered businesses (OECD, 2021). Finally, AI enables risk-based auditing by analyzing historical and industry data to prioritize audit targets, optimizing resource use while ensuring fairness and cost-efficiency (OECD, 2021). Overall, AI is a powerful enabler of transparency, compliance, and policy effectiveness in modern digital taxation systems.

Cyber-security in AI-Driven Tax Administration

As tax administrations worldwide increasingly integrate Artificial Intelligence (AI) to enhance operational efficiency, accuracy, and compliance, the accompanying cyber-security challenges become critical. AI-powered tax systems utilize technologies such as machine learning (ML), big data analytics, and automation to detect fraud, streamline tax filing, and improve taxpayer engagement. However, these advances introduce new vulnerabilities that require robust frameworks to protect data, maintain system resilience, and ensure cyber integrity. Firstly, data protection and privacy concerns are paramount. AI-based tax platforms process extensive sensitive information, including financial records, employment histories, and biometric data, raising issues of privacy, consent, and compliance with regulations (Taddeo & Floridi, 2018). The European Union's General Data Protection Regulation (GDPR) mandates principles like data minimization, purpose limitation, and explicit consent (Voigt & Von dem Bussche, 2017), while Nigeria's Data Protection Regulation (NDPR) emphasizes lawful, transparent, and secure data handling. However, AI's opaque algorithms can conflict with such frameworks (Burrell, 2016). Privacy-preserving AI techniques, including federated learning and differential privacy, offer promising solutions by enabling model training without direct access to raw data, thus protecting user privacy while retaining analytical capability (Abadi et al., 2016). Secondly, cyber threats against AI-powered tax systems are escalating. These include data breaches, ransomware, adversarial attacks, and model inversion, which can manipulate AI models into misclassifying data or leaking sensitive information (Biggio & Roli, 2018; Goodfellow et al., 2015). Attackers may target machine learning pipelines or APIs for unauthorized access. Conversely, AI can bolster cyber defense by enabling real-time system monitoring, anomaly detection, and automated threat response. Methods such as convolutional neural networks (CNNs) and recurrent neural networks (RNNs) effectively detect phishing, malware, and fraudulent activities (Sarker, 2021; Alzaylaee et al., 2020). Finally, building resilient and secure AI tax platforms requires embedding security-by-design principles throughout system lifecycles. This includes secure AI architectures, encrypted data transmission, multi-factor authentication (MFA), secure coding practices, and proactive incident response. Regular audits, penetration testing, and threat modeling

are essential to identify and mitigate vulnerabilities, fostering a secure and trustworthy digital tax environment (ENISA, 2020).

Risks in Nigeria's AI-Driven Tax Administration

As Nigeria advances its tax administration reforms by integrating Artificial Intelligence (AI), it faces multiple challenges spanning technical, institutional, regulatory, and socio-political realms that could undermine the efficiency, security, and fairness of the digital tax ecosystem if not addressed effectively. Firstly, data privacy and protection remain critical concerns. AI tax systems require vast amounts of sensitive data, including personal financial details and biometric information. Although Nigeria's Data Protection Regulation (NDPR) establishes a framework for safeguarding such data, enforcement is weak, especially within government agencies that often lack the institutional capacity to fully comply. This gap exposes taxpayer information to risks such as unauthorized access, insider threats, and misconfigurations, which collectively threaten the trustworthiness of the tax system. Secondly, cyber-security vulnerabilities are significant, as AI-driven tax platforms face increased risks from data breaches, ransomware, and phishing attacks. The problem is exacerbated by outdated IT infrastructure incompatible with modern cyber defenses. Additionally, Nigerian tax authorities generally lack AI-specific security protocols to combat sophisticated threats like adversarial attacks or algorithmic manipulation, leaving AI models susceptible to fraud and system compromise. Thirdly, integration with legacy tax systems presents both technological and administrative obstacles. Existing infrastructures often cannot support AI tools adequately, while the skills gap among tax personnel further impedes effective implementation. The UK's successful adoption of AI, supported by blockchain technology to ensure data integrity and real-time analytics for anomaly detection, offers a valuable model for Nigeria to emulate (Blanco et al., 2022). Furthermore, data quality and accuracy pose challenges. Nigerian tax records are frequently outdated, incomplete, or manually entered, resulting in flawed AI assessments and potential errors in tax enforcement. Finally, algorithmic bias and discrimination arise from poor data quality and uneven data representation, which may unfairly target informal sector participants or vulnerable groups, eroding public trust due to opaque AI decision-making processes. Addressing these challenges is essential for building a secure, equitable, and efficient AI-driven tax administration in Nigeria.

Theoretical Framework

To understand the relationship between cyber-security, digital taxation, and AI-driven tax administration, the following two theories are relevant:

The Technology Acceptance Theory (TAT), developed by Fred Davis in 1986, explains how individuals decide to embrace or reject new technologies based on two key factors: Perceived Usefulness and Perceived Ease of Use. Perceived Usefulness refers to how much a user believes a technology will enhance their job performance, while Perceived Ease of Use relates to the effort required to operate the technology effectively. In the context of Nigeria's AI-driven digital tax systems, TAT is crucial because user acceptance directly impacts the success of technology adoption. Studies like Ogunleye et al. (2023) show that tax officials are more willing to use AI-powered tools when they recognize their value in improving compliance monitoring and fraud detection. However, challenges persist, as highlighted by Afolayan and Ojo (2022), who found that many individual taxpayers and SMEs face difficulties due to complex user interfaces, low digital literacy,

and limited internet access, all of which reduce the perceived ease of use. Additionally, Abdullahi and Okeke (2023) emphasize that cybersecurity concerns, including weak enforcement of data protection laws like Nigeria's Data Protection Act (2023), undermine trust and discourage adoption. Therefore, an extended version of TAT, which incorporates trust, perceived risk, and awareness, offers a more comprehensive framework for understanding technology adoption behaviors in Nigeria's evolving tax environment.

The Cyber-security Risk Management Framework (CRMF), developed by the National Institute of Standards and Technology (NIST), provides a structured approach to managing cyber risks through five core functions: Identify, Protect, Detect, Respond, and Recover. This framework is essential for securing AI-driven tax systems in Nigeria, where threats such as malware, phishing, and ransomware are increasing, especially as platforms like FIRS's TaxPro-Max expand. CRMF guides organizations in pinpointing vulnerabilities, implementing protections like encryption and two-factor authentication, deploying monitoring systems, and preparing for incident response and recovery. However, many Nigerian institutions face significant challenges in adopting CRMF effectively. Oluwatosin et al. (2023) report that public financial bodies often lack cyber risk registers and regular penetration testing, relying instead on outdated manual logs and IT tools, which hinders timely threat detection and mitigation. The International Telecommunication Union (ITU, 2023) confirms that Nigeria's cyber-security maturity scores below global averages, especially in continuous monitoring and incident readiness. Consequently, adopting CRMF is vital for enhancing resilience, governance, and operational continuity in Nigeria's AI-powered tax administration systems.

Empirical Review

Recent empirical studies emphasize the growing role of artificial intelligence (AI) and digital technology in improving tax compliance, administration efficiency, and cybersecurity in Nigeria, albeit with notable limitations and policy implications.

Eke et al. (2025) explored how broadcast media and AI contribute to combating corruption in Nigeria, particularly through enhancing cybersecurity. Using thematic analysis grounded in technological determinism theory, the study found that AI has significantly improved Nigeria's cyber-security landscape through real-time threat detection, predictive analytics, and automated responses. However, its adoption remains constrained due to a lack of AI expertise, insufficient datasets, and high implementation costs—especially for small and medium-sized enterprises (SMEs). The study concluded with recommendations for increased investment in AI tools and continuous training of cybersecurity professionals to bolster digital resilience.

Tolulope (2025) investigated AI integration in tax systems and its impact on compliance and detection of non-compliance. Through literature review and case study analysis, the study affirmed that AI improves compliance by identifying irregular patterns and predicting evasion risks. However, ethical and privacy issues, such as data misuse and surveillance concerns, were flagged. The study advocated for robust safeguards to accompany AI adoption, suggesting that AI, when ethically managed, promotes both efficiency and fairness in tax administration.

Yusuf (2025) focused on the impact of digital transformation on tax evasion in Kwara State. Using a cross-sectional design and data from 499 stakeholders, the study applied Partial Least Squares Structural Equation Modeling (PLS-SEM) and found that electronic

tax identification and clearance systems significantly reduced tax evasion. The study emphasized that digital transformation enhances revenue performance and recommended continued investment in technology and taxpayer education.

Kehinde et al. (2024) examined the application of AI—specifically machine learning, deep learning, and natural language processing—in fraud detection. Drawing from theory and global practices, they observed that AI technologies increased fraud detection accuracy by up to 85% compared to traditional methods. Despite these advantages, the study noted regulatory and ethical concerns and proposed policy measures to ensure transparency, accountability, and fairness in AI-enabled tax systems.

Rida and El Houssain (2024) conducted a systematic review of 62 studies using PRISMA methodology to evaluate the effect of digital technologies—AI, machine learning, and blockchain—on tax compliance. Their findings indicated significant improvements in compliance and operational efficiency. However, integration challenges in developing economies, such as Nigeria, were evident. The study called for strategic planning, capacity building, and SME-focused support to fully leverage Tax Administration 3.0 initiatives.

Chimenka et al. (2024) analyzed how digital technology adoption affects tax audit effectiveness in Nigeria's Federal Inland Revenue Service (FIRS). Using structured questionnaires and PLS-SEM, the study concluded that data analytics, blockchain, and cloud computing enhance audit efficiency and accuracy. Interestingly, AI and machine learning were found to have no significant impact on tax audits, possibly due to implementation challenges or underutilization.

Gbenga et al. (2024) studied digital tax administration and tax compliance among informal sector operators in Southwest Nigeria. Surveying 547 respondents, including artisans and street vendors, they found that digital payment platforms and user technical competence significantly influence compliance. The study concluded that enhancing digital literacy and expanding access to payment technologies could positively shape tax behavior in the informal sector.

Contrastingly, Audu and Ishola (2021) analyzed the impact of digitalization on tax administration from 2010 to 2017 using *ex post facto* design and linear regression. Their findings showed that ICT had a statistically non-significant effect on both tax revenue and tax evasion. They recommended enacting enabling legislation to ensure tax systems are responsive to the digital economy.

Raphael et al. (2020) also reported a negative relationship between digitalization and tax compliance in a study conducted in Akwa Ibom State. Using surveys and regression analysis, they concluded that poor integration and lack of tax policies targeting e-transactions undermined compliance. They urged the Nigerian government to incorporate e-transaction taxation into the national tax framework and enhance tax education.

Method

The study employed a survey research design aimed at assessing the effect of cybersecurity threats on digital taxation. The target population comprised employees of the Federal Inland Revenue Service (FIRS) in Nigeria. A purposive sampling technique was adopted to select a sample of 100 participants, and all 100 administered questionnaires were correctly completed and returned. Data collection was conducted using a structured questionnaire designed in a four-point Likert scale format (Strongly

Agree to Strongly Disagree), allowing respondents to indicate their level of agreement with the research items. The questionnaire was distributed electronically via Google Forms using the social media platforms of the selected respondents. Descriptive statistics—frequencies, percentages, and mean—were used to analyze responses to the research questions and demographic information, while multiple regression analysis was used to test the hypotheses.

The model used was: Digital taxation = $\beta_0 + \beta_1(\text{cybersecurity threats}) + \mu$.

The decision rule for analyzing the research questions stipulated that a mean score of 2.5 or higher indicates acceptance, while a score below 2.5 indicates rejection. For hypotheses testing, the null hypothesis was accepted when the p-value exceeded 0.05; otherwise, it was rejected in favor of the alternative hypothesis. This methodological approach ensured both the reliability and statistical relevance of the findings.

Estimation of Results and Discussion of Findings

Data Presentation

The analysis focused on cyber-security and digital taxation: addressing risks in Nigeria's AI-driven tax administration. The study addressed three major questions (i) to identify the cyber-security risks in AI-driven tax system, (ii) to recommend strategies for improving cyber-security in AI-driven tax administration in Nigeria and (iii) to examine the impact of cyber-security threats on digital tax system in Nigeria. 100 questionnaires were distributed to the staff of FIRS and all the questionnaires were correctly filled and returned.

Data Analysis.

The data were analyzed using both descriptive statistics and simple regression analysis.

Cyber-security risks in AI-driven tax system

Table 4.1 Result on Cyber-security risks in AI-driven tax system

	SA	A	D	SD	Mean	STD
Data breaches	50	42	6	2	3.4000	0.69631
System hacking	59	35	4	2	3.5100	0.67412
Identity theft	46	48	5	1	3.3900	0.63397
AI system manipulation	55	34	9	2	3.4200	0.74101
Insider threats	60	34	5	1	3.5200	0.64322

Source: SPSS result extracted from Appendix 2

The result in table 4.1 shows that descriptive statistics of cyber-security risks associated with AI-driven tax system. All the variables have mean values greater than 2.5 (criterion mean), which implies that data breaches, system hacking, identity theft, AI system manipulation and insider threats are the cyber-security risks associated with AI-driven tax system. This finding is line with that of Biggio and Roli (2018); Goodfellow et al., (2015), which states that AI models can be manipulated by malicious actors to evade detection, poison datasets, or extract sensitive information from trained systems. Adversarial attacks involve subtly altering input data to deceive AI models into misclassification, potentially

allowing fraudulent tax filings to pass undetected. Additionally, attackers may exploit vulnerabilities in machine learning pipelines or cloud-based APIs used by tax agencies.

Strategies for improving cyber-security in AI-driven tax administration in Nigeria
Table 4.2 Result on the Strategies for improving cyber-security in AI-driven tax administration in Nigeria.

	SA	A	D	SD	Mean	STD
Strengthen laws and regulations	40	40	15	5	3.1500	0.85723
Invest in secure AI technologies	45	40	12	3	3.2700	0.78951
Staff training and capacity building	50	35	8	7	3.2800	0.88854
Establish independent cyber-security oversight	35	50	8	7	3.1300	0.83672
International collaboration	50	30	10	10	3.1500	0.85723

Source: SPSS result extracted from Appendix 3

The result in table 4.2 shows that descriptive statistics of the strategies for improving cyber-security in AI-driven tax administration in Nigeria. All the variables have mean values greater than 2.5 (criterion mean), which implies that strengthen laws and regulations, invest in secure AI technologies, staff training and capacity building, establish independent cyber-security oversight and international collaboration are the strategies for improving cyber-security in AI-driven tax administration in Nigeria. This finding is line with that of Gbenga et al. (2024) investigated digital tax administration influences tax compliance among informal sector operators in Nigeria’s Southwest states. In their study, they revealed that strengthen laws and regulations, invest in secure AI technologies, staff training and capacity building as well as establish independent cyber-security oversight and international collaboration are the strategies for improving digital tax administration in Nigeria.

Regression Analysis

Dependent variable: Digital Taxation

Parameters	Coefficient	Std Error	T-statistics	P-value
Constant	0.588	0.116	5.080	0.000
CYBER SECURITY THREATS	0.852	0.035	24.025	0.000
R-Square	0.855			
Adjusted R-Square	0.853			
F-statistics	577.202			
P-value	0.0000			

Source: SPSS result extracted from Appendix 4

Table 4.3 presents the regression results analyzing the effect of cyber-security threats on digital taxation. The model’s R² value is 0.855, indicating that 85.5% of the variation in digital taxation can be explained by changes in cyber-security threats, while the remaining 14.5% is attributed to other factors not included in the model. The adjusted R² value of 0.852 shows only a slight reduction from the R², suggesting that the model remains robust and reliable even when accounting for other potential variables. The constant term of 0.588 means that if cyber-security threats are held constant, digital taxation would still increase by 0.588% due to other factors not covered in this study. Importantly, the

coefficient for cyber-security threats is 0.852, implying that a one-unit increase in cyber-security threats results in an 85.2% increase in digital taxation, demonstrating a strong positive relationship between the two variables. The F-statistic of 577.202 with a p-value of 0.0000 confirms that this relationship is statistically significant at the 5% level.

These findings align with Tolulope (2025), who found that integrating AI technologies into tax systems enhances compliance and enables early detection of tax evasion, thereby improving efficiency and fairness in tax collection. Similarly, Yusuf (2025) observed that digital transformation, through electronic tax identification and clearance certificates, significantly reduces tax evasion and boosts revenue performance in Kwara State, Nigeria. However, the findings contrast with Raphael et al. (2020), whose study suggested that digitalization negatively affects tax compliance in Nigeria, highlighting that technological adoption alone may not guarantee improved tax outcomes without adequate policies and capacity-building. Overall, the current results affirm that addressing cyber-security threats plays a critical role in enhancing digital taxation effectiveness in Nigeria.

Conclusion

The study examined cyber-security risks affecting Nigeria's AI-driven digital tax administration, focusing on the Federal Inland Revenue Service (FIRS). The findings revealed major threats such as data breaches, system hacking, identity theft, AI system manipulation, and insider threats, all significantly impacting digital taxation. These risks highlight the urgent need for robust mitigation strategies. Recommendations include strengthening regulatory frameworks, investing in secure AI technologies, enhancing staff training, establishing independent oversight bodies, and promoting international collaboration. The study concludes that AI plays a vital role in improving Nigeria's digital tax resilience through proactive threat detection, automated responses, and intelligent risk prediction. However, maximizing these benefits requires significant investment in AI infrastructure and skilled personnel, as well as integrated security systems that balance automation with human oversight. Additionally, AI deployment introduces ethical and policy challenges related to data privacy, algorithmic transparency, and legal accountability. The absence of clear regulations exposes the tax system to vulnerabilities, underscoring the need for comprehensive governance frameworks. By adopting enforceable data protection laws, clear accountability standards, and aligning with global best practices, Nigeria can develop a secure, efficient, and ethically sound AI-driven digital tax administration.

Recommendations

In view of the findings from the work, the following recommendations have been made.

1. Nigerian tax authorities should implement advanced AI-powered threat detection systems with real-time monitoring, machine learning capabilities, and mandatory multi-factor authentication to safeguard digital tax operations.
2. The Nigerian government must develop and enforce a comprehensive regulatory framework that includes ethical AI guidelines, data privacy protections, and clear accountability standards for AI use in tax administration.

3. Continuous training programs focusing on cyber risk management, AI literacy, and ethical practices should be established for FIRS and state tax personnel to enhance their capacity to manage AI-driven tax systems securely.

Policy Implications

- 1) The study underscores the need for policymakers to prioritize robust cyber-security measures in AI-driven digital taxation to mitigate significant threats impacting tax administration effectiveness in Nigeria.
- 2) It highlights the importance of developing targeted policies addressing specific cyber-security risks such as insider threats and AI system manipulation within Nigeria's tax administration.
- 3) The research advocates for the formulation of comprehensive regulatory frameworks and investment in continuous capacity-building programs to ensure ethical, secure, and effective AI integration in tax systems.

References

- Abadi, M., Chu, A., Goodfellow, I., McMahan, B. H., Mironov, I., Talwar, K., & Zhang, L. (2016). Deep learning with differential privacy. *Proceedings of the 2016 ACM SIGSAC Conference on Computer and Communications Security*, 308–318.
- Abdullahi, I., & Okeke, F. (2023). Cybersecurity and taxpayer confidence in Nigeria's digital revenue system. *Nigerian Journal of ICT and Law*, 8(2), 101–120.
- Abhishek, N., Suraj, N., Rahiman, H. U., Nawaz, N., Kodikal, R., Kulal, A., & Raj, K. (2024). Digital transformation in accounting: elevating effectiveness across accounting, auditing, reporting and regulatory compliance. *Journal of Accounting & Organizational Change*.
- Adebayo, R., & Olayemi, O. (2020). Cybercrime and the Challenges of Cybersecurity in Nigeria. *Journal of African Law and Digital Governance*, 5(2), 45–61.
- Adebisi, J. F., & Gbegi, D. O. (2020). Tax Administration in the Digital Era: The Nigerian Experience. *International Journal of Academic Research in Business and Social Sciences*, 10(5), 176–189.
- Afolayan, T. O., & Ojo, J. (2022). Perceived challenges of e-taxation among SMEs in Nigeria. *African Journal of Digital Economy*, 5(1), 22–35.
- Al-Farooque, O., Cravens, K. S., & Rahman, M. A. (2021). Artificial intelligence and tax compliance: A systematic literature review. *Journal of International Accounting, Auditing and Taxation*, 43, 100393
- Aliyu, C. V. (2023). Transforming Nigeria's Tax System with AI and Big Data. Retrieved May 7 2025, from Chivian Technology website: <https://medium.com/chivian-technology/transforming-nigerias-tax-system-with-ai-and-big-data-1cee32f448fe>
- Alzaylaee, M. K., Yerima, S. Y., & Sezer, S. (2020). DL-Droid: Deep learning-based android malware detection using real devices. *Computers & Security*, 89, 101663.
- Audu S. I., & Ishola, K. (2021). Digital economy and tax administration in Nigeria. *Global Scientific Journals. Vol. 9 (9).pp 1251- 1262*
- Bajpai, D. A. (2024). Evaluating the Impact of Artificial Intelligence on Enhancing Tax Compliance and Financial Regulation. Available at SSRN: <https://ssrn.com/abstract=4922459>
- Biggio, B., & Roli, F. (2018). Wild patterns: Ten years after the rise of adversarial machine learning. *Pattern Recognition*, 84, 317–331.
- Blanco, G., de Coninck, H. C., Agbemabiese, L., Anadon, L. D., Lim, Y. S., Pengue, W. A., ... & Winkler, H. (2022). Innovation, technology development and transfer. In IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change (pp. 2674-2814). Cambridge University Press.

- Burrell, J. (2016). How the machine ‘thinks’: Understanding opacity in machine learning algorithms. *Big Data & Society*, 3(1).
- Chimenka, E., Murtadho, A. A., Sarafadeen, D., & Akeem, A. A. (2024). The Influence Of Artificial Intelligence (Ai) And Machine Learning on Tax Audits In Nigeria. *Journal of Liaoning Technical University, Natural Science Edition. Vol 18 (12)*, pp. 75-87
- Chukwunonso, F. N., & Okoye, E. I. (2021). Tax Digitalization and the Risk of Cyber Threats in Nigeria: A Critical Assessment. *Nigerian Journal of Taxation and Public Finance*, 3(1), 67–81.
- Davis, F. D. (1986). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340.
- Deloitte (2025). Nigeria Cybersecurity Outlook 2025
- Deloitte. (2025). VAT in the digital age: The future of VAT compliance. Retrieved from <https://www.deloitte.com/nl/en/services/tax/perspectives/vat-in-the-digital-age.html>
- Dwivedi, Y. K., Hughes, L., Ismagilova, E., Aarts, G., Coombs, C., Crick, T., & Williams, M. D. (2021). Artificial Intelligence (AI): Multidisciplinary perspectives on emerging challenges, opportunities, and agenda for research, practice and policy. *International journal of information management*, 57, 101994.
- Ebers, M., & Tupay, P. K. (2023). Artificial Intelligence and Machine Learning Powered Public Service Delivery in Estonia: Opportunities and Legal Challenges. Springer
- Eke, C., Ikebude, O. D., & Okure, E. G. (2025). Artificial Intelligence and Cyber-Security in Nigeria: Communicative Strategies for Risk Mitigation and Opportunities in Digital Security. *Top Academic Journal of Humanities and Social Sciences Vol.10, Issue 2*.
- ENISA.(2020). AI Cybersecurity Challenges – Threat Landscape for Artificial Intelligence. European Union Agency for Cybersecurity.
- Gbenga, A. F., Mustafa, S. D., Faraj, G. A., & Muyiwa, E. D. (2024). Digital Tax Administration and Tax Compliance in Nigerian Informal Sector. *Economy, Business & Development* 5(2), 32-45
- Goodfellow, I., Shlens, J., & Szegedy, C. (2015). Explaining and harnessing adversarial examples. *International Conference on Learning Representations (ICLR)*.
- International Telecommunication Union (ITU, 2023). Global Cybersecurity Index 2023 Report. Geneva: ITU Publications.
- Kehinde, O. A., Oluwashola, F. B., Tolulope, F. E., Oladiipo, I. O., Ifeoluwa, U. W. & Ebenezer, O. M. (2024). Leveraging Artificial Intelligence for enhanced tax fraud detection in modern fiscal Systems. *GSC Advanced Research and Reviews*, 21(02), 129-137
- Madan, R., & Ashok, M. (2023). AI adoption and diffusion in public administration: A systematic literature review and future research agenda. *Government Information Quarterly*, 40(1), 101774.
- Mohammad, H. S., & Mashiyat, T. (2022). Artificial Intelligence and Tax Administration in Asia and the Pacific July 2022 DOI:10.4324/9781003196020-4(pp.45-55).
- Mpofu, F. Y. (2024). Prospects, Challenges, and Implications of Deploying Artificial Intelligence in Tax Administration in Developing Countries. *Studia Universitatis Babes Bolyai-Negotia*, 69(3), 39–78.
- Mulligan, D. K., & Bamberger, K. A. (2019). Privacy in the Age of Machine Learning. Cambridge University Press.
- National Science and Technology Council - NSTC, 2016
- Nembe, J. K., Atadoga, J. O., Mhlongo, N. Z., Falaiye, T., Olubusola, O., Daraojimba, A. I., & Oguejiofor, B. B. (2024). The role of artificial intelligence in enhancing tax

- compliance and financial regulation. *Finance & Accounting Research Journal*, 6(2), 241-251.
- NIST (2021). Framework for Improving Critical Infrastructure Cybersecurity, Version 1.1. National Institute of Standards and Technology. Retrieved from: <https://www.nist.gov/cyberframework>
- NITDA (2021). Nigeria Data Protection Regulation Performance Report. National Information Technology Development Agency.
- OECD (2023), Tax Administration 2023: Comparative Information on OECD and other Advanced and Emerging Economies, OECD Publishing,
- OECD (2020). Tax Administration 3.0: The Digital Transformation of Tax Administration. OECD Publishing.
- OECD (2021). *Digital Transformation in Tax Administration*. OECD Publishing.
- OECD (2021). Tax Administration 2021: Comparative Information on OECD and other Advanced and Emerging Economies. Paris: OECD Publishing.
- Ogunleye, P., Chukwuma, E., & Bello, R. (2023). AI-Driven Tax Systems: Adoption and Security Challenges in Nigeria. *Journal of Financial Technology*, 14(4), 67–89.
- Ojedokun, A. Y., & Idowu, A. O. (2021). Cybersecurity Readiness in Nigeria's Public Sector: Challenges and Recommendations. *Journal of Cybersecurity and Information Management*, 5(2), 112–129.
- Ojo, Adefisayo. (2024). Integrating Outcome-Based Education into the Undergraduate Mathematics Curriculum. *International Journal of Latest Research in Humanities and Social Science Vol 7(7)*, 14-21
- Oluwatosin, K., Abiola, R., & Emeka, U. (2023). Cyber-risk vulnerabilities in AI-powered public financial systems in Nigeria. *Journal of Information Security and Governance*, 7(1), 35–52.
- Omowore, L. (2022). Artificial Intelligence and the Future of Taxation in Nigeria: Prospects and Pitfalls. *Nigerian Law and Technology Journal*, 6(1), 98–115.
- Raphael, S. E., Mfon, S. J., & Patrick, B. S. D. (2020). Tax Compliance and Digitalization of Nigerian Economy: The Empirical Review. *American International Journal of Social Science Vol. 9, No. 2*.
- Rida, B. & El Houssain, A. (2024). Digital taxation, artificial intelligence and Tax Administration 3.0: improving tax compliance behavior – a systematic literature review using textometry (2016–2023). *Accounting Research Journal*. 1030-9616
- Sarker, I. H. (2021). Machine learning: Algorithms, real-world applications and research directions. *SN Computer Science*, 2, 160.
- Taddeo, M., & Floridi, L. (2018). How AI can be a force for good. *Science*, 361(6404), 751–752.
- Tolulope, A. (2025). The role of AI in enhancing tax transparency and reducing evasion. *World Journal of Advanced Research and Reviews, Vol 25(01)*, 206-212
- Tukur, A., & Olayemi, A. (2022). Emerging Cybersecurity Threats in Nigeria's Financial Services Sector. *Nigerian Journal of Information Security*, 3(1), 34–45.
- Vasarhelyi, M. A., & Kogan, A. (2020). Artificial intelligence and the future of accountancy. *Accounting Horizons*, 34(4), 147–158.
- Voigt, P., & Von dem Bussche, A. (2017). The EU General Data Protection Regulation (GDPR). Springer.
- World Bank (2021). Digital Technologies and the Future of Tax Administration in Africa.
- Yusuf, A. O. (2025). Digital Transformation in Taxation and Tax Evasion in Nigeria: Insights from Kwara State. *Nigerian Journal of Banking and Financial Issues (NJBFI) - Vol 11, No. 1*