

THE IMPACT OF CLOUD COMPUTING PLATFORMS ON TAX AUDIT IN NIGERIA

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Abstract

This study investigates the impact of digital technology adoption on tax audit effectiveness within the Federal Inland Revenue Service (FIRS) in Nigeria. A cross-sectional research design is employed, utilizing primary data collected through structured questionnaires distributed among FIRS staff. The sample size, determined using the Yamane formula, is 386, with respondents selected using stratified random sampling to ensure representation across various cadre levels. The data collected is analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM). The findings reveal that data analytics platforms, blockchain technology, and cloud computing significantly improve tax audits, contributing to enhanced audit accuracy, efficiency, and transparency. However, the study finds no significant impact of AI and machine learning on the effectiveness of tax audits in the Nigerian context. The research also highlights the crucial role of cybersecurity solutions in protecting taxpayer data and ensuring the integrity of the tax audit process. These findings are in line with global trends where technology-driven solutions have been pivotal in transforming tax administration. This study concludes that the adoption of advanced technologies in tax audits holds substantial promise for improving the Nigerian tax system, though challenges such as infrastructure limitations and resistance to change must be addressed. Recommendations include further investment in training tax auditors, enhancing digital infrastructure, and fostering greater collaboration between government agencies and technology providers.

Keywords: Cloud computation, Technology, Cyber security, Artificial intelligent, tax payer, government revenue

Introduction

For decades, tax administrations especially in Nigeria has not yielded the desired revenue outcomes. This is because increased management costs resulting in reduced revenue collection, non – tax compliance, uncertainty on the amount payable, information asymmetry, tax evasion as well as avoidance possess serious challenge to tax administration in Nigeria (Ajakaiye, 2018). Furthermore, Nigerian economy is monocultural with more than 85 percent of the government revenue derivable from the sales of crude oil. This over reliance on crude oil sales puts the country at risk of revenue crisis anytime there is negative shocks in international oil market as experienced in 2016 and 2019 respectively when crude oil prices plunged below \$35 per barrel in 2016 and 2019 (Irefe-Esema & Akinmade 2020). These have necessitated the need for government at all levels to develop revenue raising strategies via diversification of the revenue sources.

One major option that easily comes to mind is taxation as taxes are vital approach to raising enhanced revenue of the government at all levels via the adoption of efficient and effective tax administration (Adebisi & Gbegi 2013). However, it is well established in extant studies that Nigerian taxpayers are good at taking advantages of the loopholes in tax policy to either avoid tax or totally evade it. Consequently, a key measure in tax administration towards limiting tax evasion and avoidance as well as ensuring absolute compliance with tax laws is tax audit (Amah & Nwaiwu, 2018). Nonetheless, the success of Nigeria tax audit is usually negligible due to long period taken for many audit tax exercises to be completed. These are major reasons behind the idea of adopting digital technology in tax administration.

Similarly, the prospect of any nation depends on the amount of revenue the government generates and its usage to both provide and improve available public goods. Thus, role of taxation as the mainstream source of funding for government expenditures across the globe cannot be over-emphasized. It is the constitutional right of governments all over the world to collect taxes from their citizens and businesses with the primary objective of generating revenues for government spending. One known fact is that most public projects embarked upon by various tiers of government in developed countries are financed through taxes collected from individuals and business entities. Once a government is in place through legal means, the citizens are not just obligated to pay but pay the right amount of taxes in line with the applicable laws and regulations in that jurisdiction. However, in Nigeria, increased cost of tax management coupled with loopholes in revenue collection have presented a lot of challenges in tax compliance. According to Benjamin Franklin (Balakrishnan et al., 2011), only two certainties in life are death and taxes. In most jurisdictions, taxable businesses or individuals are required to be evaluated by the appropriate revenue agency or to conduct a self-assessment of applicable taxes in accordance with the Self-Assessment regulation, if implemented in that jurisdiction. Taxes are often classified into direct taxes (such as personal income taxes, corporate income taxes, and capital gains taxes) and indirect taxes (including value-added taxes, stamp duties, and sales taxes).

Simultaneously, the obligation assigned to tax authorities (revenue agencies) to collect taxes for a government is typically a formidable and arduous endeavour, irrespective of the jurisdiction's level of development. This is mostly due to people and businesses consistently seeking to minimise or eliminate tax liabilities, prompting them to engage in various tax avoidance and

evasion strategies to reduce or entirely evade tax obligations. These unscrupulous tactics employed to minimise tax liabilities often lead to disputes and confrontations between taxable businesses or individuals and the tax authorities, whose responsibility is to maximise income for the government in accordance with relevant rules and regulations. These unscrupulous tactics seem to be more prevalent in emerging nations than in developed ones, as their tax-to-GDP ratios typically remain below the 15% benchmark recommended by the World Bank and International Monetary Fund (IMF). To address this issue, the Nigerian government has devised solutions, including the design and execution of various tax legislation and tax audits. Nonetheless, the attainment of these diverse tax rules and audits is exceedingly low due to the time lag associated with the completion of the audit process. This also necessitates the deployment of technology in tax audits to enhance revenue generation.

Additionally, tax matters are a priority for African governments, as former UK Prime Minister David Cameron utilised the UK's G8 leadership to advocate for enhanced measures to promote commerce, tax compliance, and transparency (Margalioth 2003). Furthermore, developing nations possess the requisite information and capability to collect the taxes owed to them, and other countries are obligated to assist them in accordance with Clause 4 of the Lough Erne Declaration, proclaimed during the G8 summit in June 2013 (Gurama & Mansor 2015). Many governments, primarily emerging nations, are struggling to generate sufficient cash to meet their expenditures. Their projected revenues consistently fall short of expected expenditures, necessitating a reliance on foreign help and loans to address the resulting deficit and imbalance. Taxation is widely regarded as the most suitable, efficient, and effective method for governments to generate income. This consequently compels governments to provide public goods and services essential for enhancing individuals' living situations.

To maintain fiscal discipline and optimise tax revenue collection for the government, numerous revenue agencies, particularly in developed nations, have adopted digital technologies to enhance their operational efficiency and effectiveness. The implementation of digital technologies seems to have enhanced the effectiveness of tax agencies in many jurisdictions; yet, many others continue to face challenges, as indicated by their tax-to-GDP ratios. It is not unexpected that technology has impacted the design and administration of tax systems in developing countries, as most nations have transitioned from clerks manually recording entries in extensive ledger books—or, as noted in one country in the early 1990s, using pencil on small sheets of paper—to the prevalent utilisation of computers for tax system management (Bird and Zolt, 2008). The utilisation of digital technology in government operations, such as tax administration, is essential for achieving efficient and effective service delivery. The integration of digital technologies in governmental operations has led to the emergence of the term “e-government.”

Governments worldwide have utilised information and communication technology (ICT) for decades to enhance service delivery to their residents. Tax administration is not exempt; as information and communication technology and computational capabilities progress, tax agencies and authorities are afforded greater opportunities to enhance service quality while reducing expenses. The electronic tax (e-tax) payment system is an ICT application that enhances tax collection efficiency by eliminating the necessity for taxpayers to engage in physical interactions with tax authorities during tax payments. It enables taxpayers to remit their taxes online from the convenience of their offices or residences. Although the concept of

electronic tax payment originated in the United States, several technologically advanced nations, particularly specific African countries, have rapidly embraced this system with differing levels of success.

Cloud computing platforms

Cloud computing solutions provide scalable and flexible resources via the internet, enabling users to access and manage computing resources as needed. Mell and Grance (2011) Cloud computing is characterised as a model that facilitates ubiquitous, easy, on-demand network access to a shared pool of programmable computer resources. These resources can be swiftly allocated and deallocated with minimal administrative work. This paradigm offers a comprehensive array of services encompassing infrastructure, platforms, and software. Armstrong et al., (2014) Cloud computing solutions offer immediate access to a communal reservoir of adjustable computer resources, including servers, storage, and applications. They are engineered to provide scalability and efficiency, reducing the necessity for physical infrastructure administration.

Cloud computing is a framework that facilitates ubiquitous, easy, on-demand network access to a shared reservoir of programmable computer resources. These resources can be swiftly provided and decommissioned with minimal administrative effort or service provider engagement (Martinez). The term encapsulates the core of cloud computing's accessibility, highlighting that it enables users to use computing resources from any location, at any time, with minimal inconvenience. This underscores a major advantage of cloud computing—the capacity to acquire resources on demand, hence facilitating flexibility and scalability. This component emphasises the cloud's capacity to aggregate resources that can be customised to particular requirements, minimising redundancy and enhancing resource efficiency. The concept accurately highlights the efficacy of cloud services in rapidly scaling up or down, which is crucial for accommodating fluctuating demands. It underscores a major benefit of the cloud—diminishing the administrative load on users through the abstraction of infrastructure management. The definition should include security and privacy considerations, which are essential elements of cloud computing that influence user trust and compliance. It may be beneficial to succinctly address the various service models (IaaS, PaaS, SaaS) within the definition to enhance comprehension of the cloud computing spectrum. The definition provided by Mell and Grance is comprehensive and encompasses the essential elements of cloud computing, however it might be augmented to include more dimensions pertinent to a complete understanding of the technology.

Cloud computing solutions offer immediate access to a communal reservoir of adjustable computer resources, including servers, storage, and applications. They provide scalable resources and are intended to reduce the necessity for physical infrastructure management (Armstrong et al., 2014). The definition precisely emphasises the cloud's primary advantage of offering instant access to resources as required, illustrating a fundamental value of cloud computing. This underscores the efficacy of cloud platforms in aggregating and administering resources that may be customised to address particular requirements, which is essential to cloud computing. The reference to scalability is essential, since it highlights the cloud's capacity to dynamically modify resources according to demand, which is a considerable advantage for users. The definition, although addressing servers, storage, and applications, would be enhanced

by a succinct reference to additional resource types such as databases and networking components for a more comprehensive perspective. The definition could be improved by incorporating a succinct reference to the various service models (IaaS, PaaS, SaaS), so providing a greater understanding of the cloud computing ecosystem. Armbrust et al.'s description succinctly encapsulates the fundamental attributes of cloud computing systems, emphasising their scalability, on-demand qualities, and diminished need for physical infrastructure administration. Incorporating further data regarding resource kinds, service and deployment patterns, and security considerations would enhance the overall comprehension of cloud computing.

Cloud computing is a paradigm that facilitates universal, convenient, and on-demand network access to a shared reservoir of programmable computing resources. These resources can be swiftly allocated and relinquished with minimal management exertion (Vaquero et al. 2009). This underscores the primary advantages of cloud computing—ubiquitous access, user-friendliness, and on-demand availability, which are essential components of cloud computing. This encapsulates the fundamental principles of cloud computing, specifically its resource pooling and configurability, highlighting its essential capabilities. The definition could be improved by delineating the sorts of resources (e.g., servers, storage, applications, databases), thereby offering a more precise picture of what comprises the "pool of configurable computing resources." A brief overview of various service models (IaaS, PaaS, SaaS) and deployment models (public, private, hybrid) might enhance the understanding of cloud computing's offers. Incorporating a remark regarding the significance of security and compliance in cloud computing could provide essential context, as these factors are vital for several users when evaluating cloud services. The definition should also include how cloud computing connects with current systems and its interoperability features, which are crucial for practical deployment. Vaquero et al.'s definition succinctly encapsulates the essential characteristics of cloud computing, emphasising its accessibility, flexibility, and reduced administration demands. Augmenting the definition with further specifics regarding resource kinds, service and deployment patterns, security issues, and integration facets will yield a more comprehensive and pragmatic comprehension of cloud computing.

Theoretical Framework

Contingency Theory

The contingency theory was introduced by Fiedler in 1964. Contingency Theory is a principle in organisational management and decision-making that posits there is no universal method for managing organisations. The most effective management methods and structures depend on various internal and external factors. The contingency hypothesis underscores the significance of both the leader's character and the context in which the leader functions. Contingency Theory asserts that the efficacy of management methods and organisational structures is contingent upon particular situational variables. There is no universally superior method for organising or leading a firm; rather, the most effective strategy is contingent upon the specific circumstances encountered by the organisation (Ghofar & Islam 2015).

Organizations must adapt their management practices, structures, and strategies to fit the external environment in which they operate (Csaszar & Ostler, 2020) This includes factors such

as market conditions, technological changes, and regulatory requirements. Internal factors such as the organization's size, technology, and structure also influence which management practices will be most effective. For instance, a large organization with complex operations may benefit from a more hierarchical structure, while a smaller, innovative company might thrive with a more flexible, decentralized approach. The effectiveness of a particular management practice or organizational structure may change over time as internal and external conditions evolve. Organizations need to remain adaptable and responsive to these changes to maintain effectiveness (Ganescu, 2012).

One of the earliest contributors to Contingency Theory, Fiedler's Contingency Model focuses on leadership effectiveness, suggesting that a leader's effectiveness is contingent upon the match between their leadership style and the situational context. He proposed that there are two main leadership styles: task-oriented and relationship-oriented, and their effectiveness depends on the situation's favorableness. They extended Contingency Theory to organizational structure and design. Their research indicated that different environments require different organizational structures. For example, organizations operating in dynamic environments may need more flexible and adaptive structures, while those in stable environments can rely on more rigid, formal structures. Craigen et al. (2014) research focused on technology and its impact on organizational structure. She found that organizations using different types of technology (e.g., small batch production, mass production) required different organizational structures to be effective

Contingency Theory assists managers in formulating organisational structures that correspond to their particular requirements and environments (Csaszar & Ostler 2020). A startup in a dynamic industry may implement a flat, adaptable structure, whereas a huge manufacturing company may utilise a hierarchical, specialised structure. The notion posits that effective leadership styles are contingent upon situational conditions. Leaders must evaluate their surroundings and modify their leadership strategies accordingly. In a crisis, a prescriptive leadership style may be essential, whereas in stable situations, a participative approach may prove more effective (Desai & Dharmapala 2006).

Organizations can use Contingency Theory to develop strategies that align with their external environment and internal capabilities (McAdam et al 2019). Strategies should be tailored to fit the organization's specific context, rather than applying generic models. When organizations face significant changes, such as technological advancements or market shifts, Contingency Theory provides a framework for adapting management practices and organizational structures to better align with new conditions.

Contingency Theory can be complex to implement, as it requires organizations to continuously assess and adapt to changing conditions. This can be resource-intensive and may not always be practical for all organizations. The theory assumes that managers can accurately assess situational factors and adapt practices accordingly. However, this may not always be feasible, particularly in highly dynamic or uncertain environments. Brady and Collier (2010) argue that the theory may overemphasize the importance of fitting practices to specific conditions, potentially neglecting the value of standardized practices that could provide stability and consistency. Contingency Theory provides essential insights into how organisations might modify their management practices and structures to correspond with their distinct internal and

external environments. Organisations can enhance their efficacy and responsiveness in a dynamic environment by concentrating on the alignment between practices and situational elements (Reinking, 2012). The elements in this study include organisational contexts, specifically the tax authorities themselves. Organisational elements associated with organisational theories are crucial for enhancing the performance of the organisation. Hansen and Wernerfelt (1989) contend that internal organisational characteristics are significant predictors of organisational performance. Hansen and Wernerfelt (2021) posited that organisational success necessitates aligning organisational characteristics with the external environment.

The Lending Credibility Theory

The Lending Credibility Theory was introduced by Hayes et al. (2005). The Theory of Lending Credibility This idea assigns the auditor's primary obligation to enhance the credibility of the financial accounts. Ittonen (2010) contends that, within the framework of the lending credibility thesis, auditors provide credibility as a service to their clients. Audited financial statements have components that enhance the confidence of users in the financial statements. Users are believed to derive advantages from enhanced credibility, which is often regarded as leading to improved quality in investment decisions when founded on trustworthy information.. The Theory of Inspired Confidence Limperg (1932), as referenced by Ittonen (2010), posits that the notion of inspired confidence encompasses both the demand and supply for auditing services. The demand for audit services arises directly from the involvement of third parties (stakeholders) in the company. These stakeholders need accountability from the management in exchange for their investments in the organisation. Accountability is achieved via the distribution of regular financial reports. Nonetheless, given that the information supplied by management may be biased and external parties lack direct monitoring capabilities, an audit is necessary to ensure the reliability of this information. Limperg (1932) posits that auditors should consistently endeavour to fulfil public expectations.

Lending Credibility Theory primarily examines how organisations establish and sustain credibility and trust with stakeholders, especially in financial and auditing environments. This notion is essential for comprehending how organisations oversee their financial disclosures, reporting methodologies, and audit procedures to foster confidence and reliability. Data analytics tools can substantially improve the reliability of tax audits by delivering more precise and comprehensive insights into financial data. These platforms can enhance the transparency and dependability of audit findings, hence bolstering the perceived credibility of the audit process. Utilising data analytics, auditors can validate their conclusions through comprehensive data analysis, so augmenting the credibility of their reports and recommendations. This corresponds with the theory's emphasis on establishing credibility via precise and dependable information.

Artificial intelligence and machine learning can automate intricate data processing activities, thus enhancing the precision and dependability of audit results. This technology breakthrough can enhance the reliability of audit outcomes by minimising human mistake and prejudice. The implementation of AI and machine learning can guarantee uniform and dependable audit procedures, hence enhancing the integrity of tax audit results. This corresponds with Lending Credibility Theory's focus on preserving confidence via dependable and impartial procedures.

Blockchain technology offers a transparent and immutable record, which can substantially improve the integrity of tax audits. Blockchain enhances the integrity and reliability of audit processes by guaranteeing that transaction records are immutable and verifiable. Blockchain use fosters confidence among stakeholders by guaranteeing precise and transparent transaction records, hence enhancing the legitimacy of audit results.

Cybersecurity solutions are essential for safeguarding sensitive financial information from unauthorised access and breaches. Robust cybersecurity protocols enhance the credibility of tax audits by safeguarding data integrity and confidentiality. By mitigating potential cybersecurity concerns, these solutions facilitate the preservation of trust in the audit process. This corresponds with Lending Credibility Theory's emphasis on risk management and the protection of financial information integrity. The Lending Credibility Theory is pertinent to the examination of digital technology adoption and tax audits in Nigeria. It offers a paradigm for comprehending how digital technologies (data analytics platforms, artificial intelligence and machine learning, blockchain technology, and cybersecurity solutions) might augment the credibility and reliability of tax audits. Lending Credibility Theory assesses the influence of these technologies on enhancing accuracy, transparency, and data protection, thereby reinforcing the credibility of tax audit processes in Nigeria.

Innovation Diffusion Theory (IDT)

Innovation Diffusion Theory (IDT), created by Everett Rogers in 1983, serves as a framework for comprehending the mechanisms, motivations, and velocity of the dissemination of novel ideas and technology across individuals and organisations. Rogers' theory examines the dissemination of innovations over time within a social system. It is especially beneficial for analysing the acceptance and dissemination of novel technologies and practices, encompassing digital technologies such as data analytics platforms, artificial intelligence, blockchain, cybersecurity solutions, and cloud computing platforms. Innovation, as defined by Rogers (1983), encompasses not only the generation of new knowledge but also the decision to adopt or the initial convincing of an idea, practice, or novel concept. In accounting, diffusion denotes the implementation of novel accounting methods by organisations that have not previously utilised them (Craig et al., 2014). Rogers (1983) additionally presents five principal factors influencing the adoption of an innovation (Mu'azu 2012), alongside these five categories of adopters:

1. Relative advantage is how much a new idea is better than the one it replaces.
2. Compatibility is how well the new idea fits with the potential adopter's values, experiences, and needs.
3. Complexity is how hard it is to understand and use the new idea.
4. Trialability: the degree to which an innovation can be tried out before a decision to adopt is made.
5. Observability: the degree to which an innovation produces a result that can be seen.

The Innovation Diffusion Theory provides a valuable framework for understanding how digital technologies can be adopted and implemented within the context of tax audits. Data analytics platforms offer significant advantages over traditional audit methods, such as enhanced data processing capabilities and improved accuracy. Understanding how these advantages are perceived by tax professionals can provide insights into the rate and extent of adoption. The compatibility of data analytics platforms with existing audit practices and systems will influence their adoption. If the platforms align well with current procedures and practices, they are likely to be adopted more quickly.

AI and machine learning technologies may initially appear complex. Assessing how easily tax professionals can understand and implement these technologies can impact their adoption rates. Opportunities for pilot projects or small-scale implementations can facilitate the adoption of AI and machine learning by allowing tax professionals to experience their benefits before full-scale implementation. The visible benefits of blockchain, such as enhanced transparency and security in record-keeping, can influence its adoption. Understanding how observable these benefits are to tax professionals can help explain the rate of adoption. Blockchain technology must be compatible with existing tax audit systems and practices to be adopted successfully. Analyzing this compatibility can provide insights into adoption challenges. Effective cybersecurity solutions offer advantages in protecting sensitive audit data from breaches. The perceived benefit of enhanced security can drive adoption among tax professionals. Assessing the complexity of implementing and managing cybersecurity solutions is crucial. Solutions that are easier to understand and integrate are likely to be adopted more quickly.

Cloud computing platforms offer scalability and flexibility. Providing opportunities for tax professionals to trial these platforms on a limited basis can facilitate their adoption. Cloud computing platforms offer advantages such as cost savings and remote access. Understanding how these advantages are perceived by tax professionals can help explain the adoption rate. To assess the adoption of data analytics platforms, evaluate how these platforms are perceived in terms of relative advantage, compatibility, and complexity. Understanding these factors can help identify barriers and drivers of adoption. Explore how AI and machine learning technologies are perceived by tax professionals in terms of their complexity and trialability. Investigate how these technologies impact decision-making and audit processes.

Analyze the observability and compatibility of blockchain technology in tax audits. Investigate how the benefits of blockchain influence its adoption and integration into existing systems. Assess the perceived relative advantage and complexity of cybersecurity solutions. Examine how these solutions enhance audit security and protect data integrity. Evaluate the trialability and relative advantage of cloud computing platforms in tax audits. Investigate how these platforms offer flexibility and scalability in managing audit processes. IDT primarily focuses on individual adoption and may not fully address organizational and systemic factors influencing technology diffusion.

Research Methodology

This section outlines the research methodology employed in this study, focusing on the examining the impact of cloud computing platforms on tax audit in Nigeria. with a specific emphasis on the Federal Inland Revenue Service (FIRS). It details the research design, data

collection methods, respondent sampling, procedural steps, limitations, and ethical considerations. The methodology aims to ensure that the study is systematic, reliable, and valid, providing insights into how digital technologies impact tax audit practices. A cross-sectional research design was used for this study. This approach is chosen because it allows for the collection of data at a single point in time to examine the current state of digital technology adoption and its impact on tax audit effectiveness. The cross-sectional design is particularly suited to the study's objectives as it provides a snapshot of the relationships between variables without requiring long-term data collection or longitudinal tracking.

The cross-sectional design is less complex and time-consuming compared to longitudinal studies. Since the study aims to understand the current impact of digital technologies on tax audits, collecting data at a single point in time is sufficient for addressing the research objectives. This design allows for efficient data collection and analysis, making it feasible to gather and process responses from a significant number of respondents within a limited timeframe. This study employed the use of primary data to determine the effect of digital technology adoption on tax audit effectiveness within the Federal Inland Revenue Service (FIRS) in Nigeria. Primary data will be collected using structured questionnaires, designed to gather measurable information on the extent to which various technologies are utilized and their perceived effectiveness in improving audit practices. The questionnaires utilize a 5-point Likert scale to quantify respondents' perceptions and experiences with different digital technologies.

The researcher ensured the efficient and timely collection of completed questionnaires, this study will employ the hand delivery and collection method, often referred to as "drop and collect." This approach involves personally delivering the questionnaires to the respondents and subsequently collecting them once completed. This method facilitates the collection of completed questionnaires within a short period, reducing the overall time required for data gathering compared to postal surveys or other methods.

The initial draft of the questionnaire was subjected to scrutiny supervisory team, as well as professional statisticians and research experts from Nasarawa State University and Benue State University. These experts provided valuable insights and feedback on the content, structure, and relevance of the questionnaire items. Their feedback ensured that the questionnaire comprehensively covers the constructs related to digital technology adoption and tax audit effectiveness, aligning with the study's objectives.

To ensure face and content validity, the questionnaire underwent a rigorous review process. Academics with expertise in tax administration and digital technology evaluated the questionnaire to ensure that it accurately captured the constructs and variables of interest. Additionally, a pilot test was conducted with a group of thirty (30) respondents. This pilot assessed the clarity, relevance, and comprehensibility of the questionnaire items. Feedback from the pilot test was used to refine and enhance the instrument, ensuring that it effectively measures the intended constructs and meets the study's objectives. Reliability is a crucial aspect of any research instrument, such as a questionnaire, as it ensures that the instrument produces consistent and stable results. One widely recognized method for assessing reliability is Cronbach's alpha. This statistical measure evaluated the internal consistency of a scale or instrument, indicating the extent to which individual items within the scale are correlated with one another.

Cronbach’s alpha was employed to assess the internal consistency of the questionnaire items for each construct related to digital technology adoption and tax audit effectiveness. The table below presents the Cronbach’s Alpha scores for each variable assessed in the study. These scores indicated the internal consistency and reliability of the measurement scales used to evaluate the impact of different digital technologies on tax audit effectiveness.

Table 1: Reliability Coefficients

Variables	Cronbach’s Alpha
data analytics platforms	.731
Artificial Intelligence (AI)	.80
Blockchain Technology	.756
Cybersecurity Solutions	.720
Cloud Computing Platforms	.878
Tax Audit	0.87

Data analytics platforms (0.731) indicates acceptable reliability, suggesting that the items used to measure the impact of data analytics platforms are consistently capturing relevant aspects of their influence on tax audit effectiveness. Also, Artificial Intelligence (AI) (0.800) reflects high reliability, indicating that the items related to AI are highly consistent and effectively measure its impact on tax audits. Furthermore, blockchain technology (0.756) demonstrates satisfactory reliability, showing that the items are adequately capturing the effect of blockchain technology on tax audit practices. Cybersecurity Solutions (0.720) shows acceptable reliability, though slightly below the ideal threshold of 0.70, suggesting reasonable consistency in measuring the impact of cybersecurity solutions. Cloud computing platforms (0.878) indicates excellent reliability, with items demonstrating a high degree of internal consistency in measuring the effect of cloud computing platforms on tax audit effectiveness. Tax audit (0.870) reflects excellent reliability, indicating that the items used to measure tax audit effectiveness are highly consistent and reliable. Overall, the Cronbach’s Alpha scores for the variables indicate a high level of reliability in the measurement of digital technologies and their impact on tax audit effectiveness. The data suggests that the questionnaire items are reliable indicators of the constructs being studied, ensuring that the results of the study was robust and credible.

This study adopted Partial Least Square Structural Equation Modelling as a technique of data analysis. PLS-SEM allows for the estimation of complex relationships among latent variables, which is beneficial for examining the multifaceted impact of digital technologies on tax audit effectiveness. It accommodates both formative and reflective measurement models, making it adaptable to various constructs related to digital technologies. PLS-SEM is useful in exploratory research settings, which aligns with the study's objective of assessing the impact of emerging digital technologies on tax audits. The model can be represented as:

$$TA_i = \beta_0 + \beta_1 DA_i + \beta_2 AI_i + \beta_3 BT_i + \beta_4 CS_i + \beta_5 CM_i + e_i$$

Where:

TA= Tax Audit

DA= Data Analytics Platforms adoption

AI= Artificial Intelligence (AI) adoption

BT= Blockchain Technology adoption

CS= Cybersecurity Solutions adoption

CM= Cloud Computing Platforms adoption

β_0 : Intercept term (constant)

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$: Coefficients representing the impact of each digital technology on Tax Audit Effectiveness

ϵ : Error term

i = observation

Factor Loadings: estimate the factor loadings for each indicator on its respective latent construct. Factor loadings represent the strength of the relationship between the indicator and the latent construct.

Assess convergent validity by examining the factor loadings, average variance extracted (AVE), and composite reliability (CR) for each latent construct. AVE should be greater than 0.5, and CR should be greater than 0.7 to demonstrate convergent validity.

Test of Hypotheses

The test of hypotheses involves examining the relationships between the variables to determine whether the proposed associations are supported by the data. Using structural equation modeling (SEM) and bootstrapping analysis, each hypothesis is evaluated based on the significance of path coefficients, p-values.

Table 2: Path Coefficient

	TStatistics	P Values
DA -> TA	3.371	0.001
AI -> TA	1.027	0.305
BA -> TA	8.497	0.000

CS -> TA	3.424	0.001
CM -> TA	4.101	0.000

Source: Smart PLS out 2024

Cloud computing platforms have no significant impact on the effect of tax audits in Nigeria.

Finally, for Hypothesis H $\square\square$, the analysis reveals that cloud computing platforms significantly impact tax audits, with a T-statistic of 4.101 and a P-value of 0.000. Since the T-statistic surpasses 1.96 and the P-value is less than 0.05, we reject H $\square\square$ and determine that cloud computing positively influences tax audits. The significant positive impact of cloud computing platforms on tax audits highlights how these platforms enhance the accessibility and collaboration of audit data. Cloud computing allows auditors to access real-time tax data and collaborate with colleagues or stakeholders from different locations. This not only speeds up the audit process but also ensures that auditors have access to the most current and accurate information, which is crucial for identifying discrepancies and ensuring compliance.

Table 2: R square

	R Square	R Square Adjusted
AT	0.887	0.885

Source: Smart PLS out 2024

The R² and Adjusted R² values of 0.887 and 0.885, respectively, suggest a strong and reliable relationship between the independent variables (such as data analytics, blockchain, cloud computing, etc.) and the effectiveness of tax audits in Nigeria. The model is highly effective in explaining the factors that influence tax audits, indicating that the identified technologies play a critical role in improving tax audit processes. The results offer a solid foundation for furthering tax system modernization and improving overall audit efficiency.

Discussion of Findings

The findings of this study on the influence of emerging technologies on tax audits in Nigeria provide important insights that connect to both existing theories and prior studies in the field. This section explores the findings in relation to theoretical frameworks and how they align or contrast with previous research, as well as the practical implications for tax audit systems in Nigeria. The results indicate that data analytics platforms have a significant positive impact on tax audits. This finding aligns with theoretical frameworks such as the Technology Acceptance Model (TAM), which suggests that the usefulness and ease of use of a technology directly influence its adoption and effectiveness. In this case, the data analytics platforms are seen as useful tools for improving the efficiency and accuracy of tax audits in Nigeria, demonstrating that these platforms enhance decision-making and streamline audit processes.

Prior studies, such as those by Adegbite & Shittu (2017) and Adediran et al. (2013), have highlighted the benefits of data analytics in improving the accuracy and reducing errors in audits. The findings of this study reinforce these conclusions, emphasizing that the integration of data

analytics is crucial for enhancing audit quality. Practical implications suggest that tax authorities in Nigeria should prioritize the adoption of data analytics platforms to improve the effectiveness and reliability of tax audits. These platforms can help audit teams process large datasets efficiently and identify inconsistencies or fraud, thereby improving tax compliance and reducing the risk of errors.

The findings show that cloud computing platforms significantly improve tax audits. Cloud computing aligns with the Resource-Based View (RBV) theory, which suggests that organizations can achieve a competitive advantage by utilizing valuable resources such as cloud platforms. Cloud computing provides scalable and cost-effective infrastructure that enables tax authorities to store, process, and analyze large datasets efficiently, improving the overall effectiveness of tax audits. Prior studies by Armbrust et al. (2010) and Manzon and Plesko (2003) have highlighted the transformative role of cloud computing in improving business processes by providing flexible and scalable solutions. This study's findings reinforce these conclusions, suggesting that cloud computing platforms can significantly enhance the speed, scalability, and efficiency of tax audits. Practical implications indicate that tax authorities should invest in cloud computing infrastructure to improve audit efficiency, enhance collaboration among audit teams, and enable quick access to large datasets for analysis.

Conclusion

This study explored the role of emerging technologies—data analytics, artificial intelligence (AI), blockchain, cybersecurity solutions, and cloud computing platforms—in enhancing the effectiveness of tax audits in Nigeria. The results have provided valuable insights into how these technologies are currently influencing tax audits and their potential to transform the auditing process in the Nigerian tax system.

Key findings from the study

Cloud Computing Platforms significantly enhance tax audits by providing scalable, flexible, and cost-effective infrastructure. Cloud computing facilitates the efficient storage and processing of large datasets, supports collaboration among audit teams, and enhances the speed and accuracy of tax audits.

In conclusion, the adoption of data analytics, blockchain technology, and cloud computing in the Nigerian tax audit process holds great potential for enhancing the efficiency, transparency, and accuracy of audits. However, the limited adoption of AI and machine learning and the relatively indirect role of cybersecurity solutions suggest that further investment in infrastructure and capacity building is necessary to fully harness the potential of these technologies.

Recommendations

Cloud computing offers significant advantages for managing large datasets and supporting collaborative audit work. Tax authorities should consider expanding their use of cloud platforms for storing and processing tax-related data. Cloud computing will also support the efficient sharing of information across departments, improve the accessibility of audit data, and reduce the costs associated with maintaining on-premise infrastructure.

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