



Readiness Assessment of Artificial Intelligence Driven Tax Administration 3.0 in Nigeria

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Abstract. This research paper examines the impact of artificial intelligence (AI) technologies in the form of machine learning, big data analytics, blockchain and robotic process automation on tax administration in Nigeria. Literature have been reviewed from various scholarly journals which exposes that emerging technologies, particularly through AI, enhances tax collection and in essence tax administration processes. Though several studies show a positive relationship, however challenges tend to persist, especially in developing economies in Africa regarding the implementation and integration of these technologies. There is a universal development toward digital tax administration 3.0, highlighting the significance of frameworks that are regulatory especially in Nigeria that is still on 2.0. Research carried out shows that Nigeria is emerging in the use of automation in its tax administration process due to challenges such as lack of significant investment in infrastructure, legal and regulatory frameworks surrounding AI and robotisation, digital illiteracy and resistance to adopting new technologies on the path of the taxpayers and tax practitioners. This research shows that AI can revolutionize tax administration globally by increasing efficiency and accuracy, however addressing the associated risks such as cybersecurity threats, data security, ethical and legal issues and complexity of implementation problem is important especially in a developing country like Nigeria. As tax authorities continue to explore AI's applications, changes and adaptations will be essential in the long run.

Keywords: Artificial intelligence, Emerging technologies, tax administration, challenges of AI, practical applications of AI.

1. Introduction

Nigeria, a nation rich in natural resources yet struggling with concerns from tax administration processes such as tax evasion, fraud, non-compliance functions is not appropriate for the Nigerian tax

system (Bankole & Adetoro, 2022). Conversely, with the progress of digitalization and automation which includes the use of artificial intelligence (AI), machine learning, big data analytics and a host of other innovative technologies are expected to solve the problems inherent in tax administration processes (Aggarwal, 2024). Research shows that these technologies present a longstanding solution to the inefficiencies that plague the Nigerian tax system due to its capacity to analyze vast volume of data, automate processes, and predict patterns (Aina, 2024; Bankole et al. 2025; Belahouaoui & Attak, 2024; Hlomendlini, 2022). The USA, UK, Australia, Singapore and Australia are some of the countries that have harnessed the use of AI in their tax administration and have achieved optimized revenue collection in around (Aggarwal, 2024).

Presently, the Nigerian Revenue Service (NRS) has just gone live with the Rev360 tax platform which is said to be a move from tax administration 2.0 to 3.0. However, despite the potential benefits that can be gained, the successful integration of AI into Nigeria's tax administration will require careful consideration of various challenges, including infrastructure limitations, data privacy concerns, and the need for skilled personnel (Adegbite & Houghton, 2021). The Nigerian government has also engaged with technology companies to enhance its tax administration capabilities, utilizing data analytics and platforms to identify tax evasion and optimize tax collection strategies (Azubuike et al., 2024). Understanding the implications of AI is fundamental to confirm that it serves as a tool for progress rather than a source of new challenge. While many studies exist on AI applications in tax administration around the globe (Koivula et al., 2024; Raikov, 2021; Qu & Jing, 2025; Zhao & Wang, 2025), specific challenges which are unique to Nigeria's socio-economic and political context have not been extensively documented such as lack of infrastructure, resistance from tax officials and privacy concerns (Aina, 2024;

Bankole et al. 2025; Belahouaoui & Attak, 2024; Forunso & Nwankwo, 2024).

Research by Josiah et al. (2020) shows that tax administration in Nigeria needs to be improved upon in order to prevent tax revenue loss hence the reason behind this research. Despite the growing literature on AI and the need to revolutionize the tax administration system, the problem of AI use in tax administration remains considerably underexplored especially as it relates to developing countries in which Nigeria is part (Belahouaoui & Attak, 2024). Therefore, this research focus is on the possible implementation of AI in Nigeria's tax system.

Nigeria has been making slow efforts to digitalise its tax administration process. The Nigeria Revenue Service (NRS) have implemented digital initiatives to improve efficiency, compliance, and revenue collection such as the TaxProMax portal and of recent Rev 360 platform, allowing taxpayers to register, file returns, and make payments electronically (Adeagbo et al. 2024; CITN Website, 2021; Yeye & Ologhodo, 2024; NRS, 2026). However, the taxpromax system has its shortcomings therefore the need for more advanced technologies in tax administration in Nigeria, and hence the need for this study.

This paper therefore examines the use of AI, machine learning, blockchain, data analytics and robotic process automation and the ability to which it can enhance tax administration in Nigeria. The paper begins with an introduction, includes a literature review on AI and tax administration, the benefits and risks in adopting AI in Nigeria's tax administration process and ends with a conclusion and a recommendation.

2. Materials and Methods

This paper used a systematic literature review to synthesize recent academic research on AI and tax administration in Nigeria with materials published between 2020 and 2026. A systematic literature review is a critical analysis and interpretation of already existing research on an area of study to bring to knowledge its current state and findings of studies.

Literature has been sourced from academic databases such as google scholar, Elsevier, and publication by institutions and organisations such as organization for economic corporation and development (OECD), World Bank, PriceWaterCoopers, Nigeria Revenue Service (NRS) online portal. For the search terms, key components used include artificial intelligence and tax administration, machine learning and tax administration, big data analytics and tax

administration, blockchain and tax administration, robotic process automation and tax administration, tax administration in Nigeria, practical applications of AI in tax administration, challenges of AI in tax administration.

This theoretical approach has been carried out for this study to give directions in which the empirical findings will follow. Also, empirical analysis in this area of study are presently just evolving in Nigeria.

3. Tax Administration

Nigeria's tax system is quiet complex and includes various forms of taxation imposed by both federal and state governments. Its purpose is to generate revenue for the government, expedite economic development, and ensure impartial distribution of resources (Adeyeye, 2019). The system includes income taxes, corporate taxes, value-added tax (VAT), and others that play vital roles in funding public services and infrastructure (Adeyeye, 2019; Chiemeka, 2024). Tax administration involves the registration and assessment of returns, collection, monitoring and compliance enforcement, sanctions, and awareness of any activity that can improve the efficiency and effectiveness of taxation (Ozioma, 2024). Tax administration is important in that it plays a crucial role in the collection and enforcement of tax laws. It is necessary for ensuring that governments can fund services and infrastructure adequately. The structure and effectiveness of tax administration vary widely across different countries and regions and are mainly influenced by economic, political and cultural factors (Azubuike et al., 2024). Carrying out tax administration processes in developing countries like Nigeria is often described by interactions between the tax official's and taxpayers hence the need for digital technologies to improve the tax process.

Tax administration system in Nigeria has been inundated by many inadequacies, revenue loss and non-compliance measures from taxpayers. According to report by the FIRS, Nigeria losses about N5 trillion annually to tax evasion therefore the needed efforts to integrate technology into tax administration (Folurunso & Nwankwo, 2024). Due to the inconsistencies in tax collection methods, tax authorities now rely more on digital technology and methods to transform the tax administration process (Buckley et al., 2022). Nonetheless, tax administrations worldwide are experiencing a significant digital revolution and are integrating innovative technologies such as big data analytics, machine learning, natural language processing and blockchain to enhance taxpayer experiences and streamline processes. Connected with this

transformation is the Organization for Economic Co-operation and Development (OECD) tax administration 3.0 vision (OECD, 2020), which calls for a comprehensive digital overhaul of tax administration processes (Belahouaoui & Attak, 2024; Aggarwal, 2024). The idea of this vision spreads beyond merely adjusting to societal changes, it aims to influence digital advancements to reduce administrative problems, encourage innovation in policy and reduce compliance gaps (Azubuike et al., 2024).

3.1. Tax administration 1.0

This process of tax administration refers to the paper based and manual approach of tax collection and management that was established before the adoption of more advanced, digitalized systems. It typically involves a series of sequential steps designed to ensure revenue collection. The key components of this tax administration process involve; paper based manual registration of taxpayers through physical forms and documentation, audits are conducted by physical inspections and document reviews, and revenue is collected mainly through physical cash payments at tax offices or designated banks (Obafemi, 2021). There are several challenges of this method of tax administration such as; inefficiency, errors and fraud, loss of tax revenue, lack of tax compliance (Azubuike et al., 2024).

3.2. Tax Administration 2.0

Tax administration 2.0 refers to a shift from manual, paper-based methods to e-taxation process. Presently, Nigeria is on tax administration 2.0 and has made significant strides in this direction, including launching e-filing portals and integrating tax databases. It includes the implementation of online portals and e-filing systems that allow taxpayers to register, file returns, make payments, and access tax information conveniently (Josiah et al., 2020). It introduced the use of mobile apps and online support centers to improve taxpayer's accessibility and responsiveness. There are still challenges in its implementation involving infrastructure deficits, such as unreliable internet and power supply, resistance to change among tax practitioners and taxpayers, data security and privacy concerns and the need for continuous capacity building (Gbemigun & Alade, 2024; Josiah et al., 2020).

3.3. Tax Administration 3.0

The concept of tax administration 3.0 reflects automation, emphasizing digitalization to enhance

efficiency, compliance, and taxpayer experience (Aggarwal, 2024). It is characterized by the integration of advanced digital technologies, such as AI and other emerging technologies such as blockchain, big data analytics to modernize tax collection, enforcement, and taxpayer services (OECD, 2020). It is a shift from manual processes to fully automated systems that interact seamlessly with taxpayers culminating in a highly integrated, data-centric framework. For example, countries like Estonia and Singapore exemplify successful implementations of tax Administration 3.0, showcasing streamlined processes and enhanced taxpayer engagement (Zheng & Penetrante, 2025). Singapore's Inland Revenue authority (IRAS) exemplifies tax administration 3.0 through its use of AI and data analytics to enhance compliance and service delivery. Also, Estonia's e-residency program demonstrates successful digital governance, facilitating seamless tax interactions for global entrepreneurs (Shakil & Tasnia, 2022; Zheng & Penetrante, 2025).

Despite the benefits, scholars also highlight challenges such as cybersecurity risks, data privacy concerns, and the digital divide that may exclude certain taxpayer groups (Ariyibi et al., 2024).

3.4. Artificial intelligence

The origin of AI academically can be traced as far back to 1956 to the conference- Dartmouth summer research project organized by John McCarthy, and ever since it has spiraled (Buckley et al., 2022; Joseph & Falana, 2021). Artificial Intelligence is a method of making a computer, a computer-controlled robot, or a software think intelligently like the human mind (Buckley et al., 2022; Bottone, 2018; Chiemenka et al., 2024; Deloitte, 2019; Gbemigun & Alade, 2024; Joseph & Falana, 2022; Qu & Jing, 2025). The development of AI involves studying the patterns of the human brain to analyze the cognitive process which in turn develops intelligent software and systems. AI encompasses a range of technologies and applications that simulate human intelligence and perform tasks autonomously which can reduce administrative costs for tax authorities (Brucjner & Coil, 2024; Gbemigun & Alade, 2024; Saba & Monkam, 2024). There is a National Centre for AI and robotics (NCAIR) in Nigeria which is created to promote research and development on emerging technologies. As a research facility it is focused on AI, robotics, Internet of Things (IoT), and other emerging technologies, aimed at transforming the Nigerian tax system (Nwaze, 2024). However, the use of AI in tax operations in Nigeria has not yet been implemented, although the new tax reform act emphasizes digitalization (Folorunsho & Nwankwo, 2024).

AI is being used in tax administration process for different functions namely; to remove repeat tasks such as documents processing and reviewing filed returns to identify correctness and errors from non-compliance. AI robots can also assist tax authorities to detect errors, classify accounts and transactions, assess and identify tax audit risks, and increase proposed tax strategies within the framework of complex global laws (Hlomendlini, 2022). AI is capable of flagging suspicious activities for further investigation by tax authorities, potentially leading to the recovery of lost revenues and a reduction in tax evasion (Faundez-Ugalde et al. 2020). AI also involves the use of machine learning to analyze tax data, detect patterns, and make informed decisions.

Intellectuals consider AI firstly as a factor of production and also that it has the potential to introduce new sources of growth and change the way work is done across several businesses. AI offers the possibility of taking content from tax websites and then restructuring that content, based on the way users search it (Deloitte, 2019). AI is a rapidly advancing technology that encompasses various techniques, such as machine learning and data analytics, to copy human intelligence and perform tasks that traditionally require human intervention (Chiemenka et al., 2024).

3.5. Tools of Artificial Intelligence

3.5.1. Machine Learning (ML)

Machine learning utilizes algorithms to analyze, learn from, and make decisions based on large datasets (Folorunso & Nwankwo, 2024; Olabanji et al., 2024). The ability of these systems to analyze large datasets thereby identifying patterns in order to make decisions with minimal human intervention positions machine learning as an integral component in the evolution of tax systems around the globe (Olabanji et al, 2024).

According to Olabanji et al., (2024) ML is implemented in tax administration in the area of income tax to detect underreported income and in VAT compliance and fraud detection. ML is also employed to analyze patterns from vast amounts of tax data such as income statements analysis which enables tax authorities to identify anomalies and probable fraud with a level of precision and swiftness that traditional methods would not ordinarily match (Donelson et al., 2022). The application of ML in the field of taxation has become prevalent therefore the ethical considerations are important in order to maintain fairness and integrity in the tax system. Ethical considerations such as issues with privacy,

bias and transparency are crucial for ML application in tax administration (Akinrinola et al., 2024).

The challenges in tax administration such as in the detection of fraud and error and risk assessment can benefit significantly from incorporating ML into its tax processes which will aid in enhancing efficiency, accuracy, and overall productivity of the system. In essence, ML can offer a significant solution to the numerous problems experienced in the tax system in Nigeria. As the country continues to transform its economy and seek inventive solutions to increase revenue collection, embracing machine learning is essential for creating a more efficient, transparent, and productive tax regime (Folorunso & Nwankwo, 2024). However, the FIRS in Nigeria is plagued with the problem of adoption of AI in its tax systems (Adelekan et al., 2024).

3.5.2. Blockchain

Blockchain technology has become popular globally through the developments in digital currency transactions such as Bitcoin (Gbemigun & Alade, 2024). It can be defined as a digital arrangement that supports internet transactions to be logged in like rings of a chain and doing this over a digital network connected to millions of computers (Yayman, 2021). It is seen to have appeared as a solution for improving tax administration systems as it provides several key advantages that directly addresses the current problems of tax administration. Blockchain technology holds significant potential for enhancing tax administration in Nigeria by improving transparency, efficiency and accountability (Ariyibi et al., 2024). The adoption of blockchain technology has transformed tax processes by offering real time transactions where records are automatically verified as they happen which minimizes chances of fraud. Its proficiency ensures a higher level of accuracy and reliability in recording data. It also involves the use of smart contracts for tax compliance which is an innovative feature. These contracts could automatically execute tax obligations, enable instant tax collection and reduce the costs associated with compliance, thus bringing efficiency to the tax collection process and removing manual methods (Mazur, 2022).

However, besides all these benefits, blockchain implementation can be faced with various drawbacks especially in a developing country like Nigeria such as the complexity of the technological skills required which many tax practitioners lack (Judijanto et al., 2024). The need for expensive computer systems, problems with data privacy which can be caused by

the storing and accessing data on the blockchain and also problems with malicious attacks are all challenges of implementation in Nigeria (Adelekan, 2024; Yayman, 2021). Although blockchain alone is not a solution for impacting the tax system, it can be applied in many areas of tax processes to reduce administrative burden and help narrow the tax deficit. Overall, to achieve successful implementation, it is important to address such factors as its regulatory standards, international cooperation and technology infrastructure. By carefully managing these considerations, blockchain has the potential to redefine tax administration globally (Yayman, 2021).

3.5.3 Big Data Analytics

The dawn of big data analytics has revolutionized various sectors such as audit and now tax administration. Big data analytics is described as innovative techniques which extracts insights from datasets. Research shows that some countries have adopted its use in their tax administration systems and are experiencing improved efficiency and effectiveness (Aggarwal, 2024). Study by Aslett et al. (2024) shows that big data analytics employs the use of predictive modelling techniques to forecast tax revenues and identify tax liabilities which facilitates better decision making and invariably improves taxpayer's compliance. Where adopted in Nigeria, its use can lead to increase tax revenue (Cyril, 2025).

3.5.4. Robotics Process Automation (RPA)

Robotics is an AI tool which can be described as a list of instructions performed by observing the user perform such tasks to achieve the required set goals and objectives (Djellaba et al, 2024; Gupta & Data, 2020). Robotics is been used in healthcare, banking industry, supply chains and now tax administration as it has the potential to increase efficiency (Nembe et al., 2024). The Nigerian government and tax authorities have been working towards digital transformation in order to enhance efficiency, reduce corruption, and improve tax collection (Chiemena et al. 2024). The specific adoption of robotics in tax administration may not be widespread yet in Nigeria, however there may be proven programs or specific applications of robotics in certain areas, like Chabot for customer service or automated data processing, but the extent of their use may still be limited compared to more developed economies (Chen et al., 2025).

According to Feria and Ruiz (2022) the birth of robotics to tax administration has come to stay as it has several advantages however there are not without risks or limitations. Whilst its impact on fundamental rights,

ethics and regulation has been widely acknowledged, its effects on legal entrenchment, and maintenance of ineffective laws, have not so far been considered (Aggarwal, 2024).

3.6. Review of Prior Studies

Research by Aggarwal (2024) on the role of AI in tax administration and compliance used a mixed methodology for their research and divided their findings into three (3) phases to include literature review, data collection and case study analysis. It can be inferred from the paper that developed nations like U.S, Australia and UK have successfully adopted the use of AI as solutions to tax administration processes and have witnessed increase in tax revenue and compliance measures. However, when compared to developing nations like Nigeria, the rate of AI implementation stands at 40% as against European countries that are at 90% as obtained in their findings. Overall, their research opines that though challenges exist with AI implementation, however, its integration in tax administration will revolutionize the tax system with improved efficiency and transparency to improve fiscal governance. In another research carried out in US by Bruckner and Coil (2024) on the adoption and deployment of AI in improving tax administration discovered that AI improves taxpayer experience by the use of virtual assistants and faster processing of paper documents. However, risks are involved such as systems creating hallucinations or already made-up responses. These risks can be mitigated by having a robust training data and a model of AI trained on massive data sets. Their paper shows that AI in tax administration will excel when tasks have defined boundaries with consistent rules and ascertainable outcomes. Overall, their paper advised tax authorities that in deploying AI, they must develop oversight and governance structure to ensure ethical use, mitigate risks, foster transparency and build taxpayers' trust.

Similarly, research by Adelekan et al. (2024) on the comparative analysis of AI-driven models and blockchain technology in tax administration in US opined that AI and block chain improves tax administration efficiency, however, certain challenges were identified such as data privacy and the lack of robust regulatory frameworks. In all, their research recommends continuous research and development in the area of AI and block chain implementation in tax compliance and administration processes.

Another paper by Belahouaoui and Attak, (2024) on digital taxation, AI and tax administration 3.0 evaluates 62 papers from the Scopus database. Their findings reveal that AI, big data, machine learning and

blockchain technologies enhance operational efficiency leading to better tax administration. However, Nigeria has not integrated AI in its tax systems due to certain challenges such as lack of digital infrastructure. Their research suggests that developing nations which Nigeria is among need to prioritize capacity building and resource allocation for the enhancement of digital tax infrastructures by including training programs for tax officials, technological development and public awareness to cultivate trust and compliance measures among taxpayers towards digital systems.

Research by Nembe et al. (2024) on the role of AI in enhancing tax compliance and financial regulations have opined that the benefits of AI are undeniable, however ethical considerations in its usage must be sought such as safeguarding privacy, ensuring transparency in order to foster trust. While the benefits to be achieved from the use of AI such as efficiency, transparency and compliance leads to enhancements in tax systems, challenges still exist which include job loss, displacements and systematic risks. In all, their research advised policy makers to balance innovation with safeguards to benefit from the transformative power of AI. Similar paper by Buckley et al, (2022) carried out research using a methodological approach. They carried out study on AI and the tax practitioner using two stages approach which include the automation susceptibility phase and the talk analysis phase. From their findings, there exists a general view that AI has a significant positive impact on tax administration and practice. However, their research also suggests that fewer individuals would be needed in carrying out tax administration as a result of AI, hence jobs may be lost in the process. Lastly, their research recommends that tax professionals need to be upskilled in order to adapt to an environment where machines and humans work increasingly better together.

Paper by Adeyeye (2019) on improving tax administration through technology innovation in Nigeria using primary data and regression model for data analysis combined the theory of planned behavior and the technology acceptance model to empirically evaluate how technology innovation enhances tax administration. The results showed a favorable response to tax administration, however, challenges such as staff illiteracy to technology, lack of cyber security, low technology awareness and others exist. The research included recommendations to mitigate the challenges discovered such as staff education to technology, availability of cyber security software amongst others.

Research by Chiemeka et al, (2024) on the influence of AI and machine learning on tax audits in Nigeria discovered no significant relationship between AI and machine learning, however, their study advised that the FIRS authorities should invest in development of AI and machine learning systems as it has the potential to automate routine tasks. In all, Belahouaoui & Attak, (2024) observed that one of the problems of adopting AI in emerging economies like Africa can be linked to bureaucratic problems, scarcity in resources and lack of explicit regulations in AI adoption.

From the literature reviewed it is certain that AI can enhance effective tax administration globally, however before it can be implemented in Nigeria, the tax laws need to be fixed and other barriers hindering its implementation such as digital literacy on the path of taxpayers and tax practitioners invariable leading to resistance in adopting new technologies.

3.7. Risks and Barriers of AI Adoption in Tax Administration in Nigeria

There are problems of using AI in tax administration processes where most risks have been identified in the empirical review, however, they are needed to be addressed in ensuring the successful integration and efficient functionality of the various AI tools in tax administration.

One of the primary challenges of adopting AI in tax administration in Nigeria is the technical and infrastructural restrictions. The implications regarding costs of implementing AI technologies such as investments in hardware, software and human resources should not be ignored especially in Nigeria (Adelekan et al., 2020). Li (2022) explained that the integration of AI into tax administration process requires robust technological infrastructure, technical expertise and innovative computing resources. Also, research by Adelekan et al. (2024) on AI deployment in developing countries like Nigeria explained challenges such as lack of regulatory framework surrounding AI, data privacy and security and lack of training by tax authorities. Fatz et al. (2019) research saw opposition to change and resistance from tax officials and tax payers as a significant barrier to AI adoption.

As regards the use of AI technology, initial and continuous experimentation is very important. However, this is not encouraged especially where the operational risks of adopting it is misunderstood (Deloitte, 2019). In Nigeria, tax payers and tax practitioners have limited digital literacy, which inherently affects their ability to use digital tax

systems effectively. This lack of skills can result in errors, inefficiencies, and resistance to adopting new technologies (Chiemenka et al, 2024). Also there exists a lack of robust technical infrastructure, problems with ethical and legal framework, complexity of implementation and data privacy issues (Adelekan et al., 2024; Olabanji et al., 2024). According to Awodun et al. (2024), Nigeria still has a long way to go regarding the use of AI in its revenue and tax administration process (Zhao & Wang, 2025).

3.8. Readiness Assessment of Nigeria for AI Adoption?

The Nigeria revenue service (NRS) has only recently gone live with the Rev360 tax platform which is said to be a move from tax administration 2.0 (e-taxation) to 3.0 (digitalization and automation). Before the Rev360 platform, the NRS used the tax-pro-max platform which had many challenges.

Nigeria is partially ready for AI adoption in its tax process due to its unique economic, technological and institutional contexts. The critical challenges Nigeria faces stems from low technological infrastructure, lack of integrated databases and lack of AI legal framework. To therefore enhance readiness, the Nigerian government and the NRS should focus on strengthening digital infrastructure, establishing comprehensive legal frameworks, training government and tax officials on the use of AI tools (Gbemigun & Alade, 2024). Where these areas are focused on, Nigeria will then be fully ready for AI adoption in its tax administration process.

4. Conclusion and Recommendation

This paper has explained the readiness of Nigeria in exploring AI driven technologies such as; machine learning, robotic process automation, blockchain and big data analytics in its tax administration process. The conceptual review provided insights on how these technology tools will improve tax administration and the challenges experienced. This study shows that AI has positive outcomes and therefore Nigeria should invest in emerging technology tools in its tax administration process. However, incorporating AI into current tax systems requires significant investment in staff training, technology infrastructure, public awareness to cultivate trust and compliance measures among taxpayers towards digital systems. In addition, concerns regarding securing of taxpayer information and data privacy are vital hence, the Nigerian government and NRS should navigate these problems carefully to guarantee the successful implementation of these technologies.

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