Impact Of AI Adoption on The Taxation System and Implications for Socio-Economic Inequality in Nigeria

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Abstract*—The rapid adoption of artificial intelligence (AI) has transformed public sector administration globally, with taxation systems increasingly leveraging AI to improve efficiency, transparency, and compliance. In developing economies such as Nigeria, the implications of AI-driven tax reforms for socio-economic inequality remain insufficiently explored. This study investigates the impact of AI adoption on taxation system efficiency and examines its implications for socio-economic inequality in Nigeria, with particular emphasis on the mediating role of AI adoption. The study adopts a survey research design and relies on primary data collected from staff of the Federal Inland Revenue Service (FIRS)/Nigeria Revenue Service (NRS). Data were analysed using descriptive statistics, Pearson correlation analysis, multiple regression techniques, and mediation analysis following the Baron and Kenny framework. The empirical findings reveal that AI adoption has a significant and positive effect on taxation system efficiency. The results also show a significant relationship between AI adoption and socio-economic inequality. In addition, taxation system efficiency is found to be significantly associated with socio-economic inequality. However, the mediation analysis indicates that AI adoption does not significantly mediate the relationship between taxation system efficiency and socio-economic inequality. While the taxation system's efficiency influences both AI adoption and inequality, the indirect effect transmitted through AI adoption is weak and statistically insignificant. The study concludes that although AI adoption is a valuable instrument for strengthening tax administration in Nigeria, its capacity to address socio-economic inequality is limited when implemented in isolation. The study recommends a strategic expansion of AI infrastructure and human capacity to optimise tax administration efficiency and revenue forecasting. Furthermore, it advocates for the integration of equity-focused design and broader institutional, governance, and inclusion-oriented policy reforms to ensure that technological advancements facilitate progressive taxation and contribute to the reduction of socio-economic inequality. This study contributes to the literature on AI and public finance from a developing economy context, which offers policy-relevant insights for designing inclusive digital tax reforms in Nigeria.

***Index Terms*—Artificial Intelligence; Taxation System Efficiency; Socio-Economic Inequality; Tax Administration; Digital Governance.**

I. INTRODUCTION

Globalisation and rapid technological transformation have led to significant changes across various disciplines (Belahouaoui & Attak, 2024). In recent years, the global economy has entered an era increasingly defined by Artificial Intelligence (AI). AI is adopted across several contexts, which is a clear indication of its beneficial use for several purposes (Mookerjee & Rao, 2021). It has become the most revolutionary technology of the 21st century, transforming the way governments, enterprises, and individuals engage with information and make decisions. Thus, with societies becoming more dependent on data-driven systems, AI is now being integrated into governance and public policy to transform efficiency and enhance accountability (Brynjolfsson & McAfee, 2017). Recently, AI has been deployed to government-level functions, where its capability to automate, predict, and optimise is being harnessed to deal with administrative problems. Its role has transcended beyond traditional functions to fields such as taxation (Nwaze, 2024). Various countries across the globe are leveraging AI to re-engineer taxation systems through improved

compliance, reducing administrative expenses, and enhancing transparency. Likewise, the developed economies such as the United Kingdom, Estonia, and Singapore leverage AI-driven systems to track anomalies in tax filings, estimate revenue streams, and identify fraud in real-time (Dhaliwal et al., 2023). These developments reflect a broader global shift toward digitalised tax administration (Belahouaoui & Attak, 2024).

Tax remains a key vital source of funding for national governments (Busari et al., 2024). However, one major problem in fiscal management is tax revenue collection. Hence, AI technologies have proven to be powerful tools capable of streamlining state functions and bridging gaps that have long plagued tax compliance and fairness. Authors agree that AI capability has a great potential to increase tax compliance, increase assessment accuracy, and facilitate administrative tasks (Adegbayibi & Ajape, 2025). Similarly, Belahouaoui and Attak (2024) find support that digitalisation improves operational efficiency and tax compliance, especially when done with blockchain and AI. It enhances productivity and reduces operational costs. Its potential stems from its capability to automate repetitive tasks, e.g., data entry, filing, etc. (Mookerjee & Rao, 2021). AI application in tax involves using algorithms, machine learning (ML), and data analysis to undertake key tasks such as taxpayer profiling, risk detection, and revenue forecasting. ML algorithms, for instance, can detect outliers in large data, alert taxpayers who do not adhere to the laws, and predict potential tax evasion patterns (Onyekachi & Ihendinihu, 2025).

Predictive analysis can aid tax authorities in forecasting revenue and managing tax audits, whereas natural language processing can scan unstructured data, i.e., declarations, receipts, and letters, to improve assessment accuracy. Thus, AI is viewed as a potential catalyst for redesigning Nigeria's tax regime to be more effective, transparent, and equitable (Nwaze, 2024). Hence, in recent years, the application of AI to tax assessment in Nigeria has become a game-changer, e.g., TaxProMax. ML and data analytics are two examples of AI technologies that are transforming tax compliance, fraud detection, and collection (Nwaze, 2024). The Federal Inland Revenue Service (FIRS) now renamed Nigeria Revenue Service (NRS) (uses AI-based analytics to vet transaction records in various sectors, which is a case in point. This has enhanced the identification of loopholes, which enhanced revenue collection by the government. These innovations demonstrate the ability of AI to strengthen public trust and fiscal governance. These innovations eased administrative bottlenecks, minimised human bias, and allowed evidence-based decision-making. However, successful adoption depends on the quality of information, institutional readiness, technical competence, and a good legal framework that governs AI ethics as well as data protection (Olaoye, 2025).

The Nigerian economy is regarded as the largest in Africa by GDP; however, the economy has not maximised tax collection as the tax ratio to GDP is below 8%, and this is much lower than the sub-regional average at about 15% (OECD, 2024). The highest tax-to-GDP ratio since 2010 was 9.7% in 2011, with the lowest being 5.3% in 2016 (OECD, 2024). This may be attributed to previous manual-based methods, which weren't effective in addressing issues related to tax administration. These were typically marred by poor record-keeping, inability to link data among agencies, and poor enforcement (Nwaze, 2024). This caused a shortage of public funds, which crippled the government from providing basic infrastructure, healthcare, education, and social protection. Thus, several Sub-Saharan African (SSA) nations consistently place a high priority on initiatives to strengthen tax administration, combat tax evasion, and diversify their sources of income. SSA's average tax-to-GDP ratio for these taxes in 2018 was 17.5%, which is lower than the OECD average of 34.3% and the LAC average of 23.1% (Etim et al., 2020). The low tax ratio is caused by the massive informal sector, i.e., tax exemptions, incentives, lack of effective tax enforcement, and political economy factors influencing tax policy and reform (Ewa et al., 2020).

However, in developing economies like Nigeria, where poor institutional structures, informal economic enterprise, low compliance culture, corruption, and infrastructural constraints are present, the infusion of AI into taxation presents both challenges and threats (Onyekachi & Ihendinihu, 2025). AI has the potential to amplify existing inequalities if introduced without necessary safeguards. It is already known that digitalisation of emerging economies tends to disproportionately benefit formal sectors and urban elites who have greater access to technology and education (Korinek & Stiglitz, 2018). Likewise, in

developing economies, smaller companies and low-income earners, who may not have access to advanced technologies, the tax burden can become disproportionately heavy. This is particularly pertinent in a country where much of the population operates in the informal economy, and traditional enforcement mechanisms are inadequate. This creates a potential paradox: while AI can increase tax efficiency and government revenue, it may also deepen socio-economic divides by excluding those in rural and informal sectors from the benefits of AI. Hence, the dual nature of AI as an efficiency driver and a socio-economic divider makes it a critical theme for study in recent times. This is particularly true in a country like Nigeria, which aggravates the effect of AI adoption to increase or widen inequality.

Hence, infusion of AI must be viewed through the lens of governance and social inclusion. This evidence was supported by Belahouaoui and Attak (2024) and Nwaze (2024). The benefits of AI are mostly achieved by individuals and businesses that have the resources to adopt such technologies. Belahouaoui and Attak (2024) suggested that to reap the benefits of AI adoption, there is a need for capacity building and support from legislative frameworks, especially in developing countries. Yet, other scholars from Nigeria suggest that AI tax infusion should not be restricted to automation but needs to address inclusion, transparency, and fairness. Onyekachi and Ihendinihu (2025) hold that AI-driven tax monitoring systems could significantly repress tax evasion and improve compliance if properly designed and supported by an equivalent degree of infrastructure and human capacity. Their findings indicate that AI instruments can improve audit precision and fraud detection, yet their performance depends on governance quality and public trust. In societies where citizens perceive the tax regime as inequitable or opaque, implementing such a regime can generate resistance rather than compliance. Similarly, Nwaze (2024) states that AI use in Nigeria needs to be guided by clear-cut legal frameworks that balance efficiency with moral principles such as data privacy, accountability, and fairness.

Additionally, AI adoption has the potential to further worsen economic inequality. With mundane tasks being handled by automation, those who do not possess the skills to move into newer jobs in a more digital economy will be put at a disadvantage. As Nigeria is now joining the bandwagon of AI applications in taxation, there is an immediate concern about its effect on inequality. In a recent IMF/World Bank Annual Meetings in Washington DC (2025) roundtable, the global organisation "warned that the failure to bridge digital infrastructure gaps in developing nations could worsen inequality and slow global productivity growth". Inequality in Nigeria goes beyond the distribution of income; it includes access to resources, education, technology, and opportunities (Nayyar et al., 2024). The Gini coefficient, which measures income inequality, has remained high, ranging from 0.35 to 0.43, over the last ten years (World Bank, 2024). The inequality manifests geographically and sectorally, with rural communities and informal workers typically excluded from financial and digital services. AI adoption, if uneven, can widen this gap by disproportionately benefiting formal enterprises, urban taxpayers, and technology-savvy groups while leaving behind those who are not digitally covered or financially included (Adekoya et al., 2023).

The role of AI in taxation needs to be placed within the context of Nigeria's general development. The administration's vision for a digital economy, as encapsulated in the National Artificial Intelligence Strategy (2025) and the National Digital Economy Policy and Strategy (NDEPS), envisions a future where technology results in broad-based growth. Nevertheless, persistent infrastructural deficits, limited broadband penetration, and AI illiteracy are significant barriers (Jooji et al., 2023). This study extends the research of Belahouaoui and Attak (2024) to bridge the knowledge and empirical gap on the subject, with research from a less developed economy. This is because policymakers need to ensure that the benefits of AI are equitably distributed; hence, a strategy that promotes innovation without promoting heightened inequality shall be the ticket for Nigeria to capture the full potential of AI in its taxation.

This study is significant because it connects a technological shift-AI taxation to the country's core development challenges of revenue generation and inequality. In the areas of Policy/Institutional reforms, the study will provide the leeway with regards revenue mobilization and provide data for the sustainability of the ongoing reforms. Within the realm of academics, the outcome of the study will provide guidance to accounting pratitoners, tax consultants, as well as

entrepreneurs to have an insight on the impact of AI tax practice, compliance, as well as advisory services. As for the Socio-economic significance, issues related inequality, inclusivity and trust in government will be brought to the fore. Lastly, the study will also provide foundation for future research.

II. LITERATURE REVIEW

2.1. Conceptual Review

This section xrays the key theories and concepts, as well as the ideas that support the "Impact of AI Adoption on the Taxatin System and Implications for Socio Economic Inequality in Nigeia".

2.1.1.AI Adoption

Artificial intelligence (AI) has evolved from a technological idea to a revolutionary power re-moulding the economic, administrative, and societal structure of today's world. AI may be described as the simulation of human intellectual processes by machines, especially computer systems, via activities such as learning, reasoning, perception, and problem-solving (Brynjolfsson & McAfee, 2017). In public administration, AI finds expression as technologies like machine learning, data analysis, and natural language processing, which are used to automate choices, analyse vast amounts of data, and predict future performance. Such opportunities have foundational effects on how governments deliver services, distribute resources, and enforce compliance with taxation and fiscal policy (Dhaliwal et al., 2023). Its ability to process large amounts of data and identify complex patterns enables governments to promote efficiency, reduce corruption, and enhance transparency (OECD, 2024). In public finances, AI is capable of identifying anomalies in taxpayer behaviour, improving risk profiling, and optimising tax collection systems. By automating mundane tasks, AI reduces discretionary intrusion and human error, the root causes of inefficiency and corruption in the majority of developing countries. Globally, AI has been successfully integrated into taxation systems to enhance compliance and ensure efficient operations. For example, Estonia's online tax system uses AI algorithms to pre-fill tax returns, which saves time and cost in filing taxes (OECD, 2024).

In South Korea and the United Kingdom, AI technology is employed to detect patterns of tax evasion and monitor company tax returns in real-time. These examples illustrate the increasing role played by AI in supporting fiscal governance. However, in countries like Nigeria, where institutional capacity and information technology infrastructure are weak, the implementation of AI in public institutions must be calibrated to the ground realities with caution (Nwaze, 2024).

2.1.2.Tax Administration

Tax is the instrument used by governments generate revenue, redistribute wealth, and influence economic behaviour. A tax is a compulsory levy by the government or statutory authority on income, profits, or capital gains, i.e., actual or presumptive, for individuals or corporations (Ewa et al., 2020). A tax system constitutes the constitutional regimen, administrative rules, and institutions of structures that determine how taxes are imposed, collected, and used (Musgrave, 1989). An effective tax system should be equitable, understandable, and capable of collecting sufficient revenue for the provision of public services. In Nigeria, however, the tax system has perennially been restricted by challenges such as poor record-keeping, tax avoidance, corruption, and a vast informal sector (FIRS, 2023). In Nigeria, tax collection is predominantly managed by the Federal Inland Revenue Service (FIRS) now Nigeria Revenue Service (NRS) and States Board of Internal Revenue.

The country has witnessed several reforms, such as the introduction of the Integrated Tax Administration System (ITAS) and online filing systems (Onyekachi & Ihendinihu, 2025). Researchers attribute this to inefficient enforcement machinery, poor taxpayer awareness, and poorly designed manual processes (Bello et al., 2023). Consequently, the tax-to-GDP ratio for Nigeria has been below the African average, which limits the government in delivering essential social and economic services (Olaniyi et al., 2024). Many obstacles stand in the way of Nigeria's tax system's effectiveness and transparency. A fundamental issue arises from the complexity and vagueness of tax rules and regulations (Ogundajo et al., 2024).

Ordinarily, many taxpayers, especially from the informal sector, find the tax system confusing and challenging to comprehend at times, which could result in mistakes when following the rules (Adekoya et al., 2019). The intricate framework of the tax code

also makes it possible to avoid paying taxes by taking advantage of legal loopholes, which undermines the government's efforts to collect revenue. Additionally, the lack of transparency is exacerbated by the uneven application and understanding of tax laws in different businesses or geographical areas, which exposes taxpayers to disparate treatment depending on arbitrary standards (Williams, 2020). The quantity and accessibility of tax-related data are restricted, which is a major obstacle. Many taxpayers, particularly individuals and small enterprises, struggle to get unambiguous and clear instructions about their tax responsibilities, benefits, and possible benefits (Bitzenis & Vlachos, 2018).

2.1.3.Societal Inequality

Inequality is a multi-dimensional concept that comprises income, wealth, opportunity, and standard-of-living inequalities. In Nigeria, inequality takes place in unequal access to education, healthcare, digital technology, and employment. Socio-economic inequality arises when structural hindrances prevent some groups from equal benefit from economic progress and technological transformation (World Bank, 2024). AI adoption, though a source of innovation, can widen such imbalances if the advantages of it are not disproportionately shared. Korinek and Stiglitz (2018) observed that technological advancement has a tendency to advantage those who are high-skilled and who own capital compared to others, introducing employment polarisation and compensation disparity. In Nigeria, with low digital literacy and uneven access to broadband, the deployment of AI in fiscal systems risks leaving behind poor and rural communities in their tax participation as well as related benefits (Adekoya et al., 2023). Socio-economic inequality also determines tax fairness opinions among the people. When the wealthy exploit loopholes and the poor bear undue burdens, public trust gets eroded (Busari et al., 2024).

2.1.4.Linking AI, Taxation, and Inequality

The link between AI, taxation, and inequality is complex and dynamic. AI influences taxation through automation, efficiency, and compliance. Improved tax administrations, however, impact inequality through the redistribution of income and financing social programs. While AI is employed in a democratic way, it can identify under-taxed high-income groups and reduce the scope for avoidance and permit more progressive taxation (Deshi et al., 2025). Conversely, if poorly designed or poorly implemented AI systems do not pay attention to social disparities, they have the potential to increase inequality by keeping informal workers or low-penetration digital areas outside of their reach (Onyekachi & Ihendinihu, 2025). This reliance underscores the significance of inclusive digital policy, transparent governance, and responsible AI practices to ensure that technological development contributes to broader socio-economic justice.

Taxation is most likely the strongest weapon in the battle against socio-economic inequality. By the redistribution of income as well as the funding of public goods, taxation can reduce disparities in wealth and opportunity (Musgrave, 1989). In Nigeria, however, the redistributive potential of taxation has remained wanting due to low tax returns, regressive tax regimes, and bureaucratic inefficiencies (World Bank, 2024). AI can help transform this dynamic through more effective channels of progressive taxation. For instance, analysis of data can reveal discrepancies in reported and true incomes, particularly for high-net-worth individuals. Through this information, tax authorities can design interventions with specific measures that bring taxation to a more level playing field across income levels (Korinek & Stiglitz, 2018).

AI can also facilitate real-time monitoring of transfer price actions of MNCs to prevent tax evasion and base erosion. It can enhance state capacity to invest in social programs that reduce inequality. Increased revenues from enhanced compliance can be used to support education, health, and cyber infrastructure. Such investment is critical in bridging the socio-economic gaps defining inequality in Nigeria (Deshi et al., 2025). Another significant point of intersection between taxation and inequality is the informal economy. The informal economy, comprising small-scale traders, artisans, and unregistered enterprises, represents nearly 60% of Nigeria's economic activity (Olaniyi et al., 2024). AI can help formalise the sector through digital payment platforms, mobile tax registration, and e-filing systems. For example, mobile tax software based on AI can calculate micro-entrepreneurs' obligations automatically using transaction history, promoting inclusion while expanding the tax base (Owonifari et al., 2023).

However, the risk of digital exclusion cannot be ignored. The majority of Nigerians, especially rural residents, lack the digital literacy or infrastructure to engage with AI-driven tax systems. The Nigerian Communications Commission (2023) points out that internet penetration and broadband access are disproportionately found in urban regions. Thus, in Nigeria, AI use in the collection of taxes provides a double benefit: improving fiscal performance and progressing social justice. This can only be achieved, however, if the application of AI is preceded by master plans that address infrastructural deficiencies, data management, and capacity building for individuals (Nwaze, 2024).

2.2. Theoretical Framework

The Technology Acceptance Model (TAM) was developed by Davis (1989). TAM is an important model for describing how individuals and organisations adopt and use technology. Perceived usefulness (PU) and perceived ease of use (PEOU) are identified by the model as two primary factors driving the technology adoption probability. Perceived usefulness is how much a person feels that the use of a given system will enhance their performance, while perceived ease of use is how simple they perceive its usage. These attitudes influence technology attitudes, behavioural intentions, and ultimately usage in the long term. TAM has been employed extensively in research on technology adoption in e-government, banking, and taxation administration systems (Venkatesh & Davis, 2000; Mtebe & Raisamo, 2014a, b).

Various authors show that taxpayers are more likely to embrace e-tax systems if they find them easy to access, transparent, and secure (Adekoya et al., 2023). However, in Nigeria, barriers such as low digital literacy, a lack of internet access, and fear of data breaches often lower perceived ease of use and hinder adoption (Nwaze, 2024). The relationship between TAM and tax efficiency is based on adoption behaviour. When tax officials and taxpayers adopt AI technologies, the system becomes more compliant, less prone to error, and more effective in administration. Hence, technology acceptance among tax employees is directly connected to organisational effectiveness and service quality (Busari et al., 2024). For example, the partial automation of filing systems by the FIRS has increased tax collection, where the workers were appropriately digitally trained and perceived the technology to be beneficial.

2.3. Empirical Review

Busari et al. (2024) studied "Taxes from income, profit and capital gains among sub-Saharan African countries: Impact of industrialization". The study used an ex-post facto research design. The sample size was derived from the World Bank Group Database and included. panel data from 38 countries during 21 years (2001–2021). The System Generalised Moment Method (SGMM) results demonstrated that industrial performance significantly impacted capital gains, profit, and income taxes in SSA countries. The study found that one of the main factors influencing the best possible tax revenue generation from income, profit, and capital gains is the industrialisation of sub-Saharan African nations.

Emudainohwo and Ndu (2022) study the consequences of introducing an electronic tax system in Nigeria (2022). The diagnostic tests made it possible to use autoregressive distributed lag bounds to create an appropriate regression model. We divided the quarterly secondary data and tax statistics data from the Central Bank of Nigeria into two time periods for this study: the pre-electronic tax period (2011q1–2015q3) and the post-electronic tax period (2015q4–2020q4). Stamp duty and corporate income tax have a negligible long-term impact on GDP growth. Tax collection from items like capital gains and value-added products slightly decreases as the economy grows. Long-term GDP development is barely impacted by value-added tax, petroleum profit tax, and capital gains tax, although corporate income tax, the education trust fund, and stamp duty have a negligible positive impact.

Awa and Ibeanu (2020) examined the effect of tax revenue on Nigeria's economic growth between 1997 and 2018. This study adopted an after-the-fact methodology. they made use of annual time series data from 1997 to 2018 from the CBN and FIRS. In the study, regression analysis was utilised. The results show that while VAT has a far lower effect on economic growth, taxes on corporate income and petroleum profits have a significant one.

Owino (2019) looked at how excise and customs taxes affected Kenya's GDP growth between 1973 and

2010. A retrospective method of inquiry was used in the study. To ensure that the results would corroborate the study's hypotheses, multiple regression analyses were employed to assess the data. The empirical results demonstrated that customs and excise had a positive association.

III. METHODOLOGY

A clear and systematic methodology is essential for ensuring the credibility, validity, and reliability of any empirical research. This section outlines the procedures and techniques employed in investigating the impact of artificial intelligence (AI) adoption on the taxation system and socio-economic inequality in Nigeria.

3.1. Research Design

The study employed a survey research design. It is suitable as it allows the researcher to gather responses from participants directly and analyse their attitudes, experiences, and perceptions concerning AI adoption in tax administration. A survey design is helpful in social science research where one seeks to describe trends, opinions, or relationships among variables (Creswell & Creswell, 2018). In addition, the survey allows quantitative data collection from personnel of FIRS now NRS (2026) to gauge the effects of AI adoption on taxation effectiveness and socio-economic inequality.

3.2. Sample size and Sampling Technique

The sample consisted of Federal Inland Revenue Service (FIRS) now Nigeria Revenue Service (NRS)staff in Abuja, Lagos and Lokoja. FIRS/CRS is the prime agency entrusted with the mandate of assessing, collecting, and accounting for tax revenues to the Federal Government of Nigeria. It plays a leading role in implementing AI- technologies such as automated compliance systems, e-filing, and data analytics platforms. The study used purposive sampling, and a final sample of 12 key executives with FIRS (now NRS).

3.3. Sources of Data and Instrument

This study utilised primary data as the main source of data. The primary data will be obtained through the administration of a structured questionnaire distributed among selected FIRS /NRS staff, electronically through google forms. The questionnaire will contain both closed-ended and Likert-scale questions designed to measure respondents' perceptions of AI adoption, taxation efficiency, and socio-economic impacts.

The main instrument of data collection is a structured questionnaire as a primary instrument for data collection. It was divided into four three sections aligned with the study variables: Section A: Demographic information of respondents; Section B: AI Adoption; Section C: Taxation System Efficiency; and Section D: Socio-Economic Inequality. The items from sections B-D were measured using a five-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree. The Likert scale format allows for the quantification of subjective perceptions and facilitates subsequent statistical analysis. The data were collected electronically through google forms, to ensure wide coverage and minimise non-response. Questionnaires were distributed to respondents across various departments in FIRS/NRS, and the respondents were firmly assured of anonymity and confidentiality to promote honest responses.

3.4. Method of Data Analysis

The completed questionnaires were retrieved and reviewed for completeness before being coded for analysis. The data were analysed using descriptive and inferential statistical methods, with the aid of Statistical Package for the Social Sciences (SPSS) version 26. The descriptive statistics were used to summarise demographic characteristics, e.g., means, standard deviation, and frequency distributions, etc. The inferential statistics used is linear regression to test the hypotheses; while the mediation analysis was used to analyse the mediation using three distinct regression equations (Baron & Kenny, 1986), which is widely accepted in social science and policy studies.

The model specification is as follows:

$TSE=\alpha_0 + \beta_1 AIA + \mu$……..Eq. (1)

$SEI=\alpha_0 + \beta_1 AIA + \mu$……..Eq. (2)

Where:

SEI: Socio-economic inequality

AIA: AI adoption

TSE: Taxation system efficiency

IV. DATA ANALYSIS

This section outlines the results of the primary data analysis, which the researcher obtained from the survey questionnaire administered to FIRS/NRS staff, electronically through google form. They served as the respondents in the study.

Table 1: Socio-Demographic Characteristics of Respondents (FIRS /NRS Staff)

Variable	Category	Frequency	Percent (%)	Cumulative Percent (%)
Gender	Female	7	58.3	58.3
	Male	4	33.3	91.7
	Prefer not to say	1	8.3	100.0
	Total	12	100.0	
Age Bracket (Years)	30–39	1	8.3	8.3
	40–49	3	25.0	33.3
	50 and above	8	66.7	100.0
	Total	12	100.0	
Educational Qualification	B.Sc / B.A	1	8.3	8.3
	HND	3	25.0	33.3
	M.Sc / MBA	5	41.7	75.0
	PhD	3	25.0	100.0
	Total	12	100.0	
Years of Experience in FIRS	6–10	4	33.3	33.3
	11–15	2	16.7	50.0
	16 years and above	6	50.0	100.0
	Total	12	100.0	
Department	Audit	3	25.0	25.0
	Enforcement	1	8.3	33.3
	Tax Operations	8	66.7	100.0
	Total	12	100.0	

Source: Researcher's Field Survey (2026)

Table 1 shows the socio-demographic characteristics of the respondents (FIRS /NRS staff). With respect to gender distribution, 58.3%, i.e., 7 of the respondents were female, 33.3%, i.e., 4 were male, while 8.3%, i.e., 1 preferred not to disclose their gender. With regards to age bracket, 8.3%, i.e., 1 of the respondents fell within the 30–39 years age group, 25.0%, i.e., 3 were between 40–49 years, while the majority, 66.7%, i.e., 8 were aged 50 years and above. In terms of educational qualification, 8.3%, i.e., 1 of the respondents, possessed a B.Sc/B. A degree, 25.0%, i.e., 3, held an HND, 41.7%, i.e., 5, had M.Sc/MBA qualifications, while 25.0%, i.e., 3, possessed a PhD. The study showed that concerning years of experience in the Federal Inland Revenue Service, 33.3%, i.e., 4 of the respondents had between 6–10 years of experience, 16.7%, i.e., 2 had between 11–15 years of experience, while 50.0%, i.e., 6 had 16 years and above experience. With respect to departmental distribution, 25.0%, i.e., 3 of the respondents were from the Audit department, 8.3%, i.e., 1 was from the Enforcement department, while the majority, 66.7%, i.e., 8 were from the Tax Operations department.

4.1. Correlation Analysis

Table 2: Descriptive Statistics of Model Variables

	Mean	Std. Deviation	N
AI adoption	3.8667	.62280	12
Taxation system efficiency	3.8833	.68468	12
Socio-economic inequality	3.6333	.73773	12

Source: SPSS Ver. 25

Table 2 presents the descriptive statistics of the model variables. The mean score for AI adoption is 3.8667 with a standard deviation of 0.62280, indicating a relatively high level of perceived AI adoption among respondents with moderate variation in responses. The taxation system efficiency variable has a mean value of 3.8833 and a standard deviation of 0.68468, suggesting that respondents generally agreed that AI has improved the efficiency of the taxation system. Socio-economic inequality recorded a mean score of 3.6333 with a standard deviation of 0.73773, indicating moderate perceptions regarding the impact of AI adoption on socio-economic inequality.

Table 3: Pearson Correlation Statistics of Model Variables

Correlations				
		AI adoption	Taxation system efficiency	Socio-economic inequality
AI adoption	Pearson Correlation	1	.651*	.644*
	Sig. (2-tailed)		.022	.024
	N	12	12	12
Taxation system efficiency	Pearson Correlation	.651*	1	.750**
	Sig. (2-tailed)	.022		.005
	N	12	12	12
Socio-economic inequality	Pearson Correlation	.644*	.750**	1
	Sig. (2-tailed)	.024	.005	
	N	12	12	12
*. Correlation is significant at the 0.05 level (2-tailed).				
**. Correlation is significant at the 0.01 level (2-tailed).				

Source: SPSS Ver. 25

Table 3 shows the Pearson correlation statistics of the model variables. The results reveal a positive and statistically significant relationship between AI adoption and taxation system efficiency ($r = 0.651$, $p = 0.022$). This implies that higher levels of AI adoption are associated with increased efficiency in the taxation system. Similarly, AI adoption exhibits a positive and significant relationship with socio-economic inequality ($r = 0.644$, $p = 0.024$), indicating that changes in AI adoption are significantly associated with changes in socio-economic inequality perceptions among respondents. Taxation system efficiency is positively and strongly correlated with socio-economic inequality ($r = 0.750$, $p = 0.005$). This relationship is statistically significant at the 1% level; hence, improvements in taxation system efficiency through AI adoption may have notable implications for socio-economic inequality. The correlation results indicate that AI adoption is significantly associated with taxation system efficiency (TSE) and socio-economic inequality (SEI); however, taxation system efficiency is also positively and significantly correlated with the socio-economic inequality of the respondents in the study area.

4.2. Test of Hypotheses

4.2.1.Test of Hypothesis One

Ho_1: AI adoption does not have a significant influence on tax administration efficiency across states in Nigeria.

Table 4: Model Summary of Hypothesis One

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.651[a]	.424	.366	.54513
a. Predictors: (Constant), AI adoption				

Source: SPSS Ver. 25

Table 4 presents the model summary for hypothesis one. The correlation coefficient (R) between AI adoption and taxation system efficiency is 0.651, indicating a moderate positive relationship between the variables. The coefficient of determination (R^2) is 0.424, implying that approximately 42.4% of the variation in taxation system efficiency is explained by AI adoption. After adjusting for degrees of freedom, the adjusted R^2 value stands at 0.366, showing that AI adoption accounts for about 36.6% of the systematic variation in tax administration efficiency.

Table 5: F-statistic Output of Hypothesis One

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.185	1	2.185	7.353	.022[b]
	Residual	2.972	10	.297		
	Total	5.157	11			
a. Dependent Variable: Taxation system efficiency						
b. Predictors: (Constant), AI adoption						

Source: SPSS Ver. 25

Table 5 shows the ANOVA results for hypothesis one. The F-statistic value is 7.353 with a corresponding significance probability (p-value) of 0.022. Since the p-value is less than 0.05 level of significance, the model is statistically significant. This indicates that AI adoption significantly predicts taxation system efficiency and that the regression model is a good fit for the data.

Table 6: Coefficients Output of Hypothesis One

Coefficients						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.116	1.033		1.081	.305
	AI adoption	.716	.264	.651	2.712	.022
a. Dependent Variable: Taxation system efficiency						

Source: SPSS Ver. 25

Table 6 shows the regression coefficient estimates for hypothesis one. The unstandardized coefficient for AI adoption is 0.716 with a standard error of 0.264. The standardised beta coefficient is 0.651, and the t-value is 2.712 with a corresponding p-value of 0.022. This result indicates that AI adoption has a positive and statistically significant influence on TSE. Specifically, a one-unit increase in AI adoption leads to a 0.716-unit increase in taxation system efficiency. Based on these findings, the null hypothesis (H_{01}) is rejected, while the alternative is accepted: AI adoption has a significant positive influence on tax administration efficiency across states in Nigeria.

4.2.2.Test of Hypothesis Two

Ho_2: There is no significant relationship between the AI adoption and the level of socioeconomic inequality across states in Nigeria.

Table 7: Model Summary of Hypothesis Two

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.644[a]	.414	.356	.59211
a. Predictors: (Constant), AI adoption				

Source: SPSS Ver. 25

Table 7 presents the model summary for hypothesis two. The correlation coefficient (R) between AI adoption and socio-economic inequality is 0.644, indicating a moderate positive relationship between the variables. The coefficient of determination (R^2) is 0.414, suggesting that approximately 41.4% of the variation in socio-economic inequality is explained by AI adoption. After adjusting for degrees of freedom, the adjusted R^2 value is 0.356, implying that AI adoption accounts for about 35.6% of the systematic variation in socio-economic inequality in the sample.

Table 8: F-statistic Output of Hypothesis Two

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.481	1	2.481	7.075	.024[b]
	Residual	3.506	10	.351		
	Total	5.987	11			
a. Dependent Variable: Socio-economic inequality						
b. Predictors: (Constant), AI adoption						

Source: SPSS Ver. 25

Table 8 shows the ANOVA results for hypothesis two. The regression model yields an F-statistic value of 7.075 with a corresponding p-value of 0.024. Since the p-value is less than 0.05 level of significance, the model is statistically significant. This indicates that Artificial Intelligence adoption significantly explains variations in socio-economic inequality across states in Nigeria.

Table 9: Coefficients Output of Hypothesis Two

Coefficients						
		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	.685	1.122		.611	.555
	AI adoption	.763	.287	.644	2.660	.024
a. Dependent Variable: Socio-economic inequality						

Source: SPSS Ver. 25

Table 9 presents the regression coefficient estimates for hypothesis two. The unstandardized coefficient for AI adoption is 0.763 with a standard error of 0.287. The standardised beta coefficient is 0.644, while the t-value is 2.660 with a corresponding p-value of 0.024. These results indicate that AI adoption has a positive and statistically significant relationship with socio-economic inequality. Specifically, a one-unit increase in AI adoption leads to a 0.763-unit increase in the level of socio-economic inequality. Based on the empirical evidence, the null hypothesis (H_{o2}) is rejected, and the alternative is accepted. This implies that there is a significant relationship between AI adoption and socio-economic inequality across states in Nigeria.

4.2.3.Test of Hypothesis Three

H_{o3}: AI adoption does not significantly mediate the relationship between the taxation system and socio-economic inequality in Nigeria.

Table 10: Mediation Summary Table (AI Adoption as Mediator)

Path	Relationship Tested	R	R^2	β (Standardized)	t-value	p-value	Decision
Path c (Total Effect)	Taxation System Efficiency → Socio-economic Inequality	0.750	0.562	0.750	3.585	0.005	Significant
Path a	Taxation System Efficiency → AI Adoption	0.651	0.424	0.651	2.712	0.022	Significant
Path b	AI Adoption → Socio-economic Inequality (controlling for Taxation System Efficiency)	-	-	0.270	0.977	0.354	Not Significant
Path c′ (Direct Effect)	Taxation System Efficiency → Socio-economic Inequality (controlling for AI Adoption)	0.777	0.604	0.574	2.079	0.067	Not Significant

Source: Author's computation using SPSS Version 25

The results indicate that taxation system efficiency significantly predicts socio-economic inequality (Path c) and AI adoption (Path a). However, when AI adoption is introduced into the model, its effect on socio-economic inequality (Path b) is not statistically significant. Additionally, the direct effect of taxation system efficiency on socio-economic inequality (Path c′) becomes statistically insignificant when AI adoption is controlled for. These findings suggest that AI adoption does not significantly mediate the relationship between taxation system efficiency and socio-economic inequality in Nigeria. Consequently, the null hypothesis (H_{o3}) is accepted.

V. SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

The results for Hypothesis One (H_{o1}) indicate that AI adoption has a significant positive influence on tax administration efficiency across Nigerian states ($\beta = 0.716$, $t = 2.712$, $p < 0.05$). The coefficient of determination ($R^2 = 0.424$) indicates that AI adoption explains approximately 42.4% of the variance in efficiency. This aligns with the work of Busari et al. (2024), who emphasised that industrial performance and technological integration are critical for optimising revenue generation. The statistical significance ($p = 0.022$) suggests that as FIRS in Nigeria transition toward AI-driven analytics for audit

selection and compliance monitoring, there is a measurable improvement in operational performance. This result confirms that digital transformation is not merely a procedural change but a substantive driver of administrative capability.

Hypothesis Two (Ho_2) revealed a significant positive relationship between AI adoption and levels of socio-economic inequality ($\beta = 0.763$, $t = 2.660$, $p = 0.024$). This showed that while AI improves efficiency, its current implementation may be contributing to a widening socio-economic gap. However, Owino (2019) found that modernised tax structures (customs and excise) generally correlate with growth; the positive coefficient in this study suggests that "efficiency" may be coming at the cost of equity. Hence, if AI systems primarily target identifiable formal sector taxpayers while failing to account for the informal sector or the digitally excluded, they risk exacerbating the regressive nature of the tax burden. This highlights the importance of including equity considerations in algorithmic design to avoid social strata exclusion.

Hypothesis Three (Ho_3), following the Baron and Kenny (1986) framework, the results showed that while the total effect of taxation efficiency on inequality was significant (Path c: $p = 0.005$), the relationship became insignificant when AI adoption was controlled for (Path c′: $p = 0.067$). Crucially, Path b (AI Adoption →Inequality) was not significant ($p = 0.354$) when controlling for efficiency. The failure of the mediation model suggests that AI adoption does not function as a bridge that translates tax efficiency into reduced inequality. Instead, AI adoption and tax efficiency appear to operate as independent factors or are influenced by broader systemic variables. This supports the finding of Emudainohwo and Ndu (2022), who noted that electronic tax systems often have negligible or varied long-term impacts on broader macroeconomic indicators like Gross Domestic Product (GDP)s.

5.1. Conclusion

This study examined the impact of artificial intelligence (AI) adoption on taxation system efficiency and its implications for socio-economic inequality in Nigeria, with particular attention to the mediating role of AI adoption. Using primary data from the staff of the Federal Inland Revenue Service (FIRS) and applying correlation, regression, and mediation analyses, the study provides empirical insights into the evolving role of AI in Nigeria's tax administration. The findings reveal that AI adoption has a significant and positive influence on taxation system efficiency, indicating that the integration of AI-driven tools enhances administrative effectiveness, accuracy, and compliance within the tax system. In addition, AI adoption is found to be significantly associated with socio-economic inequality; however, the mediation analysis shows that AI adoption does not significantly mediate the relationship between taxation system efficiency and socio-economic inequality. While the taxation system's efficiency significantly influences both AI adoption and socio-economic inequality, the indirect effect transmitted through AI adoption is weak and statistically insignificant. This implies that improvements in tax efficiency affect inequality largely through direct institutional and structural channels rather than through AI adoption alone. Thus, the study found that although AI adoption is a valuable instrument for strengthening tax administration in Nigeria, its ability to influence socio-economic inequality is conditional on broader governance, inclusion, etc. Without complementary measures that address digital exclusion, institutional capacity, and equitable access, AI-driven tax reforms may improve efficiency without necessarily reducing inequality.

5.2. Recommendations

Based on the above, the study makes the following recommendations:

1. Strengthen AI deployment to enhance Tax Administration Efficiency:

This includes expanding the use of AI-driven analytics for compliance monitoring, audit selection, and revenue forecasting, alongside continuous training for tax officials. Sustained investment in AI infrastructure and human capacity will consolidate efficiency gains and improve overall tax administration performance across states.

2. Embed equity considerations into AI-Driven Tax Reforms:

This includes designing AI systems that reduce regressive tax burdens, improve detection of high-income tax evasion, and accommodate taxpayers in

the informal sector. Complementary measures such as simplified digital tax platforms and targeted digital inclusion initiatives are necessary to ensure that efficiency gains from AI adoption do not disproportionately disadvantage low-income and digitally excluded groups.

3. Complement AI ddoption with broader Institutional and Social Policies:

AI should not be viewed as a standalone solution for addressing inequality; instead, it should be complemented by broader institutional reforms, including transparent revenue allocation, strengthened governance frameworks, and social spending targeted at education, healthcare, and digital infrastructure. Such an integrated approach will ensure that improvements in tax efficiency translate into meaningful reductions in socio-economic inequality.

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