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Effects of Artificial Intelligence on Tax Administration in Lagos State

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Abstract: Despite global interest in employing AI to enhance tax systems, a significant study gap persists about its specific effects in Lagos State. This paper addressed this gap by presenting empirical evidence regarding the effectiveness of AI technologies, including natural language processing (NLP), blockchain technology (BT), predictive analytics (PA), and machine learning (ML) in improving tax administration. The research utilizes a quantitative design, collecting primary data through a structured questionnaire, distributed to 152 participants inside the department overseeing AI and tax consultants/payers in LIRS. The data are analyzed using regression analysis to determine the relationships among the independent variables (NLP, BT, PA, ML) and the dependent variable (efficiency of tax administration). The findings demonstrate that AI technologies markedly improve the efficiency of tax administration. Predictive analytics has the most significant influence, succeeded by natural language processing, blockchain technology, and machine learning. These technologies enhance processing speed, correctness of tax evaluations, taxpayer compliance, and diminish administrative expenses. The study therefore concluded that AI has effects on tax administration in Lagos State. It was recommended that governments augment investment in AI infrastructure, facilitate training for tax officials, and advocate for the implementation of blockchain to improve security and transparency.

Keywords: Artificial Intelligence; Natural Language Processing; Blockchain Technology; Predictive Analytics, Machine Learning

JEL Classification: H2

1. Introduction

Tax administration encompasses the thorough management, oversight, and execution of taxation laws and associated regulations, crucial for securing tax revenue in both national and regional domains

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(Tian et al., 2016). Efficient tax administration requires a strong infrastructure and a proficient team to manage intricate processes (Carnahan, 2015). Individuals and international organizations often exploit loopholes to avoid taxation (Lenz, 2020). Taxation is essential for financing development initiatives, such as infrastructure, climate change mitigation, and poverty alleviation, thereby facilitating the sustainable development objectives of a region. Globally, tax evasion leads to significant revenue losses, estimated at $500 billion annually, with a substantial portion occurring in low- and lower-middle-income countries, especially in sub-Saharan Africa (Cobham & Janský, 2018). The intricate and resource-demanding aspects of tax fraud detection hinder the proper monitoring and verification of tax returns, exacerbated by multinational firms relocating earnings to low-tax jurisdictions to reduce liabilities.

Digitalization offers a solution by enabling taxpayers to register and submit returns online, while aiding tax practitioners in checking and evaluating these returns on digital platforms, therefore minimizing fraud and errors (Yusuff, 2022). Artificial Intelligence (AI) can manage tax procedures by recording tax data on blockchain systems, allowing tax authorities to monitor transactions efficiently. By minimizing human participation, AI can expedite tax collection, markedly improve revenue generation, and diminish evasion. Certain nations have achieved considerable progress in the digitalization of their tax offices. Fiji and Samoa have implemented the Automated System for Customs Data for customs administration, whilst New Zealand has used the GenTax software for tax processing (Asian Development Bank, 2020). In Asia, nations such as Bangladesh, Cambodia, and Japan are employing biometric identification for tax administration, markedly diminishing fraud and conserving time (Asian Development Bank, 2020). This underscores the revolutionary potential of incorporating modern technologies into tax systems. Artificial intelligence technologies, including machine learning and blockchain, present interesting possibilities for improving tax administration in Lagos State. Machine learning can scrutinize extensive datasets to discern trends and abnormalities, so aiding in the detection of tax fraud and non-compliance. Blockchain offers a secure, transparent, and immutable ledger for documenting tax transactions, facilitating tax authorities' ability to monitor and verify compliance. Countries like Australia, Singapore, and Malaysia are diligently exploring the integration of AI and blockchain in tax administration, setting a standard for others to follow (Asian Development Bank, 2020).

Furthermore, AI can optimize the tax collecting process by automating repetitive jobs, alleviating the workload of tax officials, and diminishing human error. Chatbots can manage taxpayer inquiries and disseminate information regarding tax regulations, while reallocating workers for more intricate activities. Robotic process automation (RPA) can mechanize repetitive operations, including data entry and document processing, thereby enhancing efficiency and precision. Countries such as India and the People's Republic of China are at the forefront of implementing these technologies within their tax administrations (Shakil & Tasnia, 2022; Subramanian, 2022). The incorporation of AI in tax administration presents several obstacles. Issues around data privacy, cybersecurity, and the necessity for substantial investments in technology and training must be resolved. The prospective benefits of AI in improving the efficiency, transparency, and compliance of tax administration are substantial.

The tax administration in Lagos State encounters substantial obstacles, notably widespread tax evasion and inefficiency in conventional tax collecting practices. These issues lead to significant revenue losses, delays in tax collection, heightened costs, and diminished compliance rates. The manual management of tax records elevates the potential of corruption and fraud while simultaneously eroding public confidence in the system. Moreover, obsolete and disjointed systems for data collection,

storage, and analysis hinder precise tracking and oversight of tax compliance. Notwithstanding the clear necessity for modernization, the implementation of innovative technology, including digital platforms and data analytics tools, has been sluggish, hence intensifying these inefficiencies. Moreover, the inadequate training of tax authorities restricts their capacity to proficiently utilize current technology, hence diminishing the potential advantages of digitalization.

Multiple studies have investigated AI, digitalization, and machine learning in Latin America and other developed areas (Faúndez-Ugalde, Mellado-Silva & Aldunate-Lizana, 2020). Previous studies, such as Patel (2020), have highlighted the potential of digitization and artificial intelligence to improve tax administration by reducing fraud and inaccuracies while increasing efficiency. Faúndez-Ugalde, Mellado-Silva and Aldunate-Lizana (2020) clarify the application of machine learning and predictive analytics for detecting tax fraud and improving compliance in Latin America. There is a lack of research about the function of AI in tax administration in Africa, especially in Lagos State. Lagos State, a main economic hub in Nigeria, faces significant challenges in tax administration, marked by inefficiencies in collection practices and high rates of tax evasion. This study seeks to address this deficiency by presenting empirical evidence about the efficacy of AI technologies, including natural language processing, blockchain, predictive analytics, and machine learning, in enhancing the efficiency, accuracy, and transparency of tax administration in Lagos State.

2. Conceptual Review

2.1.1. Natural Language Processing (NLP) in Tax Administration

Natural Language Processing (NLP) is a vital field of artificial intelligence (AI) focused on enabling efficient interaction between computers and human language. The fundamental objective is to enhance computers' ability to comprehend, interpret, and reply to human languages proficiently. NLP has the potential to revolutionize tax administration by automating and improving the interpretation of tax regulations, better communication with taxpayers, and reinforcing compliance oversight. A significant application of NLP in tax administration is the automation of customer support through AI-driven chatbots and virtual assistants. These systems adeptly handle a significant number of taxpayer inquiries rapidly and accurately by autonomously processing natural language queries. The Internal Revenue Service (IRS) in the United States has deployed chatbots to assist people with common questions regarding tax filing and payments (IRS, 2020).

Furthermore, NLP improves the efficiency of processing tax-related documents, which have traditionally been labor-intensive and prone to errors. Tax authorities can employ NLP algorithms to extract and analyze pertinent information from vast unstructured data sources, including tax filings and financial statements. This automated method improves precision and effectiveness in document management. Real-time compliance monitoring is a vital domain in which NLP demonstrates exceptional proficiency. Tax authorities employ natural language processing to analyze vast datasets from many sources, including social media and public records, identifying probable cases of non-compliance or fraud. The proactive application of NLP allows authorities to detect inconsistencies promptly, hence improving enforcement initiatives and assuring compliance with tax legislation (PwC, 2019). NLP tackles the complexity of tax legislation by converting legal jargon into comprehensible language for the general populace. NLP-powered interactive solutions offer taxpayers systematic guidance and tailored counsel, streamlining the tax filing process and enhancing compliance (KPMG, 2017).

2.1.2. Blockchain Technology in Tax Administration

Blockchain technology, originally created as the foundational structure for digital currencies such as Bitcoin, has transformed into a potent tool employed across multiple sectors, including tax administration. Blockchain functions as a decentralized and distributed ledger that securely records transactions in a transparent and immutable fashion. Its attributes make it highly favorable for enhancing the efficiency, transparency, and integrity of tax administration systems. Blockchain documents every transaction in a decentralized ledger that is available to all authorized participants. Every transaction is time-stamped and connected to preceding transactions, forming an unalterable chain of records. This transparency guarantees that all tax-related transactions are verifiable and impervious to tampering, hence diminishing the danger of fraud and corruption. Deloitte (2020) asserts that blockchain's intrinsic security attributes can assist tax authorities in verifying the accuracy of taxpayer data and preventing alterations, hence bolstering faith in the tax system.

A PwC study (2019) indicates that blockchain can markedly decrease the time and expenses related to tax filing and compliance. Blockchain technology provides instantaneous auditability, enabling tax authorities to access and authenticate transactions in real time. The continuous audit approach facilitates the rapid detection of abnormalities and discrepancies, hence minimizing the time and resources needed for conventional audits. Furthermore, the decentralized characteristic of blockchain allows all participants in a transaction to access identical data, so maintaining consistency and minimizing the necessity for duplicate record-keeping. this may result in significant cost reductions for both tax authorities and taxpayers by reducing the necessity for comprehensive audits and inquiries (EY, 2018).

The OECD (2020) posits that blockchain can augment collaboration among tax authorities and enhance the efficacy of international tax compliance. Numerous nations and entities are currently investigating the application of blockchain technology in tax administration. The Republic of Georgia has established a blockchain-based land registration system that securely documents property transactions and guarantees precise property tax assessments (OECD, 2020). The Australian Taxation Office (ATO) is investigating blockchain's capacity to improve transparency and efficiency in tax procedures, specifically with GST (Goods and Services Tax) and company activity statements (EY, 2018). A notable instance includes IBM's partnership with the Dubai government to develop a blockchain-based system for automating Value Added Tax (VAT) collection. This effort seeks to enhance compliance by preserving a visible and immutable record of all VAT-related transactions (Deloitte, 2020).

2.1.3. Predictive Analytics in Tax Administration

Predictive analytics allows tax authorities to anticipate taxpayer behavior, detect potential dangers, and enhance resource allocation for enforcement efforts. Through the analysis of historical tax data, predictive models can identify patterns and anomalies that may suggest non-compliance, tax evasion, or inaccuracies in tax reporting. This proactive strategy enables tax authorities to prioritize audits and investigations according to the probability of non-compliance, therefore optimizing revenue collection and reducing operational expenses (PwC, 2019). Moreover, predictive analytics can facilitate revenue forecasting by anticipating trends in tax collections informed by economic data, demographic shifts, and policy modifications. This assists governments in planning and budgeting, maintaining financial stability and efficient distribution of public resources (OECD, 2020).

The implementation of predictive analytics in tax administration presents numerous advantages. Primarily, it improves operational efficiency through the automation of data analysis and decision-making processes. Tax authorities can utilize predictive models to identify high-risk taxpayers and prioritize compliance efforts, rather than depending on manual checks and random audits. This alleviates the burden on tax officers and enhances the overall efficacy of enforcement operations (EY, 2018). Secondly, predictive analytics enhances tax compliance by facilitating the early identification of probable fraud and non-compliance. Through the real-time analysis of extensive data sets, predictive algorithms can identify questionable transactions or behaviors that require additional scrutiny. This proactive strategy not only discourages tax evasion but also promotes voluntary compliance among taxpayers by guaranteeing equity and openness in tax administration (PwC, 2019).

A number of nations have effectively integrated predictive analytics into their tax administration systems. The United States Internal Revenue Service (IRS) employs predictive models to detect tax returns having a high likelihood of errors or anomalies. These models examine past data regarding taxpayer behavior, revenue sources, and deductions to prioritize audits and compliance assessments (IRS, 2020). The Australian Taxation Office (ATO) has employed predictive analytics in Australia to enhance compliance and diminish the tax gap. The ATO identifies potential tax issues and implements targeted enforcement measures by evaluating data from diverse sources, including financial institutions and third-party providers (EY, 2018). The prospects for predictive analytics in tax administration are favorable, bolstered by developments in technology and data analytics skills. As governments advance in digitizing their tax systems and accumulating data, the application of predictive models is anticipated to become increasingly complex. The integration of developing technologies, including artificial intelligence and machine learning, will augment the precision and efficacy of predictive analytics in detecting tax concerns and refining compliance methods (OECD, 2020).

2.1.4. Machine Learning in Tax Administration

Machine learning (ML), a subset of artificial intelligence (AI), utilizes algorithms and statistical models to empower computers to do tasks based on patterns discerned in data, rather than through direct instructions. ML can be utilized in various aspects of tax administration, including fraud detection, tax compliance assurance, and customer service enhancement. By analyzing huge datasets, machine learning algorithms can identify anomalies and trends indicative of fraudulent activity or non-compliance. Machine learning models can examine prior tax returns and identify those exhibiting suspect trends for additional scrutiny. This proactive strategy allows tax authorities to concentrate their resources on high-risk cases, hence enhancing the overall efficacy of enforcement efforts (Sarker, 2021). Machine learning can forecast which taxpayers are prone to defaulting on their tax responsibilities in tax compliance. Through the analysis of historical behavior and pertinent data, machine learning algorithms can detect taxpayers susceptible to non-compliance and initiate preemptive intervention strategies. This can assist tax authorities in narrowing the tax gap and establishing a more resilient compliance system (Zheng et al., 2021).

Machine learning (ML) markedly improves customer service in tax administration by enabling the development of sophisticated chatbots and virtual assistants. These tools can handle routine inquiries, provide elucidation on tax regulations, and assist taxpayers in precisely and efficiently submitting their forms. This improves the overall experience for taxpayers and alleviates the administrative load on tax authorities (Davenport & Ronanki, 2018). The integration of machine learning into tax administration offers several substantial advantages. It enhances operational productivity by automating repetitive

tasks and expediting processes such as tax return filing and compliance checking. This allows tax authorities to deploy resources more efficiently and focus on complex cases requiring human discretion (Agrawal, Gans & Goldfarb, 2019). Moreover, machine learning improves the accuracy of tax administration. Machine learning models, with the use of extensive datasets and advanced algorithms, can detect nuanced patterns and relationships that traditional methods might overlook. This results in more precise predictions and decisions, hence reducing errors and improving the overall dependability of the tax system (Brynjolfsson & McAfee, 2017).

Moreover, machine learning substantially improves the proficiency of tax officials in identifying fraud. Machine learning algorithms examine historical data to identify abnormalities and atypical patterns indicative of fraudulent actions. This proactive strategy allows tax authorities to detect and combat fraud more effectively, protecting public revenues and maintaining the integrity of the tax system (Tang et al., 2021). A primary worry pertains to data privacy and security. Considering that tax authorities oversee sensitive taxpayer information; it is essential to protect the security and integrity of this data. Implementing comprehensive data governance frameworks and rigorous security protocols is essential to safeguard taxpayer data from breaches and unlawful access (Burt, 2020). A further problem involves guaranteeing the quality of data utilized for machine learning models. These models depend on comprehensive and precise datasets to learn efficiently and produce dependable predictions. Inaccurate, incomplete, or biased data may result in flawed findings. Consequently, tax authorities must emphasize data quality management initiatives to guarantee that their data is accurate, comprehensive, and impartial (Finlay, 2014).

Tax authorities must provide the requisite technical infrastructure and recruit data scientists and machine learning specialists to create, execute, and sustain machine learning models. This can be a significant endeavor, especially for tax administrations with constrained resources (Davenport & Kirby, 2016). A number of countries have effectively used machine learning into their tax administration systems. The United States Internal Revenue Service (IRS) use machine learning to improve its fraud detection efficacy. Through the analysis of patterns in tax returns, the IRS can more effectively identify potential fraud and audit high-risk cases (IRS, 2021). In the United Kingdom, Her Majesty's Revenue and Customs (HMRC) utilizes machine learning to enhance tax compliance. Machine learning models evaluate diverse data sources to forecast non-compliance risks and inform enforcement measures. This has enabled HMRC to enhance compliance rates and diminish the tax gap (HMRC, 2020).

2.2. Theoretical Framework

The Diffusion of Innovations Theory, developed by Everett Rogers in 1962, offers a thorough framework for understanding the spread of new ideas and technologies in society. Rogers characterizes diffusion as the method via which an innovation is propagated over time within a social system. He categorized adopters into five classifications based on their propensity to embrace innovations: innovators, early adopters, early majority, late majority, and laggards. Innovators are the initial adopters of new technology, distinguished by their willingness to take risks and their receptiveness to innovative concepts. Early adopters are pivotal individuals who embrace innovations judiciously, facilitating momentum through the dissemination of favorable feedback. The early majority embraces innovations prior to the general populace, nevertheless they want proof of efficacy.

The late majority adopts only upon general approval, while laggards are the final adopters due to hesitation or resource limitations (Rogers, 2003).

Researchers like Taylor and Todd (1995) have utilized Rogers' theory to investigate technology adoption in businesses, highlighting the significance of adopter traits and innovation features. Agarwal and Prasad (1997) utilized this methodology to investigate the adoption of software technologies, highlighting aspects including relative advantage, compatibility, complexity, trialability, and observability. This concept is essential in clarifying the differing rates of adoption observed among various tax authorities. For example, early adopters like the Internal Revenue Service (IRS) in the United States and Her Majesty's Revenue and Customs (HMRC) in the United Kingdom have integrated AI for purposes such as fraud detection and compliance verification, demonstrating the traits of innovators and early adopters by swiftly and effectively adopting new technologies (IRS, 2021; HMRC, 2020).

2.3. Empirical Review

Patel (2020) performed a comprehensive study employing a mixed-method approach to examine the role of artificial intelligence (AI) in detecting tax fraud. The quantitative aspect involved utilizing machine learning algorithms to analyze tax data and identify trends indicative of tax fraud, while qualitative insights were obtained through interviews with tax officials. Patel concluded that AI significantly enhances the capability of tax authorities to detect fraudulent activities. The machine learning models demonstrated high accuracy in identifying tax evasion patterns, outperforming traditional methods. Chukwu (2021) explored the implementation and impact of blockchain technology in tax administration through a case study approach. Data were collected via document analysis and interviews with key stakeholders. The findings revealed that blockchain technology significantly improves transparency and reduces administrative inefficiencies. The decentralized ledger system of blockchain ensures that all tax-related transactions are immutably recorded, enhancing trust and accountability. Ahmed (2022) applied a quantitative approach to develop predictive models for tax revenue forecasting using historical tax data. Multiple predictive analytics methodologies, such as regression analysis and time series forecasting, were employed to forecast future tax collections. The study concluded that predictive analytics significantly enhances the accuracy of tax revenue forecasts, providing reliable predictions that aid in better budget planning and resource allocation. Smith (2019) conducted an experimental study to assess the effectiveness of machine learning algorithms in monitoring tax compliance. The study involved creating a machine learning model to analyze taxpayer data and identify non-compliant taxpayers, comparing its performance against traditional compliance methods. The findings indicated that machine learning models were highly effective in identifying non-compliant taxpayers, achieving higher accuracy rates than traditional methods.

3. Methodology

This research employs a quantitative methodology to examine the effects of artificial intelligence on tax administration in Lagos State. The qualitative technique is selected for its capacity to yield profound insights into intricate phenomena by examining the perceptions, experiences, and opinions of

participants. The quantitative research design is centered around the collection of primary data through structured questionnaires.

The population for this study consists of individuals directly involved in tax administration within the department in charge of AI in LIRS, as well as tax consultants or payers. The study population is 250 individuals, which is the population of the department in charge of AI in LIRS and tax consultants or payers. Due to the characteristics and magnitude of the population, a purposeful sampling method is utilized to guarantee that the sample comprises participants who possess expertise and experience in tax administration and AI technology. The sample size is determined using the formula established by Krejcie and Morgan (1970) as follows:

$$s = \frac{\chi^2 * N * P(1-P)}{d^2(N-1) + \chi^2 * P(1-P)}$$

Where s = required sample size

χ^2 = chi-square value at 0.05 level of significance. (3.841)

N= Population size

P= population proportion (assumed 0.50)

d = degree of accuracy expressed as a proportion (0.05)

$$n = \frac{3.841 * 250 * 0.5(1-0.5)}{0.05^2 * (250-1) + 3.841 * 0.5(1-0.5)}$$

$$n = \frac{240.1}{1.6}$$

$n = 150.0625$ (To enhance the accuracy and precision of the study, the sample size of the participants will be expanded to 152)

$n \approx 152$

The model specification is as follows:

$$ETA = \alpha_0 + \alpha_1(NLP) + \alpha_2(BT) + \alpha_3(PA) + \alpha_4(ML) + \varepsilon$$

Where:

ETA= Efficiency of Tax Administration

NLP= Natural Language Processing

BT= Blockchain Technology

PA= Predictive Analytics Technologies

ML= Machine Learning Algorithms

α_0= the intercept of the regression model.

$\alpha_1, .., \alpha_4$= coefficients for the independent variables.

ε= error term.

4. Results

Table 1 presents demographic information that offer a detailed picture of the respondents' profiles. The predominant age group of responders is 26-35 years (27.78%), succeeded by those aged 36-45 years (22.22%), reflecting a relatively youthful and middle-aged participant demographic. The gender breakdown is very equitable, with males representing 52.22% and females 47.78% of the respondents. Business owners are the predominant category at 27.78%, closely succeeded by tax officials and tax specialists, each with 22.22%. Individual taxpayers represent 22.22%, whereas other occupations account for a lesser portion at 5.56%. The data on years of experience indicates that respondents possess varied levels of experience, with a substantial segment having 6-10 years (33.33%), followed by those with 1-5 years (22.22%) and 11-15 years (22.22%) of experience.

Table 1. Demographic Statistic

Parameter	Options	N	(%)
Age	18-25	25	16.67
	26-35	42	27.78
	36-45	34	22.22
	46-55	30	20
	56 and above	21	13.33
Gender	Male	79	52.22
	Female	73	47.78
Occupation	Tax Official	34	22.22
	Tax Professional	34	22.22
	Business Owner	42	27.78
	Individual Taxpayer	34	22.22
	Other	8	5.56
Years of Experience	Less than 1 year	18	11.12
	1-5 years	34	22.22
	6-10 years	49	33.33
	11-15 years	34	22.22
	More than 15 years	17	11.11

Source: Authors' compilations (2025)

Table 2 highlights the major challenges currently faced in tax administration in Lagos State. Tax evasion emerges as the most significant issue, with 55.56% of respondents identifying it as a major challenge. This is followed closely by inefficiencies in tax collection, which 50% of respondents noted as a significant problem. High administrative costs are also a prevalent challenge, identified by 44.44% of participants. Inaccurate taxpayer data (33.33%), manual errors (38.89%), and lack of transparency (27.78%) are also notable issues, reflecting broader systemic problems within the tax administration framework. A smaller portion of respondents (11.11%) mentioned other challenges, indicating a diverse range of issues that affect the efficiency of tax administration in Lagos State.

Table 2. Current Challenges in Tax Administration

Parameter	Options	N	(%)
Major challenges in tax administration	Tax evasion	84	55.56
	Inefficiencies in tax collection	76	50
	High administrative costs	68	44.44
	Inaccurate taxpayer data	51	33.33
	Manual errors	59	38.89
	Lack of transparency	42	27.78
	Other	17	11.11

Source: Authors' compilations (2025)

Table 3 elucidates the perceived influence of Natural Language Processing (NLP) and blockchain technologies on tax administration in Lagos State. The comments suggest a predominantly favorable reaction of these devices. A considerable percentage of respondents agree or strongly agree that NLP enhances the comprehension of tax legislation (61.11%). enhances taxpayer communication and support (61.11%), and reduces the time needed to process tax-related documents (66.67%). These findings suggest that NLP is seen as a valuable tool for streamlining tax administration processes and improving interactions with taxpayers. Similarly, blockchain technology is perceived to enhance the security of tax transactions, with 71.11% of respondents agreeing or strongly agreeing with this statement. Additionally, 61.11% believe that blockchain increases transparency in tax administration, and 65.55% think it reduces fraud. The overall positive responses towards blockchain technology indicate its potential to address key issues such as security, transparency, and fraud in tax administration.

Table 3. Impact of NLP and BlockChain on Tax Administration

Parameters	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
NLP improves the interpretation of tax regulations	8 (5.56%)	17 (11.11%)	34 (22.22%)	51 (33.33%)	42 (27.78%)
NLP enhances taxpayer communication and support	14 (8.89%)	12 (7.78%)	34 (22.22%)	51 (33.33%)	42 (27.78%)
NLP reduces the time needed to process tax-related documents	12 (7.78%)	14 (8.89%)	25 (16.67%)	59 (38.89%)	42 (27.78%)
Blockchain technology improves the security of tax transactions	10 (6.67%)	8 (5.56%)	25 (16.67%)	59 (38.89%)	49 (32.22%)
Blockchain technology increases transparency in tax administration	8 (5.56%)	17 (11.11%)	34 (22.22%)	51 (33.33%)	42 (27.78%)
Blockchain technology reduces fraud in tax administration	8 (5.56%)	14 (8.89%)	30 (20%)	51 (33.33%)	49 (32.22%)

Source: Authors' compilations (2025)

Table 4 depicts respondents' perspectives regarding the influence of predictive analytics and machine learning on tax administration in Lagos State. The research indicates a robust agreement regarding the beneficial impact of these technologies. A substantial majority concurs or strongly concurs that predictive analytics aids in identifying tax evasion patterns (68.89%) and enhances the precision of tax assessments (65.56%). Moreover, 63.33% of participants assert that predictive analytics efficiently aids in anticipating tax revenues. The findings underscore the significance of predictive analytics in improving the precision and efficacy of tax administration. Correspondingly, the influence of machine learning is regarded favorably, with 68.89% concurring or strongly concurring that it effectively automates ordinary tax processing operations, and 66.67% acknowledging its contribution to enhancing the accuracy of tax data analysis. Moreover, 65.56% believe that machine learning enhances decision-making processes in tax administration. This data underscores the transformative potential of predictive analytics and machine learning in modernizing tax administration, improving accuracy, and optimizing decision-making processes in Lagos State.

Table 4. Impact of Predictive Analytics and Machine Learning on Tax Administration

Parameters	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Predictive analytics helps in identifying tax evasion patterns	8 (5.56%)	14 (8.89%)	25 (16.67%)	51 (33.33%)	54 (35.56%)
Predictive analytics improves the accuracy of tax assessments	10 (6.67%)	12 (7.78%)	30 (20%)	59 (38.89%)	41 (26.67%)
Predictive analytics assists in forecasting tax revenues effectively	8 (5.56%)	17 (11.11%)	30 (20%)	51 (33.33%)	46 (30%)
Machine learning automates routine tax processing tasks efficiently	10 (6.67%)	8 (5.56%)	29 (18.89%)	56 (36.67%)	49 (32.22%)
Machine learning improves the accuracy of tax data analysis	8 (5.56%)	12 (7.78%)	30 (20%)	59 (38.89%)	42 (27.78%)
Machine learning enhances decision-making processes in tax administration	8 (5.56%)	14 (8.89%)	30 (20%)	56 (36.67%)	44 (28.89%)

Source: Authors' compilations (2025)

Table 5 evaluates the effectiveness of tax administration (ETA) in Lagos State, concentrating on certain criteria affected by the incorporation of AI technologies. 64.45% of respondents view the expedited processing of tax-related paperwork favorably, agreeing or strongly agreeing that it has enhanced. Likewise, 65.56% of respondents accept the accuracy of tax assessments. Taxpayer compliance and the simplicity of taxpayer contacts garner positive feedback, with agreement rates of 61.11% and 62.22%, respectively. A substantial majority, 67.78%, assert that AI technologies have enhanced the general efficiency of tax administration, while 65.56% contend that these technologies have bolstered taxpayer compliance. Additionally, 66.66% of respondents concur or strongly concur that the incorporation of AI has diminished administrative expenses in tax administration.

Table 5. Efficiency of Tax Administration (ETA)

Parameters	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Speed of processing tax-related documents	8 (5.56%)	12 (7.78%)	34 (22.22%)	56 (36.67%)	42 (27.78%)
Accuracy of tax assessments	10 (6.67%)	14 (8.89%)	29 (18.89%)	59 (38.89%)	41 (26.67%)
Level of taxpayer compliance	12 (7.78%)	17 (11.11%)	30 (20%)	51 (33.33%)	42 (27.78%)
Ease of taxpayer interactions	10 (6.67%)	14 (8.89%)	34 (22.22%)	52 (34.44%)	42 (27.78%)
The integration of AI technologies has improved the overall efficiency of tax administration	8 (5.56%)	12 (7.78%)	29 (18.89%)	59 (38.89%)	44 (28.89%)
AI technologies have increased taxpayer compliance	8 (5.56%)	14 (8.89%)	30 (20%)	56 (36.67%)	44 (28.89%)
AI integration has reduced administrative costs in tax administration	8 (5.56%)	13 (8.55%)	29 (18.89%)	51 (33.33%)	51 (33.33%)

Source: Authors' compilations (2025)

Table 6 presents the correlation coefficients among the explanatory variables studied: Natural Language Processing (NLP), Blockchain Technology, Predictive Analytics, and Machine Learning. The table shows that there exists a weak correlation among the explanatory variables, which suggests that there is no problem of multicollinearity. These weak correlations indicate that each variable provides distinct information and that their effects on tax administration efficiency can be analyzed independently without concern for multicollinearity affecting the regression results.

Table 6. Correlation Coefficient

	Efficiency of Tax Administration (ETA)	*Natural Language Processing (NLP)*	*Blockchain Technology (BT)*	*Predictive Analytics (PA)*	*Machine Learning (ML)*
Efficiency of Tax Administration (ETA)	1				
Natural Language Processing (NLP)	0.6121	1			
Blockchain Technology (BT)	0.3501	-0.0676	1		
Predictive Analytics (PA)	0.6117	0.1026	-0.0786	1	
Machine Learning (ML)	0.2932	0.2264	0.0190	-0.1519	1

Source: Authors' computations (2025)

Table 4.7 discusses the regression study's model summary, which assesses the efficacy of tax administration in relation to AI technologies. The explanatory factors (NLP, Blockchain Technology, Predictive Analytics, and Machine Learning) and the dependent variable (Efficiency of Tax Administration) exhibit a robust positive correlation, as indicated by the Multiple R value of 0.9648.

The model's substantial explanatory capability is underscored by the corrected R Square value of 0.9290, which indicates that approximately 92.9% of the variance in tax administration efficiency is attributable to the collective influence of these AI technologies. The model's accuracy is indicated by the Standard Error of 0.1594, which indicates that the predicted values of tax administration efficiency closely align with the observed values.. The regression model is statistically significant, as indicated by the P-value (P<0.000), which suggests that the observed association is unlikely to be due to coincidence. This emphasizes the significant impact of AI technologies on the improvement of tax administration in Lagos State.

Table 7. Model Summary

Regression Statistics	*Value*
Multiple R	0.9648
R Square	0.9309
Adjusted R Square	0.9290
Standard Error	0.1544
P-value	*0.0000*

Source: Authors' computations (2025)

The regression coefficients of the AI indicator with respect to tax administration are illustrated in Table 8. In the absence of AI technology, the baseline level of tax administration efficiency is defined by the intercept value of 1.924, a standard error of 0.173, and a highly significant t-statistic of 11.115 (P < 0.000). The t-statistic of 22.840 (P < 0.000) is accompanied by a coefficient of 0.501 for NLP. This suggests that the efficacy of tax administration improves by 0.501 units for every unit increase in the use of NLP, a statistically significant improvement. The t-statistic of 19.653 is associated with a coefficient of 0.430 for BT (P < 0.000). This indicates that a 0.430 unit increase in tax administration efficiency is correlated with a unit increase in BT use, indicating a substantial positive effect. PA's coefficient is 0.618, with a t-statistic of 28.392 (P < 0.000). This suggests that physical activity (PA) has the most substantial impact on the variables, with each unit increase in PA resulting in a 0.618 unit increase in efficiency, which is also statistically significant. The t-statistic of 11.636 is complemented by an ML coefficient of 0.273 (P < 0.000). This illustrates that tax administration efficiency is improved by machine learning, as a one-unit increase in machine learning leads to a 0.273-unit improvement in efficiency, a statistically significant improvement.

Table 8. Regression Coefficient

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1.924	0.173	11.115	0.0000
Natural Language Processing (NLP)	0.501	0.022	22.840	0.0000
Blockchain Technology (BT)	0.430	0.022	19.653	0.0000
Predictive Analytics (PA)	0.618	0.022	28.392	0.0000
Machine Learning (ML)	0.273	0.023	11.636	0.0000

Source: Authors' computations (2025)

4.1. Discussion of Findings

The findings of this study suggest that AI technology has a significant positive impact on the efficiency of tax administration in Lagos State. The demographic data suggests that the respondent base is diverse, which strengthens the validity of the results. The prerequisite for innovative solutions is emphasized by the current issues in tax administration, such as tax evasion and inefficiencies in tax collection. The analysis suggests that Natural Language Processing (NLP) significantly enhances taxpayer communication and facilitates the understanding of tax legislation, while Blockchain Technology (BT) enhances the security and transparency of tax transactions. The most significant factor is Predictive Analytics (PA), which significantly improves the precision of tax assessments and facilitates the identification of tax evasion trends. Repetitive operations are automated and decision-making processes are enhanced through the use of machine learning (ML). The regression analysis confirms the substantial contributions of all four AI technologies, with PA having the most significant impact on efficiency improvement. These results underscore the potential of AI technology to address current challenges and transform tax administration operations, thereby establishing a more efficient and effective system in Lagos State. This finding align with existing study (such as Patel, 2020; Smith, 2019) which highlight the role of AI in enhancing tax administration efficiency and support the notion that AI technologies can streamline tax processes, reduce inefficiencies, and ultimately improve overall tax administration effectiveness.

5. Conclusion and Recommendations

The study conclusively demonstrates that artificial intelligence (AI) technologies hold immense potential for revolutionizing tax administration in Lagos State. By integrating natural language processing (NLP), blockchain technology, predictive analytics, and machine learning, tax authorities can significantly enhance the efficiency, accuracy, and transparency of their operations. The empirical evidence indicates that these technologies address persistent challenges such as tax evasion, inefficiencies in tax collection, high administrative costs, and manual errors. Specifically, NLP improves the interpretation of tax regulations and taxpayer communications, blockchain ensures secure and transparent transactions, predictive analytics aids in identifying tax evasion patterns and forecasting revenues, and machine learning automates routine tasks while enhancing decision-making processes. The positive correlation between these technologies and the efficiency of tax administration underscores their transformative impact, suggesting that their adoption could lead to a more streamlined, effective, and taxpayer-friendly system. The incorporation of AI technologies into the tax administration framework of Lagos State should be prioritized by policymakers and tax authorities, as indicated by these findings.

This involves investing in the necessary infrastructure, training, and capacity building to ensure that tax officials and stakeholders are well-equipped to utilize these technologies effectively. Additionally, creating a supportive regulatory environment that encourages innovation and addresses potential implementation challenges is crucial. Collaboration with technology experts and continuous evaluation of AI applications can further optimize their benefits.

Policy Implications

- Policymakers should focus on training tax officials and professionals in the use and management of AI technologies to maximize their potential benefits and ensure smooth integration into existing systems.
- The positive reception of blockchain technology indicates that its implementation could be pivotal in enhancing the security, transparency, and integrity of tax transactions, thereby reducing fraud and increasing taxpayer trust.
- The findings highlight the importance of predictive analytics and machine learning in improving the accuracy of tax assessments and automating routine tasks. Policies should promote the adoption of these technologies to reduce manual errors and administrative costs.
- Encouraging innovation in AI applications within tax administration can lead to the development of tailored solutions that address specific challenges, such as tax evasion and inefficiencies in tax collection.
- Establishing frameworks for continuous monitoring and evaluation of AI technology integration will help in assessing their effectiveness, making necessary adjustments, and ensuring sustained improvements in tax administration.

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