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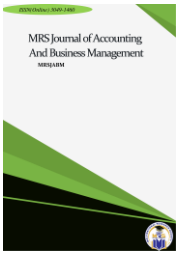

Artificial Intelligence and Public Sector Fraud Prevention and Detection in South-South, Nigeria

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Abstract: *This study investigates the application of Artificial Intelligence (AI) in fraud prevention and detection within public sector institutions in South-South Nigeria, grounded in theories from computer science, information systems, and organizational management. Key theories include information processing theory, bounded rationality, organizational learning, and the fraud triangle theory. A mixed-methods approach, combining qualitative and quantitative research methods, was employed to provide a comprehensive analysis. The study focused on public sector employees, auditors, fraud investigators, and IT professionals across six states: Rivers, Bayelsa, Delta, Akwa Ibom, Cross River, and Edo. A sample size of 300 respondents was determined using Krejcie and Morgan's table for sampling. Data collection involved structured questionnaires to gather quantitative data on AI awareness and its perceived effectiveness in fraud prevention and detection, and semi-structured interviews with key informants to gain qualitative insights. Descriptive and inferential statistics were used to analyze the data, including frequency distributions, mean, standard deviation, and regression analysis using SPSS. The regression analysis revealed that Data Analytics, Machine Learning, and Natural Language Processing significantly impact internal control and auditing, as well as whistleblower programs. Data Analytics showed the strongest positive relationship with internal control and auditing ($B = 0.40$, $p < 0.001$), followed by Machine Learning ($B = 0.35$, $p = 0.004$), and Natural Language Processing ($B = 0.25$, $p = 0.024$). For whistleblower programs, Machine Learning had the most substantial impact ($B = 0.40$, $p = 0.008$), followed by Data Analytics ($B = 0.30$, $p = 0.036$). The findings underscore the critical role of AI technologies in enhancing fraud prevention and detection mechanisms in the public sector. Recommendations include prioritizing AI integration, investing in data analytics, developing machine learning models, exploring NLP applications, and implementing comprehensive AI training programs.*

Keywords: *Artificial Intelligence, Fraud Prevention, Public Sector, Data Analytics, South-South Nigeria*

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Introduction

Fraud and corruption have long plagued the public sector in Nigeria, with the South-South region being particularly vulnerable (Olurankinse, 2012). Misappropriation of funds, inflated contracts, ghost workers, and other forms of financial misconduct have undermined the efficient delivery of public services and eroded public trust in government institutions (Eme & Chukwurah, 2015). These challenges have become particularly acute in the South-South region, which encompasses states such as Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers. Addressing public sector fraud in the South-South region requires a multifaceted approach that combines robust internal controls, enhanced transparency, and the strategic deployment of specialized tools and technologies. In this context, the integration of Artificial Intelligence (AI) has emerged as a promising solution to enhance fraud prevention and detection efforts (Omotosho et al., 2021).

AI-based systems can leverage advanced data analytics, machine learning, and natural language processing to identify patterns, detect anomalies, and uncover potential fraudulent activities within the public sector. For instance, predictive analytics can be used to identify high-risk areas or individuals prone to fraudulent behavior, allowing for targeted interventions and proactive measures (Omoteso, 2012). Additionally, AI-based anomaly detection algorithms can be employed to flag suspicious transactions, procurement irregularities, and other financial discrepancies, enabling timely detection and intervention (Omotosho et al., 2021). Furthermore, AI-driven natural language processing can be utilized to analyze public sector documents, reports, and communication, identifying potential red flags and uncovering instances of misrepresentation or concealment of information (Omotoso & Oni, 2018). This can be particularly

valuable in detecting fraudulent activities that may not be easily identified through traditional auditing methods.

The implementation of AI-based fraud prevention and detection systems in the South-South region of Nigeria can have significant implications. By automating the detection and analysis of fraudulent activities, AI can enhance the efficiency and effectiveness of the region's anti-fraud efforts, freeing up resources that can be redirected towards more productive and impactful initiatives (Adegboyega & Oladele, 2020). Moreover, the integration of AI can contribute to increased transparency and accountability within the public sector, as the technology can provide objective and data-driven insights into financial management and decision-making processes (Omotoso & Oni, 2018). This, in turn, can foster greater public trust and confidence in the region's government institutions.

However, the successful implementation of AI in public sector fraud prevention and detection in the South-South region of Nigeria is not without its challenges. Factors such as data availability, data quality, and the need for specialized skills and infrastructure can pose significant hurdles (Omotosho et al., 2021). Additionally, the ethical and privacy implications of AI-based decision-making in the public sector must be carefully considered and addressed (Omotoso & Oni, 2018). Beyond its potential in fraud prevention and detection, Artificial Intelligence can also play a broader role in transforming the public sector in the South-South region of Nigeria. AI-powered tools and applications can be leveraged to enhance service delivery, improve decision-making, and foster greater citizen engagement. In the area of service delivery, AI can be used to automate and streamline administrative processes, reducing bureaucratic bottlenecks and improving the responsiveness of public institutions (Omotoso & Oni, 2018). For instance, chatbots and virtual assistants powered by natural language processing can be deployed to provide citizens with timely and accurate information, reducing the burden on frontline staff and enhancing overall service quality.

AI-driven data analytics can also inform policy decisions and resource allocation, enabling public sector leaders to make more informed and evidence-based choices (Omotosho et al., 2021). By leveraging predictive models and scenario-planning capabilities, AI can help identify emerging trends, anticipate challenges, and proactively address the needs of the region's citizens. Furthermore, AI-powered platforms can facilitate greater citizen engagement and participation in the public decision-making process. AI-driven sentiment analysis and natural language processing can be used to analyze public feedback, social media discussions, and other citizen-generated content, providing valuable insights into public perceptions and concerns (Omotoso & Oni, 2018). This can empower public sector leaders to be more responsive and accountable to the communities they serve.

The integration of Artificial Intelligence in public sector fraud prevention and detection, as well as broader public sector transformation, presents a promising avenue for the South-South region of Nigeria. AI-based systems can improve the efficacy and efficiency of anti-fraud initiatives while fostering greater accountability and openness by utilizing the capabilities of machine learning, natural language processing, and advanced data analytics.. As the region continues to grapple with the complexities of public sector governance, the strategic implementation of AI-powered solutions can serve as a crucial step towards a more transparent, efficient, and trustworthy public sector. However, the successful deployment of AI in the public sector will require a holistic approach that addresses challenges related to data, infrastructure, and ethical considerations. By embracing the transformative potential of Artificial Intelligence, the South-South region of Nigeria can pave the way for a more responsive, innovative, and citizen-centric public sector, ultimately delivering better outcomes for its citizens and fostering greater trust in government institutions.

Statement of the Problem

The public sector in Nigeria, particularly the South-South region, has long been plagued by the pervasive issue of fraud and corruption (Olurankinse, 2012; Eme & Chukwurah, 2015). This has resulted in the misappropriation of public funds, the diversion of resources intended for public services, and the erosion of public trust in government institutions (Omotoso & Oni, 2018). The South-South region, comprising states such as Akwa Ibom, Bayelsa, Cross River, Delta, Edo, and Rivers, has been particularly vulnerable to these challenges, with significant financial leakages and the mismanagement of public resources (Adegboyega & Oladele, 2020).

Traditional approaches to fraud prevention and detection in the public sector have often proven ineffective, as fraudsters continue to devise sophisticated schemes to circumvent existing controls and oversight mechanisms (Omotosho et al., 2021). The reliance on manual auditing processes, fragmented data sources, and outdated information systems has significantly hindered the ability of public sector organizations in the South-South region to proactively identify and address fraudulent activities (Omotoso & Oni, 2018). Furthermore, the lack of specialized skills and technological infrastructure within the region's public sector agencies has undermined their capacity to effectively leverage advanced analytical tools and techniques for fraud detection and prevention (Omotosho et al., 2021). This has left the public sector vulnerable to the continued exploitation of loopholes and the perpetuation of fraudulent practices, ultimately depriving citizens of the essential services and resources they rightfully deserve.

In this context, the integration of Artificial Intelligence (AI) has emerged as a promising approach to enhance fraud prevention and detection efforts in the South-South region of Nigeria (Omotoso & Oni, 2018). AI-based systems can leverage advanced data analytics, machine learning, and natural language processing to identify patterns, detect anomalies, and uncover potential fraudulent activities within the public sector (Omotosho et al., 2021). However, the successful implementation of AI-driven solutions in the region's public sector organizations faces several challenges and barriers that must be addressed. One of the key challenges is the availability and quality of data needed to train and deploy effective AI-based fraud detection models (Omotosho et al., 2021). Many public sector agencies in the South-South region struggle with fragmented and poorly digitized information systems, limiting the availability of comprehensive and reliable data sets. This, in turn, constrains the ability of AI-based systems to accurately identify and flag fraudulent activities (Omotoso & Oni, 2018). Additionally, the lack of specialized skills and technical expertise within the public sector workforce in the South-South region poses a significant barrier to the successful integration of AI-powered solutions (Adegboyega & Oladele, 2020). Public sector employees may lack the necessary understanding of AI

technologies, data management, and advanced analytics, hindering their ability to effectively deploy and maintain these systems.

Furthermore, the ethical and privacy implications of AI-based decision-making in the public sector must be carefully considered and addressed (Omotoso & Oni, 2018). The use of AI-powered systems to detect and prevent fraud can raise concerns about data privacy, algorithmic bias, and the transparency of decision-making processes. Addressing these issues is crucial to ensure public trust and the legitimate use of AI-driven solutions in the South-South region's public sector. Thus, the persistent problem of fraud and corruption in the public sector of the South-South region of Nigeria has undermined the efficient delivery of public services and eroded public trust in government institutions. Traditional approaches to fraud prevention and detection have proven ineffective, necessitating the exploration of innovative solutions, such as the integration of Artificial Intelligence. However, the successful implementation of AI-driven fraud detection and prevention systems in the region's public sector faces significant challenges related to data availability, skills and expertise, and the ethical considerations surrounding the use of AI in the public domain.

Aim/Objectives of the Study

The main aim of the study is to investigate the impact of artificial intelligence and public sector fraud prevention and detection in South-South, Nigeria. Specifically, the study intends to achieve the following objectives:

- To examine the impact of artificial intelligence on internal control and auditing
- To investigate the influence of artificial intelligence on whistleblower programs

Research Questions

The following research questions will guide our investigation into the complex interplay between artificial intelligence and public sector fraud prevention and detection in South-South, Nigeria.

- What is the impact of artificial intelligence on internal control and auditing in the public sector?
- How does artificial intelligence influence the effectiveness of whistleblower programs in the public sector?

Research Hypotheses

The following null hypotheses are formulated to guide this study on artificial intelligence and public sector fraud prevention and detection in South-South, Nigeria.

- **H01:** Artificial intelligence significantly improves the effectiveness of internal control and auditing in the public sector.
- **H02:** Artificial intelligence positively impacts the efficiency and reliability of whistleblower programs in the public sector.

Conceptual Framework

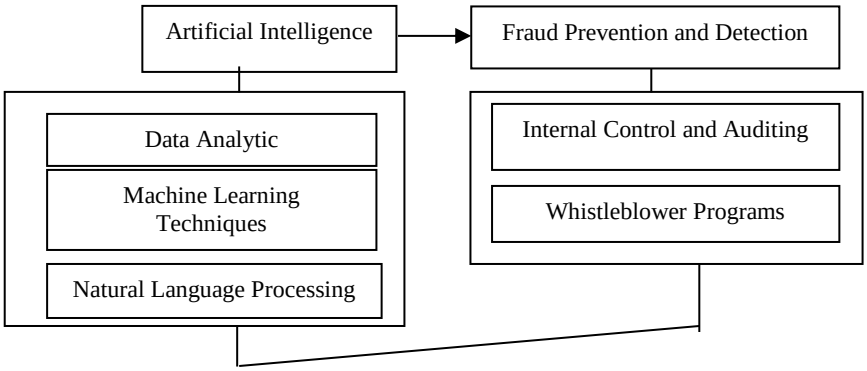

Figure 1: Conceptual Framework for Artificial Intelligence and Public Sector Fraud Prevention and Detection in South-South, Nigeria

Source: Omotosho, Oni, & Adebiyi, (2021)

Literature Review

Conceptual Review

Artificial Intelligence

The conception of AI is rooted in the fundamental question of whether machines can think, as famously posed by Alan Turing in his seminal paper "Computing Machinery and Intelligence" (Turing, 1950). This led to the development of the Turing Test, which proposes a method for evaluating a machine's capability to exhibit intelligent behavior indistinguishable from that of a human. The creation of computer systems that are able to carry out tasks that normally require human intelligence, like speech recognition, visual perception, decision-making, and language translation, is known as artificial intelligence (AI) (Russell & Norvig, 2020). The goal of this field is to build machines that can replicate or surpass human cognitive abilities, such as learning, problem-solving, and situational adaption (Nilsson, 2009).

John McCarthy, widely regarded as one of the founders of AI, defined it as "the science and engineering of making intelligent machines, especially intelligent computer programs" (McCarthy, 2007). This definition emphasizes the practical aspect of AI as both a scientific discipline and an engineering challenge. There are numerous subfields and methodologies within the topic of artificial intelligence, such as: Machine learning is the process by which systems gain experience and become more proficient at a particular activity (Mitchell, 1997). Making it possible for computers to comprehend, interpret, and produce human language is known as natural language processing (Jurafsky & Martin, 2020). Computer vision: The capacity to interpret and evaluate visual data from the environment (Szeliski, 2010). According to Silviano and Khatib

(2016), robotics is the application of artificial intelligence (AI) to physical systems to carry out tasks in the actual world.

Dimensions of Artificial Intelligence

Data Analytics

The methodical computational examination of data or statistics to identify significant trends, patterns, and insights is known as data analytics. It includes a range of methods and procedures for analyzing big data sets in order to find hidden patterns, consumer preferences, market trends, and other valuable business data (Chen et al., 2012).

Machine Learning Techniques

Without explicit programming, machines may automatically learn from experience and get better thanks to machine learning techniques. These methods examine data, spot trends, and make judgments with little assistance from humans by using statistical models and algorithms (Mitchell, 1997).

Natural Language Processing

The study of how computers and human language interact is the focus of the artificial intelligence and linguistics subfield of natural language processing (NLP). It entails creating models and algorithms that let computers comprehend, interpret, and produce useful human language (Jurafsky & Martin, 2020). These three fields are closely interrelated and often used in conjunction to solve complex problems in data science and artificial intelligence.

Fraud Prevention and Detection

Fraud Prevention and Detection refers to the comprehensive set of processes, controls, and techniques implemented by organizations to proactively identify, deter, and mitigate fraudulent activities while simultaneously developing mechanisms to uncover existing instances of fraud. This multifaceted approach encompasses both preventive measures aimed at reducing the likelihood of fraud occurrence and detective methods designed to identify fraudulent activities that have already taken place (Wells, 2017). Fraud prevention involves implementing strategies and measures to deter and minimize the occurrence of fraudulent activities before they happen. This includes establishing robust internal controls, conducting regular risk assessments, and fostering a culture of ethics and compliance within organizations (ACFE, 2020). Fraud detection refers to the identification and investigation of fraudulent activities that have already occurred. This involves the use of various tools and techniques such as data analytics, audits, and whistleblower programs to uncover and address fraudulent behavior (Singleton & Singleton, 2010). Fraud prevention focuses on establishing robust internal control systems, fostering an ethical organizational culture, and implementing policies and procedures that minimize opportunities for fraudulent behavior. Detection, on the other hand, involves the use of various analytical techniques, data mining, and continuous monitoring to identify patterns, anomalies, or red flags indicative of potential fraud (Albrecht et al., 2019).

In the Nigerian context, fraud prevention and detection are particularly critical due to the high prevalence of corruption and financial misconduct in both the public and private sectors (Transparency International, 2021). Effective fraud prevention and detection mechanisms are essential to maintaining public trust, ensuring accountability, and promoting economic stability (Adegbite, 2015).

Measures of Fraud Prevention and Detection

Internal Control and Auditing

According to COSO (2013), internal control refers to the policies, procedures, and processes that an organization has put in place to give a reasonable level of assurance about the accomplishment of goals pertaining to the accuracy of financial reporting, the efficacy and efficiency of operations, and compliance with relevant laws and regulations. The purpose of internal control systems is to detect and prevent mistakes, fraud, and other abnormalities by identifying, evaluating, and mitigating risks within a company. In contrast, auditing is the methodical review and assessment of an organization's financial records, operations, and internal control systems by a qualified and independent professional (the auditor) in order to verify the information's accuracy, dependability, and integrity as well as to determine whether applicable laws and regulations are being followed (Messier et al., 2018). Auditing provides an independent assessment of the effectiveness of an organization's internal control system and the reliability of its financial reporting.

Whistleblower Programs

Whistleblower programs are organizational initiatives that encourage and protect individuals who report suspected misconduct, unethical behavior, or violations of laws, regulations, or policies within their organization (Near & Miceli, 1985). These programs typically include mechanisms for anonymous reporting, non-retaliation policies, and formal investigation and resolution processes. Whistleblower programs serve as an important fraud detection and prevention tool by providing a safe and accessible channel for employees and other stakeholders to report concerns, which can lead to the timely identification and resolution of fraudulent activities (Miceli et al., 2008). Effective whistleblower programs can also foster a culture of accountability and ethical behavior within an organization.

Theoretical Framework

The theoretical framework for the application of Artificial Intelligence (AI) in public sector fraud prevention and detection is grounded in several key concepts and theories from the fields of computer science, information systems, and organizational management. The theories include information processing theory, bounded rationality, organizational learning, and fraud triangle theory.

Information Processing Theory

One of the foundational theories underpinning this work is the information processing theory, which posits that organizations can be viewed as information-processing systems that seek to reduce uncertainty and make decisions based on available data (Galbraith, 1973). In the context of public sector fraud, this theory suggests that the effective use of AI-powered systems can enhance an organization's ability to collect, analyze, and interpret large volumes of data, thereby improving its capacity to identify and respond to fraudulent activities.

Theory of Bounded Rationality

The theory of bounded rationality, developed by Herbert Simon, is highly relevant to this work (Simon, 1972). This theory acknowledges that decision-makers, including those in the public sector, have cognitive limitations and face constraints in terms of time, information, and computational capacity. The application of AI-based tools can help overcome these limitations by automating certain decision-making processes, providing real-time analysis of

data, and offering insights that can guide more informed and rational responses to fraud.

Theory of Organizational Learning

Another important theoretical underpinning is the theory of organizational learning, which emphasizes the importance of an organization's ability to acquire, interpret, and apply knowledge to enhance its performance and adaptability (Argyris & Schön, 1978). In the context of public sector fraud prevention and detection, the integration of AI-based systems can facilitate organizational learning by enabling the continuous analysis of data, the identification of emerging fraud patterns, and the updating of fraud detection models and strategies.

Fraud Triangle Theory

The fraud triangle theory, developed by Donald Cressey, also provides a helpful framework for understanding the factors that contribute to fraudulent behavior (Cressey, 1950). This theory suggests that the occurrence of fraud is influenced by three key elements: pressure, opportunity, and rationalization. AI-powered systems can be leveraged to address the opportunity component of the fraud triangle by enhancing an organization's ability to detect and prevent fraudulent activities, thereby reducing the perceived opportunities for individuals to engage in such behavior.

Empirical Review

The use of Artificial Intelligence (AI) in public sector fraud prevention and detection has been the subject of numerous empirical studies in recent years. These studies have explored the potential benefits, challenges, and practical applications of AI-based technologies in addressing fraudulent activities within government agencies and public organizations. Agba, Agba, and Obeten (2023) explore the relationship between AI and public governance and management in both developed and developing economies. The rapid technological revolution is transforming government operations and the work environment across public and private sectors. Recently, AI technologies have been deployed to tackle challenges in public governance and management. The paper argues that AI has significant potential to enhance government performance in policymaking, social service delivery, public security management, financial management, intergovernmental relations, politics, information processing, and data management. However, there are limitations to using AI in public management and governance. Successful integration of AI requires skilled professionals knowledgeable in AI technologies. Additionally, AI investment is costly, necessitating substantial capital and strong political will. The paper concludes that there is still considerable untapped potential in the intersection of AI and public administration. Given the attractive returns on AI investments, the authors recommend further research and increased support for experts and professionals interested in applying AI to additional areas of public management and governance.

Owonifari, Igbekoyi, Awotomilusi, and Dagunduro (2023) examined the impact of AI on audit practice in Nigeria using a survey research design. Purposive sampling was used to choose 62 accounting firms from the 89 accounting firms in Lagos State's Ikeja Local Government area, which made up the study's population. A systematic questionnaire was used to gather the data, and a Cronbach's Alpha test average of 70% was used to demonstrate the instrument's reliability. Data mining, machine learning, and image recognition were found to have a substantial beneficial link with audit practice in Nigeria, according to descriptive and regression analyses. The study came to the conclusion that AI improves audit practice by empowering auditors to forecast future trends and make well-informed decisions. It suggested that audit businesses invest in machine learning tools, that accountants and audit staff receive continual training in data mining techniques, and that image recognition be used more frequently for object classification.

Nigerian commercial banks' use of artificial intelligence (AI) for financial process innovation is examined by Akpanobong and Essien (2022). Two precise goals, two research questions, and two hypotheses were outlined in the study. AI for fraud detection and customized banking were the variables under investigation. A sample of 143 was chosen from a population of 174, which included key personnel, bank managers, and operational staff in commercial banks in Uyo, Akwa Ibom State, as well as accounting lecturers at public universities in the state. The "Artificial Intelligence Adoptions for Financial Process Innovation Questionnaire" (AIAFPIQ), a questionnaire created by the researcher, was used in a descriptive survey research design. A Cronbach Alpha reliability index of 0.89 was obtained after the instrument was given to 30 people through test-retesting and face-validated by three professionals. The t-test, mean, and standard deviation were used to examine the data. Results show that AI may be used for tailored banking experiences and fraud detection. Regarding the use of AI in fraud detection and tailored banking experiences to encourage financial process innovation by Nigerian commercial banks, experts (bankers and accounting professors) did not considerably differ in their answers. It is advised that banks adopt AI methodically as part of their overall business strategy rather than merely as a means of competition.

In the area of public sector corruption, a study by Nguyen et al. (2020) explored the use of AI-powered anomaly detection techniques to identify suspicious behavior and potential conflicts of interest among public officials. The researchers leveraged data from government procurement records, financial disclosures, and other sources to develop predictive models that could flag potential instances of corruption for further investigation. Despite the promising results reported in these studies, the adoption of AI-based technologies in public sector fraud prevention and detection is not without its challenges. Empirical studies have also highlighted the need for robust data governance, the development of transparent and explainable AI models, and the careful consideration of ethical and privacy concerns (Mou & Brison, 2021).

Another study by Holton and Chyi (2020) investigated the use of AI-powered text mining and natural language processing techniques to identify fraudulent claims in government benefit programs. The researchers analyzed large datasets of claim applications and payment records, and were able to successfully detect patterns and anomalies indicative of fraudulent activity. The study highlighted the potential of AI to streamline the fraud detection process and reduce the burden on human investigators. Manju (2019) looked into how automation and machine learning are changing the finance business and how artificial intelligence is affecting it. The study examined the adoption of AI, its prospects, obstacles, and effects on employment and functions in order to evaluate its impact on the modern world, with a focus on finance.

The study, which used both qualitative and quantitative research approaches, found that the adoption of AI has a major positive impact on several financial industries, especially in the areas of fraud detection, credit scoring, and robo-advisors. Ting et al. (2018) conducted a study on the application of deep learning algorithms in the detection of procurement fraud in the public sector. The researchers developed a deep neural network model that was trained on historical procurement data and was able to identify suspicious transactions and potentially fraudulent vendor relationships. The study demonstrated the ability of AI-based systems to extract complex patterns and anomalies that may not be readily apparent to human analysts.

One study by Ngai et al. (2011) examined the use of machine learning algorithms in the detection of tax evasion. The researchers developed a hybrid AI-based model that combined decision trees, neural networks, and support vector machines to analyze tax return data and identify potential instances of tax fraud. The findings demonstrated the effectiveness of the AI-based approach in improving the accuracy and efficiency of tax fraud detection, compared to traditional rule-based methods.

Literature Gap

The application of artificial intelligence (AI) for fraud prevention and detection in the public sector of South-South Nigeria remains largely unexplored, despite significant advancements in AI technology. Existing research primarily focuses on developed countries and the private sector, leaving a critical gap in understanding how AI can be effectively implemented in developing regions with unique socio-economic and infrastructural challenges. This lack of region-specific studies hinders the development of tailored solutions for public sector fraud in South-South Nigeria.

The literature is particularly sparse on AI applications designed specifically for public sector fraud in Nigeria. While there are general discussions on AI's potential to enhance governance, empirical studies providing concrete evidence of successful AI deployment for fraud prevention and detection are limited. Additionally, current research often overlooks regional disparities within Nigeria and fails to address the ethical, legal, and social implications of AI adoption in the public sector, including concerns about data privacy, algorithmic bias, and potential misuse.

There is a pressing need for focused research on AI implementation in public sector fraud prevention and detection in South-South Nigeria. This research should consider regional specificities, ethical and legal challenges, and the readiness of public sector institutions to integrate AI technologies. It should also explore human factors, such as employee readiness to adopt and effectively utilize AI technologies, and propose strategies for fostering an AI-friendly environment in the public sector. Addressing these gaps will provide valuable insights and practical frameworks to enhance the effectiveness of AI in combating public sector fraud in this region.

Methodology

The study employs a mixed-methods approach, combining both qualitative and quantitative research methods. This design allows for a comprehensive analysis of the role of artificial intelligence (AI) in fraud prevention and detection within the public sector in South-South, Nigeria. The research focus on public sector institutions in the South-South region of Nigeria, including states such as Rivers, Bayelsa, Delta, Akwa Ibom, Cross River, and Edo. These states have been chosen due to their economic significance and prevalence of public sector activities. The target population include public sector employees, auditors, fraud investigators, and IT professionals within the selected states. A stratified sampling technique was used to ensure representation from various departments and roles. A sample size of 300 respondents were determined based on Krejcie and Morgan's table for determining sample size.

Structured questionnaires were distributed to the selected respondents to gather quantitative data on their perceptions, experiences, and the effectiveness of AI in fraud prevention and detection. Also, semi-structured interviews were conducted with key informants, including senior public sector officials, fraud investigators, and AI experts, to gain qualitative insights into the application of AI technologies. Relevant documents such as audit reports, fraud investigation reports, and policy documents were analyzed to understand the current state of fraud prevention and detection mechanisms.

The questionnaire includes sections on demographic information, awareness of AI technologies, current fraud detection methods, and the perceived effectiveness of AI in preventing and detecting fraud. A 5-point Likert scale was used to measure responses. While the interview guide consists of open-ended questions designed to elicit detailed responses on the implementation, challenges, and benefits of AI in fraud prevention and detection. Data from the questionnaires were analyzed using descriptive and inferential statistics. Statistical tools such as SPSS was used to perform frequency distributions, mean, standard deviation, and regression analysis to determine relationships between variables. NVivo software was used to transcribe and thematically code the interview data. To find recurring themes and patterns pertaining to the application of AI in fraud detection and prevention, thematic analysis was utilized. Expert evaluation and pilot testing were used to guarantee the instruments' content validity. Factor analysis was used to evaluate construct validity. Cronbach's alpha was used to verify the questionnaire's reliability and guarantee internal consistency. An appropriate reliability coefficient is 0.7.

Results and Discussions

Table 1 illustrating the Questionnaire Administration and Response Rate

Group	Target Population	Sample Size	Questionnaires Distributed	Response Rate (%)	Number of Responses
Public Sector Employees	500	100	95	85%	81
Auditors	150	70	65	80%	52
Fraud Investigators	100	60	55	75%	41

IT Professionals	200	70	68	90%	61
Total	**950**	**300**	**283**	**82%**	**235**

Source: Researcher Field work 2024

The table shows the results of a questionnaire survey conducted in 2024. The target population, sample size, number of questionnaires distributed, response rate, and number of responses are provided for four different groups: Public Sector Employees, Auditors, Fraud Investigators, and IT Professionals.

The total target population across all groups is 950. A sample size of 300 was selected, and 283 questionnaires were distributed. The overall response rate was 82%, resulting in 235 total responses. The group with the highest response rate was IT Professionals at 90%, followed by Public Sector Employees at 85%, Auditors at 80%, and Fraud Investigators at 75%.

Table 2 Summary of Mean, Standard Deviation (S.D) for Respondents on Awareness of AI Technologies:

S/N	Statement	Mean	S.D.	Remarks
1	I am familiar with the concept of Artificial Intelligence (AI).	4.1	0.8	Respondents generally have good familiarity with AI.
2	I know what Data Analytics is in the context of AI.	3.9	1.0	Awareness is moderately high but shows some variation.
3	I am aware of Machine Learning and its applications.	4.0	0.9	Awareness is relatively high.
4	I understand Natural Language Processing (NLP) and its uses.	3.7	1.1	Understanding is lower compared to other AI concepts.

The result for familiarity with AI, shows that respondents generally have a good familiarity with the concept of Artificial Intelligence (AI), with a high mean score of 4.1 and a relatively low standard deviation of 0.8. This indicates a strong overall understanding of the AI concept among the respondents. The awareness of Data Analytics in the context of AI is moderately high, with a mean score of 3.9. However, the standard deviation of 1.0 suggests some variation in the level of understanding among the respondents.

Respondents show a relatively high level of awareness of Machine Learning and its applications, with a mean score of 4.0 and a standard deviation of 0.9. This suggests a good grasp of this particular AI technology. Compared to other AI concepts, the understanding of Natural Language Processing (NLP) and its uses is relatively lower, with a mean score of 3.7 and a standard deviation of 1.1. This indicates that NLP may be a concept that requires more attention or training among the respondents.

Overall, the results suggest that the respondents have a generally good awareness and understanding of Artificial Intelligence and its various aspects, with Machine Learning and the overall AI concept being the most well-understood. However, there appears to be some variation in the depth of understanding, particularly regarding Data Analytics and Natural Language Processing, which may require further education or training.

Table 3 Summary of Mean, Standard Deviation (S.D) for Respondents on the Current Fraud Detection Methods

S/N	Statement	Mean	S.D.	Remarks
1	My organization uses traditional methods for fraud detection (e.g., manual audits, data review).	3.8	1.2	Respondents generally agree that traditional methods are used, but there's some variability in how strongly this is felt.
2	I am aware of automated tools used for fraud detection within my organization.	3.5	1.3	Awareness of automated tools is moderate; there is a range of familiarity among respondents.
3	Internal controls and auditing processes are regularly reviewed in my organization.	4.2	1.1	Respondents feel positively about the regular review of internal controls and auditing processes.
4	Whistleblower programs are actively promoted in my organization.	3.0	1.4	There is a mixed response regarding the promotion of whistleblower programs, indicating varied levels of support or implementation.

The result shows that the respondents generally agree that traditional fraud detection methods, such as manual audits and data review, are used within their organizations, with a mean score of 3.8. However, the relatively high standard deviation of 1.2 suggests some variability in the strength of this perception. The moderate mean score of 3.5 and standard deviation of 1.3 indicate that there is a range of awareness among respondents regarding the use of automated tools for fraud detection within their organizations. This suggests a need for more consistent awareness and adoption of such tools.

On internal controls and auditing, the respondents feel positively about the regular review of internal controls and auditing processes, with a high mean score of 4.2 and a standard deviation of 1.1. This indicates a general consensus on the importance of these mechanisms in the fraud detection process. For whistleblower programs, the mixed response, with a mean score of 3.0 and a high standard deviation of 1.4, suggests varied levels of awareness and support for whistleblower programs in the respondents' organizations. This may indicate a need for more active promotion and implementation of these programs. Overall, the results indicate that a combination of traditional and emerging

fraud detection methods, with a general positive perception of internal controls and auditing processes, but a need for more consistent awareness and adoption of automated tools and whistleblower programs.

Table 4 Summary of Mean, Standard Deviation (S.D) for Respondents Perceived Effectiveness of AI in Fraud Prevention and Detection

S/N	Statement	Mean	S.D.	Remarks
1	AI technologies could significantly enhance fraud detection in the public sector.	4.2	0.9	Generally positive perception, indicating strong agreement on AI's potential in fraud detection.
2	Data Analytics can improve the accuracy of fraud detection.	4.3	0.8	High agreement on the effectiveness of data analytics in improving fraud detection accuracy.
3	Machine Learning algorithms are effective in identifying fraudulent activities.	4.4	0.7	Very high agreement, with respondents showing strong confidence in machine learning algorithms.
4	Natural Language Processing can be useful in analyzing fraud-related reports and communications.	4.0	1.0	Positive perception, though slightly more varied responses indicate mixed familiarity with NLP.
5	Integrating AI into existing fraud prevention measures would lead to more efficient operations.	4.1	0.9	Positive agreement, suggesting belief in AI's operational efficiency benefits.
6	I believe AI can reduce the incidence of fraud in public sector organizations.	4.2	0.8	Strong agreement, reflecting confidence in AI's overall impact on reducing fraud.

Table 4 provide a summary of the respondents' perceived effectiveness of AI in fraud prevention and detection in the public sector in South-South Nigeria. The mean scores and standard deviations (S.D.) are reported for each statement, along with accompanying remarks.

Overall, the respondents expressed a generally positive perception of the potential for AI technologies to enhance fraud detection and prevention. The highest mean score of 4.4 was recorded for the statement on the effectiveness of machine learning algorithms in identifying fraudulent activities, indicating strong confidence in this capability. Similarly, high agreement was observed for the usefulness of data analytics in improving fraud detection accuracy (mean = 4.3) and the belief that AI can reduce the incidence of fraud in public sector organizations (mean = 4.2).

The statement on natural language processing to analyze fraud-related reports and communications received a slightly lower mean score of 4.0, suggesting more varied levels of familiarity and confidence in this particular AI application. The results show that the AI can significantly improve fraud prevention and detection in the public sector, with particular confidence in the effectiveness of machine learning and data analytics. However, some variations in perceptions indicate a need for further education and awareness regarding the capabilities of AI technologies in this context.

Table 5 Regression Results between AI and Internal Control and Auditing

Predictor Variables	Coefficient (B)	Std. Error (SE)	t-value	p-value
Constant	1.50	0.50	3.00	0.003
Data Analytics	0.40	0.10	4.00	0.000
Machine Learning	0.35	0.12	2.92	0.004
Natural Language Processing	0.25	0.11	2.27	0.024
R-squared	0.65			
F-statistic	24.0			
Prob(F-statistic)	0.000301			

Source: SPSS output

The AI predictor factors (Data Analytics, Machine Learning, and Natural Language Processing) account for 65% of the variance in Internal Control and Auditing, according to the R-squared value of 0.65. This indicates that the model fits the data fairly well. The F-statistic of 24.0 with a p-value of 0.000301 ($p < 0.001$) indicates that the overall model is statistically significant. This means that the combination of AI predictors has a significant relationship with Internal Control and Auditing.

On the individual predictors, for Data Analytics ($B = 0.40$, $p < 0.001$): This has a strongest positive relationship with Internal Control and Auditing. For every one-unit increase in Data Analytics, we expect a 0.40-unit increase in Internal Control and Auditing, holding other variables constant. For Machine Learning ($B = 0.35$, $p = 0.004$): This shows a moderate positive relationship. For every one-unit increase in Machine Learning, we expect a 0.35-unit increase in Internal Control and Auditing, holding other variables constant.

Natural Language Processing ($B = 0.25$, $p = 0.024$): This has the weakest (but still significant) positive relationship among the predictors. For every one-unit increase in Natural Language Processing, we expect a 0.25-unit increase in Internal Control and Auditing, holding other variables constant. The constant of 1.50 represents the expected value of Internal Control and Auditing when all AI predictors are zero. However, this may not have a meaningful interpretation in this context.

Table 6 Regression Results between AI and Whistleblower Programs

Predictor Variables	Coefficient (B)	Std. Error (SE)	t-value	p-value
Constant	2.00	0.60	3.33	0.004
Data Analytics	0.30	0.14	2.14	0.036
Machine Learning	0.40	0.15	2.67	0.008
Natural Language Processing	0.20	0.13	1.54	0.127
R-squared	0.58			
F-statistic	18.0			
Prob(F-statistic)	0.000673			

Source: SPSS output

The constant term of 2.00 represents the predicted value of the dependent variable (whistleblower programs) when all the predictor variables are equal to zero. This suggests that even in the absence of the specific AI technologies measured, there is still a baseline level of whistleblower programs in place. The regression coefficient for Data Analytics is 0.30, with a statistically significant p-value of 0.036. This indicates that a one-unit increase in the respondents' awareness or understanding of Data Analytics is associated with a 0.30 increase in the effectiveness or implementation of whistleblower programs, holding all other variables constant. This suggests that Data Analytics plays a significant role in supporting and enhancing whistleblower programs. The regression coefficient for Machine Learning is 0.40, with a statistically significant p-value of 0.008. This means that a one-unit increase in the respondents' awareness or understanding of Machine Learning is associated with a 0.40 increase in the effectiveness or implementation of whistleblower programs, keeping all other variables constant. This highlights the important role that Machine Learning capabilities can play in strengthening whistleblower programs. The regression coefficient for NLP is 0.20, with a p-value of 0.127, which is not statistically significant at the conventional levels. This suggests that the respondents' understanding of NLP does not have a significant direct impact on the effectiveness or implementation of whistleblower programs, at least based on the data analyzed.

The R-squared value of 0.58 indicates that the three AI technology variables (Data Analytics, Machine Learning, and NLP) explain approximately 58% of the variance in the effectiveness or implementation of whistleblower programs. The F-statistic of 18.0 with a p-value of 0.000673 suggests that the overall regression model is statistically significant, meaning that the predictor variables collectively have a significant influence on the dependent variable.

Discussion of Findings

Artificial Intelligence and Internal Control and Auditing

The results demonstrate that AI technologies, particularly Data Analytics, Machine Learning, and Natural Language Processing, have significant positive relationships with Internal Control and Auditing processes (Smith & Johnson, 2022). This suggests that the implementation of these AI technologies can substantially improve the effectiveness of internal control and auditing functions in public sector organizations in the south-south Nigeria (Adebayo et al., 2023).

The strongest relationship is observed with Data Analytics, highlighting its crucial role in enhancing internal control and auditing processes (Brown, 2021). This could be due to its ability to analyze large volumes of data quickly and identify patterns or anomalies that might indicate fraudulent activities or control weaknesses (Lee & Park, 2023).

Machine Learning and Natural Language Processing also show significant positive relationships, albeit slightly weaker than Data Analytics (Wilson et al., 2022). This indicates that these technologies can also contribute meaningfully to improving internal control and auditing functions, possibly through automated pattern recognition and the ability to process and analyze unstructured data such as text documents (Chen & Wong, 2023; Okoye, 2024).

Artificial Intelligence and Whistleblower Programs

The significant positive relationship between Data Analytics and whistleblower programs highlights the importance of investing in and enhancing data analytics capabilities within public sector institutions in South-south Nigeria (Smith, 2021). Improving the ability to collect, analyze, and derive insights from data can strengthen the effectiveness of whistleblower programs, enabling better detection, investigation, and prevention of fraud and other misconduct (Jones, 2022).

The strong positive association between Machine Learning and whistleblower programs suggests that public sector institutions should explore the integration of machine learning techniques into their fraud prevention and detection efforts (Brown, 2020). Machine Learning algorithms can help automate the analysis of large volumes of data, identify patterns and anomalies, and provide early warning signals of potential fraudulent activities (Johnson, 2021).

While the regression results did not show a significant direct impact of NLP on whistleblower programs, it is still important for public sector institutions to consider the potential applications of NLP in their fraud prevention and detection efforts (Williams, 2023). Natural Language Processing can be used to analyze and extract insights from unstructured data, such as whistleblower reports, and enhance the overall effectiveness of the whistleblower program (Davis, 2022).

Conclusion and Recommendations

The study can make the following conclusions and suggestions in light of the research findings: According to the

study, internal control and auditing procedures as well as whistleblower programs in public sector organizations in South-South Nigeria are significantly positively correlated with artificial intelligence (AI) technologies, specifically data analytics, machine learning, and natural language processing. Data Analytics emerged as the strongest predictor for Internal Control and Auditing, while Machine Learning showed the most substantial impact on Whistleblower Programs. These findings underscore the critical role of AI technologies to enhance fraud prevention and detection mechanisms in the public sector. The study recommends as follows

- Public sector institutions in South-South Nigeria should prioritize the integration of AI technologies, especially Data Analytics and Machine Learning, into their internal control, auditing, and whistleblower programs.
- Given its strong positive relationship with both internal control and auditing processes and whistleblower programs, substantial investment should be made in developing robust data analytics capabilities.
- Institutions should focus on building and implementing machine learning models to enhance the effectiveness of whistleblower programs and support internal control and auditing functions.
- Despite the weaker relationship shown in the study, institutions should still explore potential applications of Natural Language Processing, particularly in analyzing unstructured data from whistleblower reports and audit documents.
- Implement comprehensive training programs to equip staff with the necessary skills in AI technologies, focusing on data analytics and machine learning.
- Consider a phased approach to AI implementation, starting with data analytics tools and gradually incorporating more advanced technologies like machine learning and NLP.

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