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I. Title page
II. Abstract (150-250 words)
III. Keywords (3-5)
IV. Introduction
V. Literature Review
VI. Methodology
VII. Results and Discussion
VIII. Conclusion and Recommendations
IX. References (APA 7th Edition)
X. Appendices (if necessary)
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EFFECT OF COMPUTERIZED FORENSIC INVESTIGATION TECHNIQUES ON FRAUD MANAGEMENT IN LAGOS STATE MINISTRIES, DEPARTMENTS AND AGENCIES

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ABSTRACT

This study examined the effect of computerized forensic investigation techniques on fraud management in Lagos State Ministries, Departments, and Agencies (MDAs). Specifically, the study assessed the roles of Big Data Analytics, Artificial Intelligence, Data Mining Techniques, Cloud Accounting, and Computer Auditing Techniques in enhancing fraud management, drawing on the Fraud Management Lifecycle Theory. Adopting a quantitative survey research design and a positivist epistemological stance, primary data were collected through structured questionnaires administered to staff of selected Lagos State MDAs. Data were analyzed using descriptive statistics, correlation analysis, and multiple linear regression. The findings revealed that Big Data Analytics and Artificial Intelligence exerted positive and statistically significant effects on fraud management, while Data Mining Techniques and Cloud Accounting showed no significant effect. Computer Auditing Techniques, however, demonstrated a negative and statistically significant relationship with fraud management. The study concluded that advanced technologies, particularly Big Data Analytics and Artificial Intelligence, are critical to strengthening fraud management in Lagos State MDAs. Consequently, the study recommended prioritizing investments in these technologies, reassessing the application of Data Mining, Cloud Accounting, and Computer Auditing Techniques, and implementing continuous training and capacity-building programs to enhance the effective use of computerized forensic investigation tools in the public sector.

Keywords: Fraud management, Big Data Analytics, Artificial Intelligence, Data Mining, Cloud Accounting, and Computer Auditing Techniques.

1.0 Introduction

The rapid digitization of financial transactions has significantly increased exposure to fraud risks within public sector institutions. In Nigeria, Ministries, Departments, and Agencies (MDAs) at the federal, state, and local government levels now rely heavily on electronic payment platforms, integrated financial management systems, and digital accounting records. While these systems have enhanced efficiency and transparency, they have equally expanded the scale and sophistication of fraud risks. Reports by the Economic and Financial Crimes Commission (EFCC) indicate that Nigeria loses several hundreds of billions of naira annually to public sector fraud, corruption, and financial mismanagement, with MDAs accounting for a substantial proportion of reported cases. Similarly, the Auditor-General's reports on public accounts have repeatedly revealed cases of unauthorized expenditures, unretired advances, and contract inflation running into tens of billions of naira across government institutions. These realities have intensified regulatory and legal pressures on public organizations to strengthen internal controls and adopt advanced fraud detection mechanisms (Okafor et al., 2020).

Evidence from global and local studies further underscores the magnitude of the fraud problem. The

Association of Certified Fraud Examiners (ACFE, 2018; 2019) estimated that organizations worldwide lose about 5% of their annual revenue to occupational fraud, translating to over US$4 trillion globally each year. In Nigeria, corruption-related fraud remains the dominant form of occupational fraud, particularly within the public sector. According to Transparency International and local anti-corruption agencies, corruption and financial fraud have cost Nigeria an estimated ₦10 to ₦15 trillion over the past two decades, significantly undermining public service delivery and economic development. Common fraud schemes in MDAs include payroll fraud, ghost workers, procurement fraud, contract inflation, and financial statement manipulation, many of which are only detected after substantial financial losses have occurred (Ojukwu et al., 2020; Gillis, 2021; Deshi, et al. 2025).

The rise in cyber-enabled fraud has further escalated financial losses, especially in Lagos State, Nigeria's commercial and financial hub. Data from the Nigerian Communications Commission (NCC) and EFCC cybercrime units indicate that cyber-related financial crimes in Nigeria account for tens of billions of naira annually, with Lagos State recording the highest concentration of reported incidents. These include electronic funds diversion, system override fraud, unauthorized access to government platforms, and manipulation of digital records. Studies suggest that only a fraction of these cases are successfully detected and prosecuted, while a significant number remain undisclosed due to weak investigative capacity, inadequate forensic infrastructure, and limited expertise in digital forensic techniques (Oyedokun, 2017; Tjeng & Nopianti, 2020). As perpetrators become increasingly sophisticated, traditional fraud detection mechanisms have proven insufficient in safeguarding public funds.

Computerized forensic investigation also referred to as digital or cyber forensics has therefore become critical in addressing modern fraud challenges. It involves the systematic application of investigative and analytical techniques to identify, collect, preserve, and present digital evidence in a legally admissible manner (Lutkevich, 2021). The objective is to reconstruct financial events within computing environments and establish accountability through a structured process supported by a documented chain of custody (Ewa et al., 2020). Effective computerized forensic investigations rely on advanced tools such as Big Data Analytics, Artificial Intelligence, Data Mining, Cloud Accounting, and Computer Auditing, which enhance the accuracy, reliability, and timeliness of fraud detection while reducing financial leakages running into billions of naira annually (Ofoje & Aggreh, 2023).

Existing studies on forensic accounting have largely examined the effectiveness of computerized forensic techniques within business organizations, particularly the banking sector. Studies by Okafor et al. (2022), Ugbede et al. (2021), Madu-Chimau et al. (2020), Tapang and Ihendinihu (2020), Ewa et al. (2020), and Ogiriki and Appah (2018) demonstrate how digital tools and analytics enhance fraud detection and prevention in financial institutions. However, limited empirical attention has been given to the public sector (Deshi, et al. 2025), despite the fact that Lagos State Ministries, Departments, and Agencies manage trillions of naira in annual budgets and capital projects, making them highly vulnerable to financial misappropriation. This study therefore examines the effect of computerized forensic investigation techniques (Big Data Analytics, Artificial Intelligence, Data Mining, Cloud Accounting, and Computer Auditing) on fraud management in Lagos State MDAs, with the aim of providing evidence-based insights to strengthen public sector fraud control in Nigeria.

The general objective of the study is to examine the effect of computerized forensic investigation technique on fraud management in Lagos State Ministry Finance. The specific objectives of this study are to:

i. Evaluates the effect of big data analytics on Fraud Management in Lagos State Ministries, Departments and Agencies Nigeria;
ii. assess the effect of artificial intelligence on Fraud Management in Lagos State Ministries, Departments and Agencies Nigeria;
iii. investigate the effect of data mining techniques on Fraud Management in Lagos State Ministries, Departments and Agencies Nigeria;
iv. ascertain the effect of cloud-based accounting on Fraud Management in Lagos State Ministries, Departments and Agencies Nigeria**;** and
v. examines the effect of computer auditing techniques on Fraud Management in Lagos State Ministries, Departments and Agencies Nigeria.

Hypotheses were established in null form to give direction to the study;

i. There is no significant effect of big data analytics on fraud management in Lagos State Ministries, Departments and Agencies Nigeria;
ii. There is no significant effect of artificial intelligence on fraud management in Lagos State Ministries, Departments and Agencies Nigeria;
iii. Data mining techniques has no significant effect on fraud management in Lagos State Ministries, Departments and Agencies Nigeria;
iv. Cloud-based accounting has no significant effect on fraud management in Lagos State Ministries, Departments and Agencies Nigeria;
v. Computer auditing technique has no significant effect on fraud management in Lagos State Ministries, Departments and Agencies Nigeria.

2.0 Literature Review

The conceptual review presents the key constructs underpinning this study and clarifies how computerized forensic investigation techniques relate to fraud management in public sector institutions. It provides conceptual definitions and explains the functional relevance of each variable within the context of Lagos State Ministries, Departments, and Agencies (MDAs). Specifically, the section discusses fraud management as the dependent construct and examines Big Data Analytics, Artificial Intelligence, Data Mining Techniques, Cloud-Based Accounting, and Computer Auditing Techniques as critical technological mechanisms for enhancing fraud detection, prevention, and response in government institutions.

Fraud Management: Fraud management is conceptualized as a coordinated and systematic framework designed to prevent, detect, investigate, and respond to fraudulent activities within an organization. According to Adebayo et al. (2022), effective fraud management integrates preventive controls, detection mechanisms, and corrective responses across organizational functions to safeguard assets, ensure financial stability, and uphold institutional integrity. This approach emphasizes proactive risk identification through internal controls, continuous monitoring, and clearly defined response procedures. Beyond operational control, fraud management plays a strategic role in corporate governance and organizational reputation. Robust fraud management systems reduce the conditions that facilitate fraud (pressure, opportunity, and rationalization) while reinforcing ethical conduct and accountability (Freeman, 2023). In the public sector, effective fraud management enhances transparency, protects public funds, and strengthens stakeholder confidence, making it a critical component of sustainable governance.

Big Data Analytics: Big Data Analytics refers to the systematic analysis of large, complex, and diverse datasets to uncover patterns, trends, and anomalies that support decision-making. In fraud management, Big Data Analytics enables government entities to identify abnormal transaction patterns and deviations from established norms, thereby improving early fraud detection (Huttunen et al., 2019; Wishmy et al., 2022). Its capacity to integrate data across multiple systems provides a holistic view of organizational activities. Additionally, Big Data Analytics supports real-time monitoring and predictive modeling, allowing public institutions to anticipate fraud risks and allocate investigative resources to high-risk areas (Abbassi et al., 2021). While challenges such as data privacy and algorithmic bias remain, its ability to automate detection processes and enhance regulatory compliance makes Big Data Analytics a vital tool for fraud management in Lagos State MDAs.

Artificial Intelligence (AI): Artificial Intelligence (AI) enhances fraud management by enabling systems to learn from historical data, recognize complex patterns, and adapt to emerging fraud schemes. AI-driven techniques such as machine learning and neural networks are particularly effective in identifying subtle anomalies that traditional methods may overlook (Mustika et al., 2021; Jiří, 2023). These capabilities allow for continuous improvement in fraud detection accuracy. Furthermore, AI supports real-time analysis, predictive fraud modeling, and automated decision-making, significantly improving response speed and efficiency. Applications such as biometric verification, natural language processing, and behavioral analysis further strengthen fraud detection in government operations. However, ethical concerns relating to transparency, bias, and accountability necessitate careful governance when deploying AI in public sector fraud management.

Data Mining Techniques: Data mining techniques involve extracting meaningful patterns, relationships, and anomalies from large datasets using statistical and computational methods. Techniques such as classification, clustering, and association rule mining enable government agencies to detect irregularities in procurement, payroll, and financial transactions (Song, 2020; Singla & Jangir, 2020). In addition, data mining supports predictive analysis and cross-departmental data integration, allowing fraud risks to be identified proactively rather than reactively. While data mining systems are scalable and adaptable, their effectiveness depends on data quality, staff competence, and technological infrastructure, particularly within public sector environments like Lagos State MDAs.

Cloud-Based Accounting: Cloud-based accounting refers to the use of internet-hosted accounting systems that provide centralized, real-time access to financial data. In fraud management, cloud accounting enhances transparency by enabling continuous transaction monitoring, automated alerts, and detailed audit trails (Mohanty & Mishra, 2017; Jiří, 2023). These features make fraudulent activities easier to detect and trace. Moreover, cloud accounting supports collaboration, scalability, and integration with advanced analytics and AI tools. Despite concerns relating to data security and regulatory compliance, cloud accounting improves accountability and cost efficiency, making it a valuable platform for strengthening fraud management in public sector institutions.

Computer Auditing Techniques: Computer auditing techniques involve the use of automated audit tools and analytical procedures to examine financial data, controls, and information systems. These techniques enable continuous auditing, exception testing, and real-time fraud alerts, thereby enhancing the detection

of suspicious transactions in public sector organizations (Mojtahed, 2021). Additionally, computer auditing supports forensic investigations through detailed audit trails, access control analysis, and automated confirmation procedures. When integrated with AI and data analytics, computer auditing strengthens compliance, governance, and accountability. However, its effectiveness depends on proper implementation, staff expertise, and alignment with organizational fraud management objectives.

2.2 Empirical Studies Review

2.2.1 Big Data Analytics and Fraud Management

Rosnidah et al. (2022) reviewed literature on big data analytics in auditing using sources drawn from Scopus, Web of Science, ScienceDirect, and Google Scholar (2011–2022) and reported that big data analytics enhances fraud detection by providing richer audit evidence for anomaly identification and fraud prediction. However, the study was review-based and did not empirically test or quantify the effect of big data analytics on fraud outcomes, creating a methodological gap that the current study addresses by empirically examining this relationship within Lagos State MDAs. Wishmy et al. (2022) conducted a scoping review of studies indexed in Scopus and Sinta and concluded that internal audit models integrating data analytics (often combined with AI) can improve detection accuracy and audit quality. Nonetheless, the review was constrained by limited available literature, lacked hypothesis testing, and did not provide Nigeria-specific evidence, thereby justifying the current study's quantitative assessment of big data analytics and fraud management in Lagos State MDAs.

Huttunen et al. (2019) explored the growing role of big data and advanced analytics in transforming the financial sector, noting potential gains in operational insight and service outcomes but also highlighting slow adoption due to expertise gaps, infrastructural constraints, and organizational resistance. Since the study was largely exploratory and non-quantitative, it offered limited measurable evidence, motivating the current study to provide empirical validation of big data analytics in fraud management within a public sector setting. Singh et al. (2019) examined fraud detection in procurement transactions in American telecommunications firms using binary logistic regression and found that model cutoff choices significantly affect detection outcomes—higher cutoffs reduce flagged cases but risk missing fraud, while lower cutoffs increase detections but raise false positives. Given the sectoral and geographic specificity of the study, the current research extends the discussion by assessing whether big data analytics can improve fraud management in Lagos State MDAs while reducing false positives and improving model adaptability.

From an agency theory perspective, Singh et al. (2019) further argued that big data analytics can reduce monitoring costs linked to information asymmetry by improving auditor efficiency, independence, and real-time fraud detection capability. However, the model's applicability outside Western corporate environments and beyond telecommunications was not established, which strengthens the need for context-specific evidence from Nigerian public institutions, as provided by the current study on Lagos State MDAs. Rizki et al. (2017) assessed fraud detection models using 124 Indonesian listed firms (100 non-fraud, 24 fraud) and found that Support Vector Machines and Artificial Neural Networks achieved high prediction accuracy (88.37% and 90.97% respectively), with algorithm choice influenced more by practicality than performance gaps. Because the study was limited to the Indonesian capital market and corporate reporting context, the current study builds on its analytics orientation by testing the relevance of big data-driven approaches for fraud management in Lagos State MDAs, where fraud patterns, data structure, and governance conditions differ.

2.2.2 Artificial Intelligence and Fraud Management

Bohdan et al. (2023) developed and tested machine learning models for detecting fraudulent banking transactions in the post-COVID-19 era and reported strong predictive performance, with an AUC of about 0.946 and improved accuracy through data preprocessing and imbalance handling. However, because the study focused on banking where transaction data are more structured and patterns more standardized its findings may not directly transfer to public sector environments, which the current study addresses by testing AI's effect on fraud management in Lagos State MDAs. Wishmy et al. (2022) reviewed 24 studies and concluded that AI-based fraud detection models improve audit quality by enhancing detection accuracy. Nevertheless, the study's scoping-review design limited empirical testing of causal effects, and its evidence base excluded Nigeria, thereby necessitating the current study's quantitative approach to evaluating AI-driven fraud management within Lagos State MDAs.

Muawanah et al. (2022) examined auditors' perceptions of AI adoption and found that AI is viewed as capable of automating tasks and improving audit efficiency, while also raising concerns about job displacement and organizational resistance. The study further identified implementation constraints, including skills gaps and system-integration difficulties, suggesting that AI's effectiveness in fraud management depends not only on technology but also on capacity and institutional readiness; an issue the current study considers within the Lagos State MDA context. Arora and Bhardwaj (2022) demonstrated how AI, deep learning, and blockchain can strengthen

system security and fraud detection, using logistic regression for user authentication and emphasizing AI's role in safeguarding information systems. However, the study was not tailored to public sector financial operations and did not address the unique governance and accountability dynamics of MDAs, which the current study examines by focusing specifically on AI and fraud management within Lagos State institutions. Tang et al. (2018) proposed an ontology-based fraud detection framework integrated with a C4.5 decision-tree algorithm and reported promising performance, including a fraud detection rate of 86.67% and overall accuracy of 80% using matched samples of fraudulent and non-fraudulent firms. Despite these results, the model relied largely on financial statement data and did not incorporate auditors' experiential judgment, indicating a practical gap that supports further research on how AI-driven tools function in real-world public sector fraud management settings.

2.2.3 Data Mining Techniques and Fraud Management

Ewa (2022) examined the role of data mining techniques in fraud detection and prevention within Nigerian Ministries, Departments, and Agencies (MDAs) using a survey design and multiple regression analysis. The study found that data mining significantly enhances fraud identification and prevention in public institutions, particularly through trend analysis and analytical monitoring. However, it also revealed gaps in preventive control knowledge and IT competence among MDA staff, emphasizing that the effectiveness of data mining depends not only on technological infrastructure but also on human capacity. Building on these findings, the current study extends the analysis by evaluating the effectiveness of data mining techniques within Lagos State MDAs while accounting for variations in staff expertise and IT infrastructure.

Okafor et al. (2022) investigated the effect of data mining on financial statement fraud in Nigerian deposit money banks between 2016 and 2020 using Panel Least Squares regression. The study reported a significant reduction in fraud incidence attributable to the application of data mining and forensic accounting practices, recommending their institutionalization as mandatory tools for fraud mitigation. While the findings demonstrate the effectiveness of data mining in the banking sector, their applicability to public sector institutions remains underexplored, motivating the current study's focus on Lagos State MDAs.

Ewa et al. (2020) analyzed the effectiveness of data mining and forensic accounting techniques in Nigerian commercial banks using descriptive statistics and Ordinary Least Squares regression. The results showed that data mining substantially improves fraud detection and prevention, particularly when supported by specialized software. Nonetheless, the study identified limited staff understanding of data mining applications as a major constraint, recommending targeted training and the adoption of anonymous fraud reporting mechanisms. The present study adapts these insights to the public sector by examining how data mining can be effectively deployed within Lagos State MDAs, considering institutional and capacity-related challenges. Ogiriki and Appah (2018) employed an ex-post facto design and regression analysis to assess the use of data mining in fraud detection and prevention within the Nigerian public sector. Their findings indicated a strong positive relationship between data mining application and effective fraud investigation and control. The study further advocated the establishment of forensic accounting units, whistleblowing mechanisms, and fraud hotlines to strengthen public sector fraud management. While the study provided valuable public sector evidence, it did not isolate specific MDAs or techniques, a gap the current study addresses by focusing on Lagos State MDAs.

Dong et al. (2018) explored the application of text mining for fraud detection by analyzing financial statements and social media data using algorithms such as Support Vector Machines, Neural Networks, Decision Trees, and Logistic Regression. The study found detection accuracy ranging from 54.5% to 75.5%, with Support Vector Machines performing best for social media data and Logistic Regression excelling in financial text analysis. Although the study highlights the potential of unstructured data in fraud detection, its corporate and social-media orientation limits direct applicability to public sector accounting, which the current study addresses by focusing on structured administrative data in Lagos State MDAs. Amahalu et al. (2017) examined the effect of data mining and forensic accounting techniques on rogue trading and money laundering in deposit money banks in Anambra State. The findings confirmed that data mining significantly improves fraud detection when integrated with forensic accounting practices. However, the study was confined to the banking sector, prompting the current study to evaluate whether similar techniques can be adapted to the operational realities of Lagos State MDAs, while also assessing the training and capacity-building requirements necessary for effective public sector implementation.

2.2.4 Cloud Accounting Techniques and Fraud Management

Firas (2021) examined the role of cloud-based accounting (CBA) in mitigating accounting risks among Jordanian five-star hotels using survey data from 118 accountants and found that cloud systems significantly enhance the security and reliability of financial reporting. While the study provides

empirical evidence of CBA's effectiveness in reducing accounting risks, its private-sector and hospitality focus limits applicability to public sector institutions, thereby justifying the current study's investigation of cloud accounting and fraud management within Lagos State MDAs. Thirmal et al. (2020) investigated emerging accounting technologies and reported that accounting professionals perceive cloud accounting as effective in reducing financial manipulation and enhancing fraud detection. However, the study relied primarily on simple percentage analysis, limiting its explanatory depth and causal inference. This methodological limitation motivates the current study's hypothesis-driven and statistically robust examination of cloud accounting and fraud management in Lagos State MDAs.

Huttunen et al. (2019) explored the integration of big data and cloud-based analytical tools in the financial sector, highlighting their transformative potential while noting slow adoption due to expertise gaps and infrastructural constraints. The absence of quantitative analysis in the study restricts conclusions on the measurable impact of cloud accounting on fraud detection, a gap the current study addresses through empirical testing in Lagos State MDAs. Rihan (2019) provided an exploratory review of cloud accounting adoption in Bangladesh, emphasizing benefits such as cost efficiency, flexibility, and enhanced data security. However, the study was literature-based and lacked empirical validation, leaving unanswered questions about the practical effectiveness of cloud accounting in fraud detection. The present study builds on this foundation by empirically evaluating cloud accounting's role in fraud management within a comparable developing-country public sector context. Jones et al. (2017) assessed cloud computing implementation in three UK local government authorities and found improvements in information management and operational flexibility, alongside concerns about data ownership and control. Although the study offered valuable public-sector insights, it did not employ hypothesis testing and was geographically limited, prompting the current study to provide quantitative evidence from Lagos State MDAs.

Tahmina (2017) conducted a theoretical analysis of cloud accounting, outlining its advantages, limitations, and distinctions from traditional accounting systems. While the study contributed to conceptual understanding, its lack of empirical data limits conclusions regarding fraud detection effectiveness, reinforcing the need for the current study's quantitative assessment of cloud accounting in Lagos State MDAs. Mohanty and Mishra (2017) analyzed cloud computing adoption in accounting and emphasized efficiency gains and cost reductions, while cautioning against security and operational risks without proper governance frameworks. As their study focused largely on corporate environments, the present study extends this discussion to the public sector by empirically examining how cloud accounting can support fraud management and accountability in Lagos State MDAs.

2.2.5 Computer Auditing Techniques and Fraud Management

Okafor et al. (2022) examined the effect of computer-assisted audit techniques on financial statement fraud in Nigerian deposit money banks from 2016 to 2020 using Panel Least Squares regression. The findings revealed that computer auditing techniques significantly reduce fraud and enhance financial reporting integrity, underscoring the importance of integrating forensic accounting and adequate data access into audit practices. However, the study's focus on the banking sector limits its applicability to public institutions, motivating the current study's examination of computer auditing techniques within Lagos State Ministries, Departments, and Agencies (MDAs). Taiya et al. (2021) investigated the use of forensic accounting technologies in curbing revenue leakages in Nigerian federal universities using regression analysis on data obtained from 238 respondents. The study found that forensic data analysis techniques significantly reduce revenue leakages, demonstrating the effectiveness of technology-driven audit tools in public institutions. Nonetheless, the sector-specific focus on universities leaves unanswered questions regarding the applicability of these techniques across broader public sector entities, which the current study addresses by extending the analysis to Lagos State MDAs.

Fadilah et al. (2019) analyzed the influence of forensic accounting and ICT skills on fraud detection among auditors from Big Four accounting firms, using survey data, interviews, and multiple regression analysis. The results showed a strong positive relationship between auditors' ICT competence and fraud detection effectiveness, emphasizing the importance of technologically driven audit skills. While insightful, the private-sector orientation of the study necessitates further investigation into whether similar skill-based advantages translate effectively into public sector auditing environments such as Lagos State MDAs. Ogiriki and Appah (2018) employed an ex-post facto design and regression analysis to assess the impact of computer-assisted audit tools on fraud detection, investigation, and prevention in Nigeria's public sector. Their findings revealed a significant positive relationship between the use of computer auditing techniques and effective fraud management, leading to recommendations such as strengthening whistleblowing mechanisms and establishing forensic accounting units. However, the study did not sufficiently examine how these tools interact with broader governance and institutional frameworks, a gap the current study addresses within the Lagos State

MDA context. Amahalu et al. (2017) examined the effectiveness of Computer Assisted Auditing Techniques (CAATs) in mitigating rogue trading and money laundering in deposit money banks in Anambra State using survey data and t-test analysis. The study found that CAATs significantly reduce financial crimes and recommended the integration of forensic accounting into routine audit processes. Given its sectoral and geographical limitation, the present study extends this inquiry by empirically evaluating the relevance and adaptability of CAATs for fraud management within Lagos State MDAs.

2.3 Theoretical Framework

This study is underpinned by Fraud Management Lifecycle Theory. The Fraud Management Lifecycle Theory was developed by Wilhelm in 2004 to provide a comprehensive and systematic framework for understanding how organizations prevent, detect, and respond to fraud. Wilhelm conceptualized fraud management as an interconnected lifecycle consisting of eight key components: deterrence, prevention, detection, mitigation, analysis, policy, investigation, and prosecution. Deterrence and prevention focus on discouraging fraudulent intent and strengthening internal controls, while detection and mitigation address the identification of fraud and the reduction of associated losses. The analysis and policy stages ensure continuous evaluation and refinement of fraud control mechanisms, whereas investigation and prosecution provide the evidential and legal processes necessary to hold offenders accountable. Wilhelm emphasized that these components do not operate in a strict sequence but rather as an interdependent system that requires balance and strategic resource allocation to achieve an effective and sustainable fraud management framework. Within Wilhelm's framework, the integration of information technology is central to enhancing the effectiveness of fraud management across all stages of the lifecycle. Computerized forensic investigation techniques such as Big Data Analytics, Artificial Intelligence, Data Mining, Cloud Accounting, and Computer Auditing Techniques strengthen prevention and detection by enabling real-time transaction monitoring, anomaly identification, and predictive risk assessment. These technologies also support investigation and resolution by automating data analysis, preserving digital evidence, and facilitating timely decision-making, while continuous monitoring tools enhance post-investigation oversight and adaptability to emerging fraud risks. Consequently, the application of computerized forensic investigation techniques aligns strongly with Wilhelm's Fraud Management Lifecycle Theory, providing a technology-driven approach that improves fraud detection, investigation, and prevention, particularly within complex public sector environments.

3.0 Methodology

The quantitative research design chosen for this study is particularly to assess the effect of computerized forensic investigative techniques on fraud detection within various Ministries, Departments, and Agencies (MDAs) in Lagos State. The cross-sectional survey research design facilitates this investigation by enabling the collection of data at a single point in time across a wide array of respondents from different MDAs. This approach allows for a broad, snapshot-like view of the current state of fraud detection practices and the role that computerized techniques play in these settings. Survey research, as utilized in this study, is instrumental for gathering quantitative data that can be analyzed to reveal patterns, correlations, and potential causations related to the use of forensic technologies in fraud management. **The philosophical stance of this study resembles that of a natural scientist (positivist), which entails reliance on empiricism (Jephitha, 2020).** The population of this study is 440 staff from the selected Ministries, Department and Agencies. The study relied on primary data gathered through the use of well-structured questionnaires. In this study, the researcher used descriptive statistics, correlational analysis, and multiple linear regression analysis. This type of test can only be used when it is necessary to establish the linear relationship between two or more variables as well as the strength of these relationships. The researcher used Yaro Yamane's formula to calculate the sample size, as shown below.

$$\text{Formula: Sample Size (n)} = \frac{N}{1 + N(e)^2}$$

Where; N = population (440); n = sample size (unknown); e = level of significant and 1 = constant.

$$\text{Therefore, sample size (n)} = \frac{440}{1 + 440(0.05)^2} = \frac{440}{2.1} = 210$$

Table 3.2: Population and Sample distribution of the study for the MDAs

Ministries, Department and Agencies	Breakdown	Sample Size
Office of the Accountant General (State Treasury Office)	$\frac{95 * 210}{440} + 5$	50
Ministry of Innovation Science and Technology	$\frac{111 * 210}{440} + 5$	57
Economic, Budget and Planning	$\frac{75 * 210}{440} + 5$	40
Lagos State Ministry of Finance	$\frac{62 * 210}{440} + 5$	35
Office of central internal audit	$\frac{59 * 210}{440} + 5$	33
Lagos state public procurement unit	$\frac{38 * 210}{440} + 5$	23
Total		**238**

Source: Author's computation (2024).

The questionnaire was constructed and presented to forensic accounting professionals and academicians for their professional opinions; all necessary adjustments were made based on the professionals' opinions. The measurement of the dependability and internal consistency of the items content in the data collection instrument is referred to as research instrument reliability.

Table 3.3: Reliability Statistics

Variable	Cronbach's Alpha	Remark
Big-data Analytics	0.77	Reliable
Artificial Intelligence	0.79	Reliable
Data Mining Techniques	0.80	Reliable
Cloud Accounting	0.88	Reliable
Computer Auditing Techniques	0.79	Reliable
Fraud Management	0.78	Reliable

Source: SPSS Version 23 output, (2024)

Cronbach's Alpha is a widely used statistical measure for assessing the internal consistency reliability of multi-item scales, with values ranging from 0 to 1, where higher values indicate stronger consistency among scale items. In this study, the reliability results demonstrate that all constructs related to computerized forensic investigation techniques and fraud management achieved acceptable to good internal consistency. Specifically, Big Data Analytics recorded a Cronbach's Alpha of 0.77, indicating acceptable reliability, while Artificial Intelligence and Computer Auditing Techniques both yielded values of 0.79, reflecting good internal consistency. Data Mining Techniques achieved a Cronbach's Alpha of 0.80, meeting the commonly recommended threshold for strong reliability, and Cloud Accounting recorded the highest value of 0.88, signifying excellent internal consistency among its measurement items.

Similarly, the Fraud Management construct produced a Cronbach's Alpha value of 0.78, indicating good reliability and consistency of the items used to measure the concept. Overall, the Cronbach's Alpha values across all variables ranged from 0.77 to 0.88, confirming that the measurement instruments employed in the study were reliable and suitable for empirical analysis. These results suggest that the questionnaire items consistently captured the underlying constructs of computerized forensic investigation techniques and fraud management, thereby providing a dependable foundation for subsequent statistical analyses and interpretation of findings.

Model Specification: The functional relationship between the dependent and independent variables in the model is presented thus:

$FMGT = f(BDA + AI + DMT + CAC + CAT)$ ……..…….(i)

Therefore:

$FMGT = \alpha + \beta_1 BDA + \beta_2 AI + \beta_3 DMT + \beta_4 CAC + \beta_5 CAT + \mu$…….....…… (ii)

Where:

f = functional dependency of the relationship; BDA = Big Data Analytics; AI = Artificial Intelligence; DMT = Data mining techniques; CAC = Cloud Accounting; CAT = Computer Auditing Technique; α = is the intercept or constant; β_1 to β_4 = are the Coefficients of the explanatory variables and μ = is the error term.

Table 1: Variables Measurement and Source of the Study

Variables	Proxies	Measurement	Source
Dependent	Fraud Management (FMGT)	The sum of responses for the seven (7) items questionnaire using five points Likert -scale to test the effect of forensic accounting skills on fraud Management MDAs in Lagos State.	Adebayo, et al., (2022)
Independent	Big Data Analytics (BDA)	The sum of responses for the five (5) items questionnaire using five points Likert -scale to test the effect of accounting and auditing skills on Fraud management of selected MDAs in Nigeria.	Siddik, (2021) and Kosgey & Solomon, (2022).
Independent	Artificial Intelligence (AI)	The sum of responses for the five (5) items questionnaire using five points Likert -scale to test the effect of Computer Assisted Auditing Techniques on Fraud management of selected MDAs in Nigeria.	Braun & Davis, (2003)
Independent	Data Mining Technique (DMT)	The sum of responses for the five (5) items questionnaire using five points Likert -scale to test the effect of Data Mining Skills on Fraud management of selected MDAs in Nigeria.	Rygielski, et al., (2002)
Independent	Cloud Accounting (CAC)	The sum of responses for the five (5) items questionnaire using five points Likert -scale to test the effect of forensic Investigative skills on Fraud management of selected MDAs in Nigeria.	Okoye, et al., (2020).
Independent	Computer Auditing Technique (CAT)	The sum of responses for the five (5) items questionnaire using five points Likert -scale to test the effect of forensic Investigative skills on Fraud management of selected MDAs in Nigeria.	Asaolu, (2018)

Source: Author's compilation, (2024).

4.0 Results and Analysis

Table 2: Descriptive Statistics

Variable	N	Minimum	Maximum	Mean	Standard Deviation
BDA	219	1.80	5.00	3.2183	.57918
AI	219	1.80	5.00	3.2365	.57385
DMT	219	1.40	5.00	3.1132	.67671
CAC	219	2.00	5.00	3.3525	.52070

Table 4.5 presents the descriptive statistics for variables related to the study on the effect of computerized forensic investigation techniques on fraud management in Lagos State Ministries, Departments, and Agencies. The table summarizes the key characteristics of each variable, including the number of observations (N), minimum and maximum values, mean, and standard deviation. These statistics provide an overview of the central tendencies and variability within the data, offering insights into how the variables behave in relation to fraud management. The dependent variable, Fraud Management proxied by Fraud Detection (FDT), is represented by five independent variables or proxies: Big Data Analytics (BDA), Artificial Intelligence (AI), Data Mining Technique (DMT), Cloud Accounting (CAC), and Computer Auditing Technique (CAT). The descriptive statistics for these variables help to understand their distribution and potential impact on fraud management.

The dependent variable Fraud Detection (FDT) has the mean value of 3.3137, this indicates a positive assessment of FDT's impact on improving fraud

detection and prevention practices in Lagos State Ministries, Departments, and Agencies. The standard deviation of 0.53943 shows moderate variability in opinions, reflecting general agreement on FDT's effectiveness while acknowledging some differences in views. The minimum value of 1.72 indicates that there are some reservations about FDT's effectiveness, but the maximum value of 5.00 demonstrates that it is also considered highly effective by certain respondents. This range of opinions underscores the strong positive perception of FDT's role in enhancing fraud management efforts in the Lagos State Ministries, Departments, and Agencies.

The first independent variable, the mean value of 3.2183 for Big Data Analytics (BDA) suggests that, on average, respondents perceive BDA as moderately effective in the realm of fraud management. This indicates a generally positive but cautious view of BDA's contribution to detecting and preventing fraud within public sector organizations in Lagos State. The standard deviation of 0.57918 reveals that while many respondents find BDA useful, there are diverse opinions about its overall impact on fraud management. Some see it as a significant asset, while others are less convinced of its effectiveness. The minimum value of 1.80 demonstrates that a minority of respondents view BDA as ineffective, indicating that its benefits may not be universally recognized. Conversely, the maximum value of 5.00 shows that BDA is considered a highly effective tool by some, reflecting strong positive views on its role in enhancing fraud management in the Lagos State Ministries, Departments, and Agencies.

For Artificial Intelligence (AI), the mean value of 3.2365 suggests a slightly higher average perception of its effectiveness in managing fraud compared to BDA. This indicates that respondents generally see AI as a valuable tool in forensic investigations within Lagos State Ministries, Departments, and Agencies. The standard deviation of 0.57385 points to moderate variability in opinions, reflecting that while AI is broadly appreciated for its role in fraud management, there are differing views on its effectiveness. The minimum value of 1.80 indicates that some respondents are skeptical about AI's impact on fraud detection and prevention, while the maximum value of 5.00 shows that AI is regarded as extremely effective by others. This range of opinions highlights the varied perceptions of AI's contribution to improving fraud management in the Lagos State Ministries, Departments, and Agencies.

The mean value of 3.1132 for Data Mining Technique (DMT) indicates that it is perceived as less effective compared to other forensic techniques in the study. This suggests that respondents are somewhat less confident in DMT's ability to aid in fraud management within Lagos State's public sector. The standard deviation of 0.67671 is the highest among the variables, indicating substantial variability in opinions. This suggests that while some respondents see DMT as a valuable tool for detecting fraud, others do not share this view, resulting in a broad spectrum of perceptions. The minimum value of 1.40 reveals a critical perspective from some respondents, reflecting doubts about DMT's utility. On the other hand, the maximum value of 5.00 shows that DMT is also seen as highly effective by certain individuals, highlighting the mixed opinions about its effectiveness in managing fraud in the Lagos State Ministries, Departments, and Agencies.

Cloud Accounting (CAC) has the highest mean value of 3.3525, suggesting that it is viewed as the most effective computerized forensic technique for fraud management among those studied. This indicates that respondents generally consider CAC to be a highly valuable tool in enhancing fraud management practices within Lagos State Ministries, Departments, and Agencies. The standard deviation of 0.52070 is the lowest, showing a higher degree of consensus on CAC's effectiveness compared to other techniques. This suggests that most respondents agree on CAC's strong role in fraud prevention and detection. The minimum value of 2.00 points to some lower ratings, indicating that not everyone views CAC positively. However, the maximum value of 5.00 demonstrates that CAC is also seen as extremely effective by some respondents, reflecting strong support for its role in managing fraud in the Lagos State Ministries, Departments, and Agencies.

For Computer Auditing Technique (CAT), the mean value of 3.2018 suggests a moderate perception of its effectiveness in fraud management, similar to BDA and AI. This indicates that respondents view CAT as a useful tool in the context of forensic investigations within Lagos State's public sector. The standard deviation of 0.57819 reflects moderate variability in opinions, indicating that while CAT is generally regarded as effective, there are differing levels of support. The minimum value of 1.80 shows that some respondents view CAT as less effective, while the maximum value of 5.00 indicates that it is also seen as highly effective by others. This range highlights the varied perceptions of CAT's role in enhancing fraud management in the Lagos State Ministries, Departments, and Agencies.

Table 3: Pearson Correlation

	FDT	BDA	AI	DMT	CAC	CAT
FDT	1.000					
BDA	.548	1.000				
AI	.903	.585	1.000			
DMT	.527	.489	.582	1.000		
CAC	.528	.560	.516	.463	1.000	
CAT	.575	.901	.667	.492	.443	1.000

Source: SPSS version 27 output, (2024)

The correlation results in Table 4.6 indicate that computerized forensic investigation techniques are positively associated with fraud detection within Lagos State Ministries, Departments, and Agencies, though the strength of these relationships varies. Big Data Analytics (BDA) shows a moderate positive correlation with Fraud Detection (r = 0.548), suggesting that while BDA enhances fraud detection effectiveness through improved data processing and pattern recognition, it is not sufficient on its own and works best when complemented by other forensic tools. Similarly, Data Mining Techniques (r = 0.527) and Cloud Accounting (r = 0.528) both exhibit moderate positive relationships with fraud detection, implying that these technologies contribute meaningfully to identifying anomalies and improving transparency, but their individual influence on fraud detection remains moderate.

In contrast, Artificial Intelligence (AI) demonstrates a very strong positive relationship with Fraud Detection (r = 0.903), indicating that AI plays a dominant and critical role in enhancing fraud detection capabilities within the public sector. This strong association reflects AI's ability to deploy advanced algorithms, automation, and real-time analytics to significantly improve the detection of fraudulent activities. Computer Auditing Techniques (CAT) also show a relatively strong positive correlation with fraud detection (r = 0.575), highlighting their importance in strengthening audit processes and uncovering irregularities. Overall, the findings suggest that while all the techniques positively support fraud detection, Artificial Intelligence stands out as the most influential, with the other techniques providing complementary and supportive roles in a comprehensive fraud management framework.

4.2 Analyses and Results

Table 4: Model Summary

R	R Square	Adjusted R Square	Std. Error	Durbin-Watson
.910	.828	.824	.226	1.768

Source: SPSS version 27 output, (2024)

The model summary indicates a very strong relationship between computerized forensic investigation techniques and fraud detection within Lagos State Ministries, Departments, and Agencies, as reflected by an R-value of 0.910. The R^2 value of 0.828 implies that about 82.8% of the variations in fraud detection effectiveness are jointly explained by Big Data Analytics, Artificial Intelligence, Data Mining Techniques, Cloud Accounting, and Computer Auditing Techniques, while the adjusted R^2 of 0.824 confirms the robustness and reliability of the model after accounting for the number of predictors. The relatively low standard error of 0.226 suggests that the model's predictions closely approximate observed fraud detection outcomes, indicating high predictive accuracy. In addition, the Durbin–Watson statistic of 1.768 falls within an acceptable range, suggesting no serious autocorrelation problem in the residuals. Overall, the results demonstrate that computerized forensic investigation techniques collectively exert a strong and significant influence on fraud detection, underscoring their effectiveness as a comprehensive framework for enhancing fraud management in Lagos State public sector institutions.

Table 5: ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	52.554	5	10.511	205.776	.000
Residual	10.880	213	.051		
Total	63.434	218			

Source: SPSS version 27 output, (2024)

The overall significance of the regression model is indicated by the Sig. value, which is 0.000. This p-value is less than the commonly used significance level of 0.05, suggesting that the regression model is statistically significant. This implies that the forensic investigation techniques (Big Data Analytics, Artificial Intelligence, Data Mining Techniques, Cloud Accounting, and Computer Auditing Techniques) collectively have a significant impact on fraud detection within Lagos State Ministries, Departments, and Agencies.

Table 6: Collinearity Statistics

Variables	Tolerance	VIF
BDA	.148	6.776
AI	.421	2.373
DMT	.610	1.639
CAC	.552	1.813
CAT	.142	7.060
Mean VIF		4.0402

Source: SPSS version 27 output, (2024)

The multicollinearity diagnostics in Table 4.9 show a mean VIF of 4.0402, indicating an overall moderate level of multicollinearity among the independent variables in the model. Big Data Analytics (VIF = 6.776; Tolerance = 0.148) and Computer Auditing Techniques (VIF = 7.060; Tolerance = 0.142) exhibit relatively high multicollinearity, suggesting strong overlap with other computerized forensic techniques, which may affect the precision of their individual regression coefficients in explaining fraud detection within Lagos State Ministries, Departments, and Agencies. In contrast, Artificial Intelligence shows a moderate level of multicollinearity (VIF = 2.373; Tolerance = 0.421), implying some interdependence with other techniques but within acceptable limits. Data Mining Techniques (VIF = 1.639; Tolerance = 0.610) and Cloud Accounting (VIF = 1.813; Tolerance = 0.552) demonstrate low to moderate multicollinearity, indicating that they contribute more distinct explanatory power to the model. Overall, while multicollinearity is present (particularly for BDA and CAT) it remains within a tolerable range for the model, suggesting that the regression results are still interpretable, though caution is required when isolating the unique effects of highly correlated forensic techniques.

Table 7: Regression Coefficients

	B	Std. Error	Beta	T	Sig.
(Constant)	.466	.112		4.176	.000
BDA	.184	.069	.197	2.671	.008
AI	.872	.041	.928	21.227	.000
DMT	-.014	.029	-.017	-.476	.635
CAC	.054	.040	.052	1.357	.176
CAT	-.220	.070	-.236	-3.125	.002

Source: SPSS version 27 output, (2024)

4.3 Test of Hypotheses

4.3.1 Big Data Analytics and Fraud Management

Big Data Analytics (BDA) has a coefficient of 0.184, indicating a positive relationship with fraud detection. This means that an increase in Big Data Analytics usage is associated with a rise in fraud detection within Lagos State Ministries, Departments, and Agencies. The t-value is 2.671 and the Sig. value is 0.008, which is less than the significance level of 0.05. Therefore, the null hypothesis, which posited that BDA has no effect on fraud detection, is rejected. The findings suggest that Big Data Analytics has a positive and statistically significant effect on improving fraud detection in the public sector.

4.3.2 Artificial Intelligence and Fraud Management

Artificial Intelligence (AI) shows a coefficient of 0.872, reflecting a strong positive relationship with fraud detection. This coefficient indicates that greater implementation of AI leads to significantly enhanced fraud detection within Lagos State Ministries, Departments, and Agencies. The t-value is 21.227, and the Sig. value is 0.000, which is far below the 0.05 threshold. Thus, the null hypothesis, which stated that AI has no effect on fraud detection, is rejected. The results demonstrate that Artificial Intelligence has a positive and statistically significant impact on fraud detection within Lagos State Ministries, Departments, and Agencies.

4.3.3 Data Mining Techniques and Fraud Management

Data Mining Techniques (DMT) has a coefficient of -0.014, signifying a negative relationship with fraud detection. This suggests that an increase in the

application of Data Mining Techniques is associated with a slight decrease in fraud detection in Lagos State Ministries, Departments, and Agencies. The t-value is -0.476, and the Sig. value is 0.635, which is much higher than the 0.05 significance level. Therefore, the null hypothesis, which posited no effect of DMT on fraud detection, fails to be rejected. Consequently, Data Mining Techniques do not have a statistically significant effect on fraud detection in the Lagos State Ministries, Departments, and Agencies.

4.3.4 Cloud Accounting and Fraud Management

Cloud Accounting (CAC) presents a coefficient of 0.054, indicating a positive but weak relationship with fraud detection. This suggests a minor positive effect of Cloud Accounting on improving fraud detection in Lagos State Ministries, Departments, and Agencies. The t-value is 1.357, and the Sig. value is 0.176, which exceeds the 0.05 threshold. As a result, the null hypothesis, which states that CAC does not affect fraud detection, fails to be rejected. Therefore, Cloud Accounting does not have a statistically significant impact on fraud detection in Lagos State Ministries, Departments, and Agencies.

4.3.5 Computer Auditing Techniques and Fraud Management

Computer Auditing Techniques (CAT) shows a coefficient of -0.220, representing a negative relationship with fraud detection. This indicates that an increase in the use of Computer Auditing Techniques is associated with a decrease in fraud detection in Lagos State Ministries, Departments, and Agencies. The t-value is -3.125, and the Sig. value is 0.002, which is well below the 0.05 significance level. Thus, the null hypothesis, which posited that CAT has no effect on fraud detection, is rejected. The findings reveal that Computer Auditing Techniques have a negative and statistically significant effect on fraud detection in Lagos State Ministries, Departments, and Agencies.

4.4 Discussion of Findings

The study revealed that Big Data Analytics (BDA) has a positive and statistically significant effect on fraud detection within Lagos State Ministries, Departments, and Agencies (MDAs). This finding aligns with Rosnidah et al. (2022) and Wishmy et al. (2022), who emphasized that BDA enhances audit quality and fraud detection by enabling the analysis of large, complex datasets and facilitating the identification of anomalies. Although these prior studies were largely theoretical or review-based, the current study provides empirical evidence from a public sector context, thereby extending existing literature and confirming the practical relevance of BDA in strengthening fraud management within government institutions.

However, the finding contrasts with Huttunen et al. (2019) and Singh et al. (2019), who reported slow adoption and limited effectiveness of BDA due to infrastructural and skill-related constraints. The positive outcome observed in Lagos State MDAs suggests that when BDA is adequately implemented and aligned with institutional objectives, its benefits outweigh initial adoption challenges. Consistent with the Fraud Management Lifecycle Theory, BDA enhances the detection and analysis stages by enabling continuous monitoring and real-time identification of fraudulent patterns, thereby improving transparency and accountability in the public sector.

Artificial Intelligence (AI) was found to have a highly positive and statistically significant impact on fraud detection in Lagos State MDAs. This result is consistent with Bohdan et al. (2023), who demonstrated that AI-driven models significantly improve fraud detection accuracy in the banking sector, and Wishmy et al. (2022), who highlighted AI's role in enhancing audit effectiveness. The strong relationship observed in this study suggests that AI's ability to process large datasets, learn from patterns, and detect anomalies is equally effective in the public sector, despite differences in data structures and operational environments.

Nonetheless, some studies have raised concerns regarding AI implementation challenges. Tang et al. (2018) noted that AI models relying solely on structured data may overlook qualitative insights, while Muawanah et al. (2022) emphasized issues such as skill gaps and resistance to technological change. Despite these concerns, the findings indicate that Lagos State MDAs have benefited substantially from AI, particularly in the detection stage of the Fraud Management Lifecycle Theory, where real-time analysis and rapid response are critical. This underscores AI's practical relevance in enhancing fraud management when supported by adequate institutional readiness.

The study found that Data Mining Techniques (DMT) do not have a statistically significant effect on fraud detection within Lagos State MDAs. This outcome aligns with Ewa (2022) and Dong et al. (2018), who argued that the effectiveness of data mining depends heavily on advanced IT infrastructure, skilled personnel, and continuous training. In the context of Lagos State MDAs, limitations in technical capacity and expertise may have constrained the ability of data mining tools to meaningfully contribute to fraud detection.

In contrast, studies by Okafor et al. (2022) and Ogiriki and Appah (2018) reported significant fraud reduction through data mining in sectors with stronger technological frameworks, such as banking. These discrepancies suggest that sectoral differences in

resources and institutional maturity play a critical role in determining effectiveness. From the perspective of the Fraud Management Lifecycle Theory, data mining alone is insufficient where prevention, investigation, and response mechanisms are weakly integrated, reinforcing the need for a holistic fraud management framework within Lagos State MDAs.

The results indicate that Cloud Accounting does not have a statistically significant effect on fraud detection in Lagos State MDAs. This finding aligns with Firas (2021) and Rihan (2019), who noted that while cloud accounting improves efficiency and data accessibility, its effectiveness in fraud detection varies across contexts. The public sector's regulatory complexity, infrastructural limitations, and scale of operations may have constrained the impact of cloud accounting on fraud detection in Lagos State MDAs.

Conversely, Thirmal et al. (2020) and Huttunen et al. (2019) reported positive fraud-related outcomes from cloud accounting adoption, though their studies relied on less rigorous quantitative methods or were conducted in private-sector environments. Consistent with the Fraud Management Lifecycle Theory, the lack of significance suggests that cloud accounting tools in Lagos State MDAs may not yet be fully integrated into comprehensive fraud prevention and detection systems. This highlights the need for improved infrastructure, staff capacity building, and stronger policy alignment to enhance the fraud management benefits of cloud technologies in the public sector.

The study revealed a negative and statistically significant relationship between Computer Auditing Techniques (CATs) and fraud detection in Lagos State MDAs. This finding contradicts Okafor et al. (2022) and Taiya et al. (2021), who reported that computer-assisted audit tools significantly reduced fraud and revenue leakages in banking institutions and federal universities. These studies suggest that CATs are effective where technical competence, standardized procedures, and strong institutional controls exist.

The negative effect observed in Lagos State MDAs may reflect contextual challenges such as inadequate IT infrastructure, weak system integration, and limited technical expertise, as highlighted by Fadilah et al. (2019) and Amahalu et al. (2017). According to the Fraud Management Lifecycle Theory, fraud detection tools are most effective when integrated with strong preventive, investigative, and enforcement mechanisms. The findings therefore suggest that CATs, when deployed in isolation without complementary controls and capacity development, may undermine rather than enhance fraud detection in the public sector. This underscores the need for a holistic, context-specific approach to fraud management in Lagos State MDAs.

5.0 Conclusion and Recommendations

In conclusion, the study demonstrates that effective fraud management in Lagos State Ministries, Departments, and Agencies depends largely on the strategic adoption and proper use of advanced technologies. Big Data Analytics and Artificial Intelligence emerged as the most impactful tools, significantly strengthening the ability of public institutions to detect and curb fraudulent activities. However, the limited effectiveness of Data Mining Techniques and Cloud Accounting, alongside the negative influence of Computer Auditing Techniques, indicates gaps in implementation, capacity, and system integration. These outcomes suggest that while technology is essential in combating fraud, its success in the public sector hinges on contextual adaptation, adequate expertise, and a coordinated fraud management framework that aligns technological tools with institutional processes and accountability structures.

The study provides the following Recommendations and Implementation Strategies;

First, Big Data Analytics should be strategically employed to enhance fraud detection within Lagos State Ministries, Departments, and Agencies (MDAs). The Lagos State Ministry of Finance is recommended to invest in state-of-the-art Big Data Analytics platforms and initiate training programs for its staff to develop their expertise in data analysis. This approach will enable the ministry to harness large datasets and advanced analytical techniques to better identify and prevent fraudulent activities. Similarly, the Office of the Accountant General should integrate these Big Data Analytics tools into their financial monitoring systems to detect irregularities in financial transactions more effectively. The Ministry of Innovation, Science, and Technology should collaborate with other MDAs to tailor Big Data solutions that address specific fraud detection needs within Lagos State Ministries, Departments, and Agencies (MDAs).

Second, to significantly bolster fraud detection efforts, the adoption of Artificial Intelligence (AI) technologies is essential. The Ministry of Innovation, Science, and Technology should lead the integration of AI tools within Lagos State MDAs, offering technical support and ensuring successful deployment. Economic, Budget, and Planning should prioritize funding for AI technologies and partner with technology providers to develop robust AI-driven fraud detection systems. The Office of the Accountant General is encouraged to implement AI algorithms for real-time analysis and monitoring of financial transactions, which will enhance their capability to detect and prevent fraudulent activities effectively within Lagos State Ministries, Departments, and Agencies (MDAs).

Third, Data Mining Techniques may not currently offer substantial benefits in fraud detection for Lagos State MDAs. The Office of Central Internal Audit should conduct a thorough evaluation of existing data mining practices to identify potential improvements or alternative methods that might provide more effective results. The Lagos State Ministry of Finance should review its use of data mining techniques and consider incorporating complementary technologies or alternative approaches to enhance fraud detection capabilities. By addressing these areas, MDAs can ensure their data mining efforts are optimized for better fraud management within Lagos State Ministries, Departments, and Agencies (MDAs).

Fourth, Cloud Accounting methods require reassessment to ensure their effectiveness in fraud detection. The Lagos State Public Procurement Unit should evaluate the current cloud accounting systems and their impact on fraud detection, exploring enhancements or alternative solutions as necessary. The Office of the Accountant General should review cloud accounting protocols and implement best practices to improve their effectiveness in detecting fraud within cloud-based financial systems. These adjustments will help refine cloud accounting tools and enhance their role in fraud management within Lagos State MDAs.

Fifth, Computer Auditing Techniques is currently in use should be revised to improve their effectiveness. The Lagos state Office of Central Internal Audit should undertake a comprehensive review of computer auditing techniques to address any identified weaknesses. The Lagos State Ministry of Finance should support this review by providing necessary training and resources to update auditing practices. This will ensure that computer auditing methods effectively contribute to fraud detection and strengthen financial oversight within Lagos State MDAs.

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