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FORENSIC INVESTIGATION TECHNIQUES AND PUBLIC SECTOR GOVERNANCE IN ABIA STATE, NIGERIA

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ABSTRACT

This study examined the relationship between forensic investigation techniques and public sector governance outcomes in Abia State, Nigeria. The specific focus was on how digital forensics and digital surveillance techniques relate to transparency and accountability in public financial management. Using a cross-sectional survey design, data were collected from 108 staff across three public institutions: Abia State Audit, House of Assembly, and Ministry of Finance. A structured questionnaire with validated multi-item scales measured the constructs. Data analysis employed descriptive statistics and multiple linear regression. Results indicate that forensic investigation techniques explain approximately 28% of the variance in governance outcomes (transparency and accountability combined). Digital forensics showed a stronger association with transparency, while digital surveillance demonstrated moderate association with accountability. However, the modest explanatory power suggests other factors institutional capacity, political will, and legal frameworks play substantial roles. The study concludes that while forensic techniques contribute to governance improvements, they are necessary but insufficient conditions for public sector reform. Recommendations emphasize phased implementation of digital forensic tools, capacity building, and integration with broader institutional reforms.

***Key words:** Forensic Investigation, Digital Forensics, Digital Surveillance, Transparency, Public, Sector Governance.*

INTRODUCTION

Nigeria's public sector manages substantial public resources, yet persistent challenges of financial mismanagement, corruption, and weak accountability mechanisms undermine service delivery. Despite establishing anti-corruption agencies including the Economic and Financial Crimes Commission (EFCC) and the Independent Corrupt Practices Commission (ICPC), financial irregularities remain prevalent (Transparency International, 2025). These challenges necessitate examination of alternative or complementary mechanisms for strengthening governance. Forensic investigation techniques have emerged as potential tools for addressing financial misconduct. Unlike conventional auditing, which primarily verifies compliance with established procedures, forensic investigation applies specialized analytical methods to detect fraud, trace financial flows, and generate evidence suitable for legal

proceedings (Crumbley, Edmund, Fenton, Stevenson & Lester, 2019). In the Nigerian context, these techniques have gained attention following high-profile corruption cases where traditional oversight mechanisms proved inadequate.

The public sector in Nigeria plays a pivotal role in driving national development, managing essential services such as healthcare, education, infrastructure and resource allocation, which collectively account for a significant portion of the country's gross domestic product (GDP). However, persistent inefficiencies within this sector have long hindered economic progress and eroded public trust (Crumbley et al, 2019). The sector continues to face deep-rooted challenges including corruption, weak accountability mechanisms, bureaucratic inefficiency, poor service delivery and mismanagement of public funds. These problems have persisted for decades, draining resources and undermining public trust in government institutions. Despite numerous reforms and the establishment of anti-graft agencies such as the Economic and Financial Crimes Commission (EFCC) and the Independent Corrupt Practices and Other Related Offences Commission (ICPC), cases of fraud, embezzlement, and abuse of public resources continue to undermine service delivery and citizens' trust in government (Transparency International, 2023). These challenges have negatively affected the ability of the public sector to achieve value for money, transparency, and effective utilization of scarce public resources.

Corruption has been identified as one of the most damaging factors. Studies estimated that Nigeria loses billions of dollars annually to various forms of financial misconduct, including embezzlement, contract inflation, ghost worker fraud, and procurement irregularities (Transparency international, 2025; Okoye and Gbegi, 2013) these practices not only reduce the effectiveness of public spending but perpetuate poverty and slow economic progress. In response to these challenges, forensic investigation techniques have gained attention as powerful tools for detecting, investigating, and preventing financial crimes in both the public and private sectors. Unlike conventional auditing which verifies compliance, and historical records, forensic accounting applies investigative and analytical methods to uncover fraud, trace illicit funds and provide court-admissible evidence (Crumbley et al., 2019; Razaee & Burton 1997). According to Crumbley, Heitger, and Smith (2015), forensic investigation involves the application of specialized knowledge and skills to collect, analyze, and evaluate evidential matters suitable for use in a court of law. Similarly, Singleton and Singleton (2010) emphasize that forensic techniques enhance the ability to identify fraud schemes that may not be detected through routine audits.

In the Nigerian public sector, the adoption of forensic investigation techniques has become increasingly relevant in response to the growing sophistication of financial crimes and the limitations of conventional control mechanisms. Techniques such as forensic accounting, data analysis, digital forensics, and litigation support have been increasingly applied by anti-graft agencies to trace illicit financial flows, detect manipulation of financial records, and provide credible evidence for prosecution. Public sector efficiency, on the other hand, refers to the ability of government entities to maximize outputs such as quality service delivery, infrastructural development, and public welfare, while minimizing waste, fraud, and misuse of resources. Efficient public sector operations are essential for sustainable development, especially in developing economies like Nigeria where resources are limited and public demands are high. When fraud and corruption are prevalent, public-sector efficiency is severely compromised, leading to poor project execution, abandoned projects, and declining public confidence.

The relationship between forensic investigation techniques and public sector efficiency is therefore critical. The application of robust forensic investigative methods can enhance transparency, deter fraudulent practices, improve compliance with financial regulations, and ultimately promote efficiency in public sector operations. By strengthening fraud detection and enforcement mechanisms, forensic investigation techniques serve as a strategic instrument for improving governance and ensuring effective utilization of public funds in Abia State Nigeria. This study seeks to examine the effect of forensic investigation techniques on public sector efficiency in Abia State Nigeria, with a view to providing empirical evidence that can inform policy formulation, strengthen anti-corruption strategies, enhance the performance of public sector institutions and promote sustainable development.

Despite Nigeria's establishment of anti-corruption frameworks and the creation of agencies such as the Economic and Financial Crimes Commission (EFCC) and the Independent Corrupt Practices Commission (ICPC), public sector governance at the state level continues to be undermined by persistent financial mismanagement, weak accountability mechanisms, and endemic corruption. Abia State, located in southeastern Nigeria, typifies these challenges, with recurrent audit queries, allegations of procurement irregularities, and documented cases of fund misappropriation plaguing its public institutions (Transparency International, 2025). These governance challenges have been manifested in several specific ways. First, there have been concerns regarding poor accountability and transparency in public financial management. Budget implementation processes are often criticized for lack of openness,

making it difficult for citizens and stakeholders to track how public funds are allocated and utilized. Reports from the Budget and the Nigeria extractive industries Transparency Initiative have highlighted broader issues of weak fiscal transparency and accountability across Nigerian states, with sub-national governments frequently scoring low on transparency indices.

Although there is growing complexity of financial crimes, particularly with the increasing usage of digital platforms, many public institutions in Abia State still rely on conventional auditing approaches which are largely reactive and insufficient for detecting modern fraud schemes. Bashin (2017) notes that traditional audit methods are limited in scope and cannot adequately address sophisticated and technology driven financial crimes. Within Abia State's public sector, three institutions bear primary responsibility for financial oversite and governance: the Abia State Audit Department (responsible for external audit and verification of public accounts), the Abia State House of Assembly (tasked with legislative oversight and appropriation monitoring), and the Abia State Ministry of Finance (responsible for budget execution and financial management). The Abia State Audit continues to rely predominantly on manual auditing procedures and traditional compliance-based approaches that lack the technical sophistication to detect complex financial crimes, electronic fund diversion and digitally manipulated records, this technological deficit limits the department's capacity to trace illicit financial flows or provide court-admissible digital evidence, thereby weakening its oversight function.

The Abia State House of Assembly, while constitutionally empowered to exercise oversight over executive financial operations lacks robust digital surveillance mechanisms to monitor real time expenditure patterns, detect anomalies in appropriation implementation, or establish electronic audit trails that would enhance legislative accountability. The absence of such systems creates information asymmetry between the legislature and the executive, undermining the effectiveness of legislative scrutiny. The Abia State Ministry of Finance, as the primary custodian of state financial resources, operates with limited digital forensic capabilities to verify the authenticity of electronic transactions, monitor unauthorized access to financial systems, or prevent the manipulation of payroll and procurement records. This vulnerability is exploited through various schemes including ghost worker fraud, contract inflation and unauthorized fund transfers.

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There exists a significant disconnect between the potential of forensic investigation techniques and their actual deployment in Abia State's public sector. While digital forensics and digital surveillance have proven effective in private sector fraud detection and federal anti-corruption investigations (Okoye, Olokoyo, Okoh and Ezeji, 2020; Ojelabi, 2024), their systematic application within Abia State's core governance institutions remains minimal, poorly understood, and empirically unexamined. Consequently, there is an urgent need to empirically examine whether the adoption and application of digital forensics and digital surveillance techniques can significantly improve transparency and accountability within these three critical institutions. Without such evidence-based understanding, policy interventions aimed at strengthening public sector governance in Abia State risk being misdirected, resulting in continued resource leakage, eroded public trust, and suboptimal service delivery.

Objectives

The main objective is to examine the relationship between forensic investigation techniques and public sector governance outcomes in Abia State, Nigeria. Specific objectives are to:

1 assess the relationship between digital forensics techniques and transparency in public financial management.
2 evaluate the relationship between digital surveillance techniques and accountability in the public sector.

LITERATURE REVIEW

Forensic Investigation Techniques

Forensic investigation refers to the application of accounting, auditing, and investigative skills to examine financial and non-financial information in order to detect and prevent fraud, corruption, and other irregularities (Modugu & Anyaduba, 2013). It combines knowledge from fields such as law, criminology, and information technology to uncover financial crimes and present evidence in a court of law (Bassey, 2018).

Concept of Forensic Accounting

According to Adegbie and Fakile (2012) forensic accounting is practice of utilizing accounting, auditing and investigation skills to assist in legal matters and application of specialized body of knowledge to the evidence of economic transaction and reporting, suitable in the purpose of establishing accountabilities or valuation of administrative proceedings. In

the view of Bologna and Lindguist cited in Omar and Jomitin (2013), forensic and investigative accounting is the application of financial skill and investigative mentality to resolve issues conducted within the context of rule of evidence. As a discipline, it encompasses financial expertise, fraud knowledge and understanding of business reality and working of legal system.

In a nutshell, forensic accounting can best be described as the application of auditing, accounting, statistics, research and economic concept and techniques in investigation with the sole aim of solving legal problems or potential problems in the form of bribery, fraud, embezzlement, corruption and forgery that may occur from economic or financial transactions. It is therefore pertinent that the who-be forensic accountants engaging in forensic accounting assignment or investigation must understand the legal process because the forensic accounting engagement may lead to court action, requiring the professional forensic accountant to stand in as expert witness before the court to assist the court in resolving legal issues.

Concept of Digital Forensics

Digital forensics refers to the application of scientifically derived and proven methods in the identification, preservation, collection, validation, analysis, interpretation, documentation, and presentation of digital evidence derived from digital sources for the purpose of facilitating or furthering the reconstruction of events found to be criminal, or helping to anticipate unauthorized actions shown to be disruptive to planned operations (Casey, 2011; Nikkel, 2006, cited in Ademu, Imafidon & Preston, 2011). In the context of public sector governance, digital forensics involves the systematic examination of computer systems, financial databases, electronic transaction records, and digital storage devices to uncover evidence of financial misconduct, trace illicit fund flows, and generate legally admissible evidence for prosecution or administrative action.

Digital Surveillance

Digital surveillance, by contrast, refers to the continuous or periodic monitoring and collection of electronic data from computers, networks, and digital devices as part of an ongoing oversight or investigative process. This includes cybersecurity logs, email communications, access histories, electronic transaction trails, and network traffic analysis (Casey, 2011). Unlike digital forensics, which is typically reactive and incident-driven—commencing after suspected misconduct has occurred digital surveillance is predominantly

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proactive and continuous, designed to detect anomalies, deter misconduct through the awareness of monitoring, and provide real-time alerts regarding irregular activities.

Table 1: Key Differences

Dimension	Digital Forensics	Digital Surveillance
Primary Purpose	Reactive investigation and evidence generation after incidents	Proactive monitoring and detection of ongoing or potential misconduct
Timing	Post-incident; triggered by suspicion or detected anomaly	Continuous or periodic; real-time or near real-time
Scope	Deep, targeted analysis of specific digital artifacts	Broad, systematic monitoring of electronic activities and data flows
Methodology	Forensic imaging, data recovery, metadata analysis, timeline reconstruction	Log analysis, network monitoring, transaction tracking, access pattern analysis
Outcome	Court-admissible evidence, incident reconstruction, perpetrator identification	Early warning systems, anomaly detection, deterrence, compliance monitoring
Legal Framework	Governed by rules of evidence, chain of custody requirements	Governed by privacy regulations, authorization protocols, oversight mechanisms
Application in Public Sector	Investigation of specific fraud allegations, audit query resolution, prosecution support	Continuous monitoring of expenditure patterns, payroll verification, procurement oversight

Transparency

Transparency entails open, timely disclosure of financial processes, budgets and expenditures to facilitate scrutiny and curb hidden malpractices. Opacity in Nigerian procurement, budgeting and fund allocation has perpetuated corruption, including contract inflation and resource diversion.

Forensic techniques foster transparency by exposing concealed irregularities thereby reducing information asymmetry and supporting verifiable reporting. Research indicates that forensic accounting promotes financial openness, strengthens compliance, and aids anti-corruption bodies like the EFCC and ICPC in minimizing undetected leakages (Yakubu, 2025; Ariyo-Edu & Wolli-Jimoh, 2025).

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Public sector efficiency

Public sector efficiency involves maximizing outputs (service delivery, policy implementation, value for money) from given inputs (funds, personnel, processes). Nigerian inefficiency which is manifested in project delays, high costs, poor services and audit queries, stem largely from mismanagement. Forensic investigation enhances efficiency by reinforcing internal controls, detecting fraud early and minimizing leakages through procurement audits and payroll verification. Empirical findings show positive links between forensic application and improved resource utilization, operational effectiveness and performance (Okoye & Gbegi, 2013; Yakubu 2025)

Forensic Investigation Techniques and Public Sector Efficiency

Forensic investigation techniques play a pivotal role in enhancing public sector efficiency in Nigeria by addressing core inefficacies rooted in financial mismanagement, corruption, fraud and weak internal controls. These techniques go beyond traditional auditing by applying investigative, analytical and legal oriented methods (e.g. data mining, digital forensics, litigation support) to detect, prevent and prosecute irregularities.

The above-mentioned techniques are used in addressing the following:

1. ***Reduction in financial leakages and waste***

Forensic techniques identify and curb common sources of inefficiency, such as ghost worker schemes, procurement fraud, contract inflation, embezzlement and diversion of funds. By minimizing these leakages, more public resources are available for actual service delivery and project execution, directly improving value for money and operational output.

2. ***Strengthening internal control and deterrence***

Forensic methods reinforce internal control systems (e.g. segregation of duties, risk assessment, monitoring) and act as strong deterrence through higher detection probability and prosecution success. This reduces opportunistic fraud, streamlines administrative processes and lowers overall administrative costs, leading to greater operational efficiency.

3. ***Improved accountability and efficiency***

Forensic investigations produce verifiable evidence and detailed reports that enhance financial accountability, reduce information asymmetry and promote transparent resource use. This fosters better governance, timely decision making and citizen trust, which indirectly boost efficiency by aligning public sector actions with intended outcomes.

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4. Resource optimization and performance enhancement

By recovering misappropriated funds and preventing future losses, forensic practices create fiscal space for productive investments (e.g. infrastructure, health, education). Empirical evidence shows forensic techniques correlate with improved public-sector performance metrics, such as reduced audit queries, faster project completion and better service delivery

Theoretical Framework

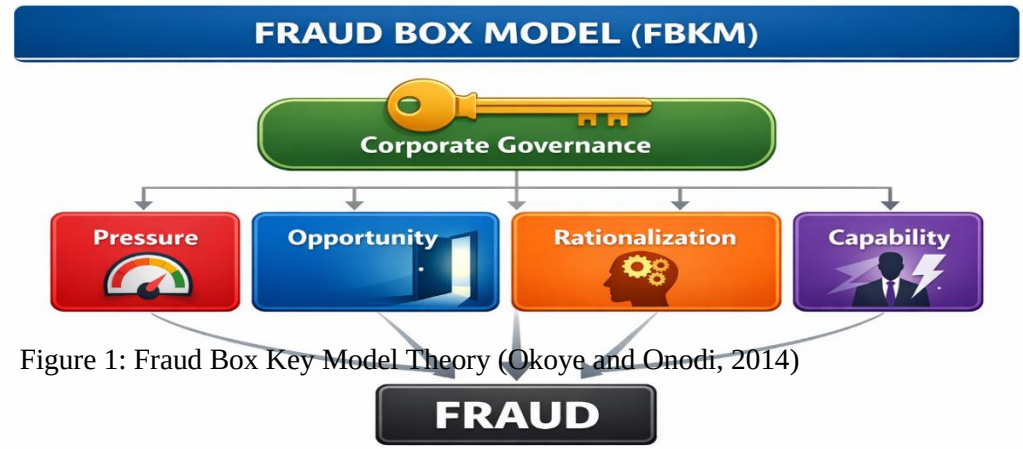


Figure 1: Fraud Box Key Model Theory (Okoye and Onodi, 2014)

The fraud box key model, developed by Okoye and Onodi in 2014, represents an advancement over earlier fraud theories such as the Fraud Triangle Theory and Fraud Diamond Theory. The Fraud Box Key Model incorporates the core elements of pressure, opportunity, rationalization and capability from prior models but introduces a box key metaphor, where the box symbolizes the containment of fraud risks through structured controls and the key represents corporate governance as the essential tool to unlock effective fraud prevention and detection. The Fraud Box Key Model is highly relevant to this research as it underscores the role of corporate governance in curbing financial irregularities within public institutions. By integrating forensic techniques such as digital forensics, and digital surveillance into governance frameworks, the public sector can proactively detect deviations, reduce fraud incidence and enhance resource efficiency.

For this study, the Fraud Box Key Model (FBKM), developed by Okoye and Onodi (2014) and subsequently elaborated by Onodi, Okoye, and Egbunike (2017), is the most appropriate theoretical framework. This model represents an advancement over the traditional Fraud Triangle Theory (Cressey, 1953) and the Fraud Diamond Theory (Wolfe & Hermanson, 2004) by incorporating corporate governance as the critical fifth dimension the "key" that unlocks effective fraud prevention and detection. The FBKM is specifically relevant to the public

sector governance context of Abia State because it shifts focus from merely understanding why fraud occurs (pressure, opportunity, rationalization, capability) to emphasizing the governance structures required to prevent it. In the Nigerian public sector, where institutional weakness rather than absence of rules is the primary challenge, the FBKM's emphasis on governance as the controlling mechanism directly addresses the core problem. Unlike the Fraud Triangle or Fraud Diamond, which focus predominantly on the fraudster's motivations and opportunities, the FBKM explicitly positions governance structures including forensic investigation techniques as the essential "key" that locks the "box" containing fraud risks. This aligns precisely with the study's examination of how digital forensics and digital surveillance (as governance tools) can enhance transparency and accountability

The model has been empirically validated in the Nigerian context, albeit primarily in banking studies (Onodi, Okoye & Egbunike, 2017). Its application to Abia State's public sector institutions would represent a novel extension, testing the generalizability of the governance-fraud nexus across different institutional settings. The FBKM accommodates the study's dual focus on transparency and accountability by conceptualizing these as outcomes of effective governance mechanisms. The model suggests that when governance structures (including digital forensic capabilities and surveillance systems) are robust, the "box" remains locked, fraud risks are minimized, and transparency and accountability are enhanced.

Empirical Review

Onyemachi, Asante, and Olajide (2024), examine the efficacy and difficulties of forensic management strategies and fraud investigation procedures in Nigerian financial institutions. It draws attention to how common fraud is and stresses the need for effective detection and prevention techniques. Using a qualitative research methodology, the study addresses constraints including regulatory flaws and insufficient technology while identifying and assessing the efficacy of typical forensic procedures used in banks. Important conclusions showed that while forensic management is essential in the fight against fraud, systemic problems seriously impair its overall efficacy. To restore the integrity of Nigeria's financial industry, the report ends with suggestions for improving fraud management techniques, such as attempts to create capacity and changes to policies. Despite extensive research on forensic investigation techniques in Nigeria’s public sector, significant gaps persist in linking these methods, particularly, advanced tools like digital forensics, digital surveillance, and the fraud box key model to measurable improvements to public sector efficiency. The table below

summarizes key gaps identified in the literature, their relevance to the study and how the present research addresses them.

Shodeinde, Dada, Adegbie, and Akinola (2024), examined the relationship between Forensic Accounting Techniques and White-Collar Crime in Nigeria Public Sector. The government's inability to eradicate white-collar crimes in the public sector harms Nigeria's economy. Several studies have focused on fraud as the major proxy for corrupt practices neglecting the white-collar crimes that were considered in this study. This study adopted a survey design. The study population consisted of 257,061 stakeholders from six selected universities and six polytechnics in southwest Nigeria, and a sample size of 500 was determined using the Taro Yamani formula. A stratified sampling technique was used to select respondents for the questionnaire. The findings revealed that forensic accounting techniques had a significant effect on fraud occurrence (Adj R2 = 0.369, F (2, 423) 40.772, $p < 0.000$) and embezzlement (Adj R2 = 0.426, F (2, 423) 53.520, $p < 0.000$) in Nigeria's public sector. The study concluded that forensic accounting resolved white-collar crimes in Nigeria's public sector. The study recommends that the government establish forensic account units in all ministries, departments, and agencies to ensure accountability and transparency in their financial operations.

Aremu, and Olayinka (2023), examines the forensic accounting techniques and output maximization in Federal Government parastatals in Nigeria. The study adopted survey research design. The population of the study was 5 Federal Government agencies in Nigeria. Purposive sampling technique was used to select 2 agencies. The target population of the study was 131 accountants in the two agencies chosen (Nigeria Port Authority and Nigeria Civil Aviation Authority). Total enumeration was adopted. A validated and structured questionnaire was used to administer 131 copies of the questionnaire to the respondents. 126 copies were retrieved, which represented 96% retrieval rate. The data were analyzed using descriptive and inferential (multiple regression) statistics at 5% level of significant. The result found that forensic accounting techniques had significant effect on output maximization in public sector of Nigeria. The study concluded that forensic accounting techniques have impact on output maximization in federal public sector of Nigeria. The study recommended that government should train and develop their staff on the use of forensic accounting techniques to achieve output maximization and attainment of results in government parastatals.

Okoye, Nwoye, Akuchi, and Onyema (2020), seek to examine the effect of Forensic investigation techniques in detecting Occupational fraud in the public sector. Purposive sampling techniques and cross-sectional survey design were employed. The sample size for the study was 250 consisting of investigators, prosecutors, staff of Finance, Accounts and Audit units. Population was drawn from five anti-corruption agencies in Nigeria: Economic and Financial crimes commission (EFCC), Independent Corrupt Practices Commission (ICPC), Code of Conduct Bureau (CCB), Federal Bureau of Investigation (FBI), Police Special Fraud Unit (PSFU) of the criminal Investigation Department of the Nigerian Police Force and Ministry of Finance, Anambra State. Data generated for the study was on a five-point Likert scale. The hypotheses of the study were statistically tested with Kruskal Wallis test (one way ANOVA for ordinal data) on Statistical Package for Social Sciences (SPSS) version 23. Findings indicate that there are no generally acceptable forensic investigation techniques in place for detecting fraud in the public sector. Again, there is a significant positive relationship between Forensic investigation Techniques and fraud detection in the public sector. To this end, it was recommended that Anti-corruption agencies in Nigeria should always adopt forensic accounting investigation techniques in all their investigations to be able to come up with evidence that will be supportive in prosecution of corruption cases in courts.

Gap in literature

Despite the growing body of research on forensic investigation techniques in Nigeria's public sector, significant empirical and contextual gaps persist that limit the understanding of how these specialized tools enhance governance outcomes at the sub-national level. Majority of existing studies have concentrated on federal-level agencies or private sector contexts, with minimal attention to state-level public sector institutions. Studies by Okoye et al. (2020), Ojelabi (2024), and Shodeinde et al. (2024) focused primarily on federal ministries, anti-corruption agencies, or the banking sector, leaving a critical void regarding state-level governance structures such as State Audit Departments, Houses of Assembly, and State Ministries of Finance. This geographical and institutional gap is significant because state governments in Nigeria control substantial portions of public expenditure and service delivery, yet face distinct resource, capacity, and political constraints compared to federal institutions, while several studies have examined traditional forensic accounting techniques such as ratio analysis, Benford's Law, and financial statement review there remains limited

empirical investigation into advanced digital forensic techniques and digital surveillance systems within public sector contexts.

METHODOLOGY

This study employs a cross-sectional survey design. This design is appropriate for examining associations between variables at a single point in time, though it limits causal inference.

The population comprises 230 professional staff across these institutions: 100 in Audit, 85 in House of Assembly, and 45 in Ministry of Finance. These figures represent staff with direct financial management, audit, or oversight responsibilities, excluding administrative and support staff. A purposive sampling was employed and determined using the formular:

$n = N / (1 + Ne^2)$

Where N = 230, e = 0.05 (margin of error)

$n = 230 / (1 + 230 \times 0.0025) = 230 / 1.575 = 146$

A target of 146 questionnaires was distributed, with 108 valid responses returned (74% response rate).

Model Specification

The regression models are specified as:

Model 1 (Transparency): $T = \beta_0 + \beta_1 DF + \beta_2 DS + \beta_3 Inst + \beta_4 Exp + \beta_5 Edu + \varepsilon$

Model 2 (Accountability): $A = \beta_0 + \beta_1 DF + \beta_2 DS + \beta_3 Inst + \beta_4 Exp + \beta_5 Edu + \varepsilon$

Where:

T = Transparency (composite score)

A= Accountability (Composite score)

DF = Digital forensics techniques

DS = Digital surveillance techniques

Inst = Institution type (dummy variables)

Exp = Years of experience

Edu = Education level

ε = Error term

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RESULTS AND DISCUSSION

Descriptive Statistics

Table 2: Demographic Characteristics (N = 108)

Characteristics	Category	Frequency	Percentage
Institution	Abia State Audit	48	44.4
	House of Assembly	38	35.2
	Ministry of Finance	22	20.4
Gender	Male	67	62.0
	Female	41	38.0
Age	25–34 years	28	25.9
	35–44 years	45	41.7
	45–54 years	28	25.9
	55+ years	7	6.5
Education	Bachelor's degree	52	48.1
	Master's degree	45	41.7
	Professional qualification	11	10.2
Experience	1–5 years	22	20.4
	6–10 years	38	35.2
	11–15 years	31	28.7
	16+ years	17	16.7

Source: *Author's Computation using SPSS*

Table 3: Descriptive Statistics for Main Study Variables (N = 108)

Variable	N	Mean	SD	Min	Max	Skewness	Kurtosis
Digital Forensics	108	3.72	0.78	1.0	5.0	-0.51	0.32
Digital Surveillance	108	3.47	0.80	1.0	5.0	-0.42	-0.02
Transparency	108	3.24	0.84	1.0	5.0	-0.26	-0.24
Accountability	108	3.26	0.81	1.0	5.0	-0.32	-0.18

Source: *Author's Computation using SPSS*

Digital Forensics recorded the highest mean score (M = 3.72, SD = 0.78), followed by Digital Surveillance (M = 3.47, SD = 0.80), while Transparency (M = 3.24, SD = 0.84) and Accountability (M = 3.26, SD = 0.81) clustered around the scale midpoint. This pattern suggests that respondents perceive digital forensic tools as relatively more established within their institutions compared to digital surveillance systems, while governance outcomes are viewed as moderate rather than strong.

These findings align with Aremu and Olayinka (2023), who found that forensic accounting techniques are increasingly recognized in Nigerian public sector institutions, though their

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implementation remains uneven across different agencies. The moderate mean scores for transparency and accountability are consistent with Transparency International's (2025) assessment of Nigeria's persistent governance challenges, particularly at the sub-national level where institutional capacity and political will often lag behind federal structures.

The skewness and kurtosis values for all variables fell within the acceptable range of ±1.0, indicating approximate normal distribution and satisfying the parametric assumptions for subsequent inferential analyses. This distributional property is essential for the validity of ANOVA and regression analyses employed in this study.

Correlation Analysis

Table 4: Pearson Correlation Matrix

	Digital Forensics	**Digital Surveillance**	**Transparency**	**Accountability**
Digital Forensics	1.00			
Digital Surveillance	0.58**	1.00		
Transparency	0.38**	0.31**	1.00	
Accountability	0.28**	0.44**	0.53**	1.00

**Note: ** p < 0.01 (two-tailed)

Source: *Author's Computation using SPSS*

Digital Forensics and Digital Surveillance were moderately to strongly correlated ($r = 0.58$, $p < 0.01$), suggesting conceptual overlap between these constructs, consistent with Casey's (2011) observation that both techniques share common technological foundations in digital evidence examination. Digital Forensics showed a moderate positive correlation with Transparency ($r = 0.38$, $p < 0.01$) and a weaker but significant correlation with Accountability ($r = 0.28$, $p < 0.01$). Digital Surveillance demonstrated moderate positive correlations with both Transparency ($r = 0.31$, $p < 0.01$) and Accountability ($r = 0.44$, $p < 0.01$). The strongest correlation emerged between Transparency and Accountability ($r = 0.53$, $p < 0.01$). This correlation patterns partially conform to the theoretical expectations derived from Agency Theory (Jensen & Meckling, 1976) and the Fraud Box Key Model (Okoye & Onodi, 2014). The positive correlations between forensic techniques and governance outcomes support the

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proposition that digital forensic capabilities serve as governance mechanisms that reduce information asymmetry and enhance oversight effectiveness.

Institutional Differences: One-Way ANOVA

Table 5: Descriptive Statistics by Institution

Institution	Variable	N	Mean	SD	Min	Max
Abia State Audit	Digital Forensics	48	3.84	0.67	2.1	5.0
	Digital Surveillance	48	3.48	0.70	1.9	5.0
	Transparency	48	3.35	0.75	1.8	4.7
	Accountability	48	3.29	0.77	1.5	4.6
House of Assembly	Digital Forensics	38	3.59	0.82	1.0	5.0
	Digital Surveillance	38	3.42	0.91	1.0	4.7
	Transparency	38	3.17	0.86	1.0	5.0
	Accountability	38	3.30	0.88	1.0	5.0
Ministry of Finance	Digital Forensics	22	3.69	0.93	2.2	5.0
	Digital Surveillance	22	3.53	0.84	2.1	5.0
	Transparency	22	3.13	1.00	1.0	4.9
	Accountability	22	3.12	0.80	1.3	4.6

Source: *Author's Computation using SPSS*

Table 6 One-Way ANOVA Results - Institutional Differences

Variable	F-statistic	Df	p-value	Significance	η^2	Effect Size
Digital Forensics	1.09	(2, 105)	0.341	Not Significant	0.020	Small
Digital Surveillance	0.14	(2, 105)	0.874	Not Significant	0.003	Small
Transparency	0.73	(2, 105)	0.483	Not Significant	0.014	Small

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Volume 7, Number 2, August 2026, pp. 85 – 107.
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Variable	F-statistic	Df	p-value	Significance	η^2	Effect Size
Accountability	0.41	(2, 105)	0.664	Not Significant	0.008	Small

Source: *Author's Computation using SPSS*

Table 7: Tests of ANOVA Assumptions

Variable	Levene's Test (F)	Levene's p	Normality (Shapiro-Wilk)	Decision
Digital Forensics	3.373	0.038*	W = 0.970-0.985	Homogeneity violated; ANOVA robust
Digital Surveillance	1.041	0.357	W = 0.949-0.984	Assumptions met
Transparency	0.679	0.510	W = 0.976-0.985	Assumptions met
Accountability	0.157	0.855	W = 0.967-0.985	Assumptions met

*Note: *$p < 0.05$. According to Field (2018), ANOVA remains robust to minor violations of homogeneity when group sizes are relatively equal, though the Welch statistic could be considered as an alternative.*

Source: *Author's Computation using SPSS*

The ANOVA results revealed no statistically significant differences across institutions for any of the four variables. The effect sizes, as measured by eta-squared, were all small ($\eta^2 < 0.06$) according to Cohen's (1988) conventions, indicating that institutional affiliation explained less than 2% of the variance in any of the study variables. The study is consistent to Okoye, Nwoye, Akuchi & Onyema (2020) the absence of significant institutional differences supports their observation that the adoption of forensic techniques in Nigerian public sector institutions is often driven by federal policy directives rather than institutional initiative, resulting in relatively uniform implementation patterns across state-level agencies. Okoye et al. (2020) their study on Anambra State's Ministry of Finance found similar patterns, where institutional type was less predictive of forensic technique adoption than individual professional exposure and training opportunities. Onyemachi, Asante, and Olajide (2024) they described what can be termed "systemic uniformity in institutional weakness" the tendency for Nigerian public sector agencies to exhibit similar capacity constraints regardless of their constitutional functions. In this context, the Abia State Audit, House of Assembly, and Ministry of Finance may face comparable challenges regarding digital infrastructure, skilled personnel, and

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funding for forensic technology. Shodeinde et al. (2024) the modest mean scores across all variables (ranging from 3.24 to 3.72 on a 5-point scale) support their argument that forensic accounting techniques remain underutilized in Nigeria's public sector due to inadequate legal frameworks, limited technological infrastructure, and insufficient political will.

Implications for Theory and Practice

From a theoretical standpoint, the homogeneity of institutional perceptions challenges the assumption that organizational mission significantly influences forensic technique adoption. This suggests that future applications of the Fraud Box Key Model in Nigerian public sector contexts should emphasize systemic governance factors over institutional-specific characteristics. From a practical perspective, the absence of institutional differences implies that uniform capacity-building interventions across all three institutions may be more effective than differentiated approaches. As Ojelabi (2024) recommended, government-wide training programs and standardized digital forensic infrastructure may yield greater governance improvements than institution-specific initiatives, particularly in resource-constrained state-level contexts like Abia State.

Regression Analysis

Table 8: Regression Results

Variable	Model 1 (Transparency)		Model 2 (Accountability)	
	Block 1	**Block 2**	**Block 1**	**Block 2**
Controls				
Institution (Audit = ref)				
House of Assembly	-0.12	-0.08	-0.15	-0.11
Ministry of Finance	-0.21*	-0.14	-0.18	-0.09
Experience	0.08	0.06	0.11	0.09
Education	0.14	0.10	0.12	0.08
Independent variables				
Digital forensics		0.31**		0.22*
Digital surveillance		0.14		0.26*
R^2	0.08	0.31	0.07	0.28
Adjusted R^2	0.04	0.26	0.03	0.23
ΔR^2		0.23**		0.21**
F-statistic	2.14	5.82**	1.89	5.14**
Durbin-Watson		1.88		1.92
VIF (max)		1.68		1.68

*p < 0.05, **p < 0.01

Source: *Author's Computation using SPSS*

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Model 1 (Transparency): Control variables explain 8% of variance ($R^2 = 0.08$, ns). Adding forensic techniques significantly improves prediction ($\Delta R^2 = 0.23$, $p < 0.01$), with digital forensics showing significant unique contribution ($\beta = 0.31$, $p < 0.01$) while digital surveillance does not ($\beta = 0.14$, ns). The full model explains 31% of variance (adjusted $R^2 = 0.26$).

Model 2 (Accountability): Similar pattern with controls explaining 7% of variance. Forensic techniques add significant explanatory power ($\Delta R^2 = 0.21$, $p < 0.01$). However, the pattern reverses: digital surveillance shows significant association ($\beta = 0.26$, $p < 0.05$) while digital forensics shows weaker association ($\beta = 0.22$, $p < 0.05$). Full model explains 28% of variance (adjusted $R^2 = 0.23$). Durbin-Watson statistics (1.88, 1.92) indicate no autocorrelation. Maximum VIF (1.68) confirms multicollinearity is not problematic. Residual plots showed acceptable homoscedasticity.

Hypotheses Testing

Hypothesis One

H_{o_1}: Digital forensics techniques do not significantly relate to transparency in public financial management.

H_{i_1}: Digital forensics techniques significantly relate to transparency in public financial management.

Decision: Deducing from table 8, we rejected the null hypothesis and this means that digital forensics shows significant positive association with transparency ($\beta = 0.31$, $p < 0.01$) after controlling for institutional and demographic factors.

Hypothesis Two

H_{o_2}: Digital surveillance techniques do not significantly relate to accountability in the public sector.

H_{i_2}: Digital surveillance techniques significantly relate to accountability in the public sector.

Decision: Deducing from table 8, we rejected the null hypothesis and this means that digital surveillance shows significant positive association with accountability ($\beta = 0.26$, $p < 0.05$), though the effect size is modest.

Discussions

The findings suggest differential effects of forensic techniques on governance outcomes. Digital forensics focused on examination of financial records and electronic evidence more strongly relates to transparency, likely by improving information quality and accessibility. Digital surveillance emphasizing monitoring and detection more strongly relates to accountability, presumably through deterrence and identification of misconduct. Forensic techniques explain approximately 23–26% of variance in governance outcomes after controls. This indicates that 74–77% of variance derives from other factors institutional culture, political will, legal frameworks, resource availability not captured in this study. Forensic techniques are contributors, not determinants, of governance quality. The significant associations cannot establish causality. Reverse causality is plausible: institutions with stronger transparency norms may invest more in forensic technologies. Alternatively, unmeasured third variables (e.g., organizational leadership quality) may drive both forensic technique adoption and governance outcomes.

The study measures staff perceptions rather than objective forensic technique implementation or documented governance outcomes. Perceptions may reflect organizational rhetoric more than operational reality. Future research should incorporate objective indicators such as audit query resolution rates, conviction rates, or forensic investigation outcomes. The significant institutional differences in digital forensics perceptions suggest that organizational mission influences technique relevance. Audit institutions may have greater forensic infrastructure, while legislative and executive bodies face different constraints.

CONCLUSION AND RECOMMENDATIONS

This study examined relationships between forensic investigation techniques and public sector governance outcomes in Abia State, Nigeria. The findings indicate that digital forensics and digital surveillance techniques show significant, positive associations with transparency and accountability respectively, though effect sizes are modest. Digital forensics explains unique variance in transparency beyond digital surveillance, while the reverse holds for accountability.

The following recommendations were made:

1. Government should prioritize digital forensic capacity in audit institutions where effects on transparency are strongest, before expanding to other agencies. This includes training existing staff rather than wholesale technology procurement.

2. Digital surveillance systems should be designed with clear accountability objectives documentation of decision trails, access logging rather than generalized monitoring that may create resistance without governance benefits.

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