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Internal control systems as a mediator between forensic accounting skills and fraud likelihood: Evidence from Nigerian government enterprises

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ABSTRACT

Fraud and corruption continue to impede the effectiveness of Nigeria's Federal Government-Owned Enterprises (FGOEs), which manage strategic public resources but often operate under weak oversight and governance challenges. Strengthening fraud prevention in these entities requires both capability development and system-level reforms. This study examines whether internal control systems (ICS) mediate the relationship between forensic accounting skills (FAS) and fraud likelihood (FL) in Nigerian FGOEs. Grounded in the Resource-Based View, Fraud Diamond Theory, and Agency Theory, the analysis investigates how forensic expertise and control mechanisms jointly mitigate misconduct risks. Data were collected from 256 finance, accounting, and internal audit personnel across 33 enterprises and analyzed using covariance-based structural equation modeling (CB-SEM). The results show that stronger forensic accounting skills are associated with more robust internal controls and lower fraud likelihood. Mediation analysis further reveals that ICS partially transmit the effect of FAS to fraud outcomes. The presence of a dedicated forensic unit demonstrates only a weak association with fraud likelihood after accounting for FAS and ICS. The study extends public-sector fraud literature by demonstrating the central role of internal control systems and underscores the need for capability building aligned with COSO-consistent control frameworks.

Contribution/ Originality: This study offers new insights by empirically examining how forensic accounting skills and internal control systems jointly influence the likelihood of fraud in public enterprises. It uniquely integrates governance and forensic accounting perspectives using Covariance-Based Structural Equation Modeling (CB-SEM), emphasizing institutional control mechanisms as critical drivers of fraud prevention across African and Asian contexts.

1. INTRODUCTION

Fraud and corruption remain pervasive challenges within the Nigerian public sector, costing billions of naira annually and steadily eroding public trust in governance institutions (Manjo, 2023; Ojewunmi, 2025; Okoye, Okafor, & Ojimba, 2024). Scholars consistently identify fraud as the most significant barrier to institutional integrity across both public and private sectors (Boateng, Wang, Ntim, & Elmagrhi, 2024; Vutumu, Aregbeyen, & Akinteye, 2024; Wu, 2005). Common forms include inflated procurement contracts, fictitious personnel records, diversion of

internally generated revenue, and project abandonment (Alonge, 2023; Kuwali, 2024). These malpractices undermine organizational performance, weaken accountability, and compromise national development goals, especially in environments where internal controls are weak and cultures of impunity prevail (De Oliveira, Imoniana, Slomski, Reginato, & Slomski, 2022; Manyika & Marima, 2024).

In response, the Nigerian government has introduced reforms to strengthen accountability. Legal and institutional measures include the establishment of the Economic and Financial Crimes Commission (Economic and Financial Crimes Commission (Establishment) Act, 2004), the Independent Corrupt Practices Commission (Corrupt Practices and Other Related Offences Act, 2000), and the Whistleblower Protection Act (2017). However, implementation challenges have limited the effectiveness of the whistleblowing framework (Ezeoha, Akinyoade, Ehrhardt, & Uche, 2025). Complementary reforms have focused on technology and systems, such as automated payment platforms, International Public Sector Accounting Standards (IPSAS) (Central Bank of Nigeria, 2016; Office of the Accountant-General of the Federation, 2015), the Treasury Single Account (TSA), the Integrated Personnel and Payroll Information System (IPPIS), and the Government Integrated Financial Management Information System (GIFMIS). Collectively, these initiatives have enhanced transparency and monitoring; however, fraud remains entrenched within public sector institutions, including semi-autonomous Federal Government-Owned Enterprises (FGOEs).

FGOEs manage strategic national assets but remain vulnerable to procurement irregularities, payroll manipulation, and revenue diversion (Azegbeobo, Onowu, & Ajah, 2025; Ibrahim, 2022). Their autonomy, weak external monitoring, and politicized appointments increase exposure to financial misconduct (Azoro, Onah, & Agulefo, 2021). Strengthening accountability within these enterprises has thus become central to Nigeria's anti-corruption reforms and aligns with broader governance modernization efforts across Africa and Asia, where state-owned enterprises similarly struggle with oversight and performance integrity (Ayee, 2023; Park, 2021). In both regions, reform momentum increasingly favors evidence-based internal control frameworks and forensic auditing tools that integrate technology, risk management, and ethical accountability.

Forensic accounting has gained prominence as a multidisciplinary approach that combines investigative, auditing, and legal techniques to detect and prevent complex financial crimes (Afriyie et al., 2023; Đukić, Pavlović, & Grdinić, 2023). Internal control systems (ICS), structured around the COSO framework, provide preventive assurance by identifying and mitigating fraud risks before they occur (Espinosa-Jaramillo, 2024; Mohammed, Al-Abedi, Flayyih, & Mohaisen, 2021). However, their effectiveness depends on institutional capacity, managerial accountability, and the extent to which forensic expertise is embedded within control processes (Alzoubi, 2025; Barzinji, Yusoff, Rosbi, Salleh, & Abdullah, 2022).

Previous studies have examined forensic accounting and internal controls independently across sectors such as banking, insurance, and local government (Eghe-Ikhurhe, Roni, & Bonsu, 2024; Nuhu, Umar, & Zannah, 2025; Oladejo, Oyelami, & Abey, 2024). However, limited research explores their combined influence within Federal Government-Owned Enterprises (FGOEs). This study investigates the mediating role of internal control systems in the relationship between forensic accounting skills and the likelihood of fraud in Nigerian FGOEs. Grounded in the Fraud Diamond Theory, which emphasizes capability and opportunity as key conditions for fraudulent behavior (Wolfe & Hermanson, 2004), and Agency Theory, which links fraud to misaligned incentives in principal–agent relationships (Jensen & Meckling, 1976), the study contributes to comparative governance literature by situating African public-sector experiences within global and Asian reform contexts. It advances understanding of how professional capacity-building and institutional design can jointly promote integrity and accountability in public enterprises across emerging economies.

The remainder of the paper is organized as follows: Section 2 presents the literature review, covering conceptual clarifications (2.1), the theoretical framework (2.2), and an empirical review with hypothesis development (2.3). Section 3 outlines the methodology. Section 4 discusses the results, including descriptive statistics (4.1), the

correlation matrix (4.2), and regression results (4.3). Section 5 concludes the paper with key findings, recommendations, and directions for future research.

2. LITERATURE REVIEW

2.1. Conceptual Clarifications

Forensic accounting skills encompass the necessary competencies required to detect, investigate, and prevent fraud. Guellim et al. (2024) and Ibrahim and Maijama'a (2022) stated that these competencies include a multidisciplinary mix of accounting principles, auditing procedures, legal frameworks, data analytics, and digital forensics. According to Đukić et al. (2023), forensic accountants play a critical role in uncovering irregularities often concealed through sophisticated fraud schemes. In the Nigerian public sector context, forensic accounting serves both preventive and investigative purposes. Recent studies by Ogunleye and Ogunleye (2023) and Abdulrahman, Mohammed, and Ishaq (2023) show that possessing forensic accounting skills strongly correlates with effective fraud detection and successful prosecution, especially within government institutions and state-owned enterprises.

Internal control systems (ICS) complement forensic expertise by promoting accountability, financial integrity, and efficiency across organizations. Drawing from the COSO framework, ICS comprise the control environment, risk assessment, control activities, information and communication, and monitoring each reinforcing sound governance. Odunko (2022), Ong'onge and Okiro (2024), and Simon and Mohammed (2022) show that effective controls enhance performance by aligning managerial actions with organizational goals. Jarah, Zaqeeba, Al-Jarrah, Al Badarin, and Almatarneh (2023) find that ICS mediate the link between governance quality and organizational effectiveness through stronger accounting information systems. While Hoai, Hung, and Nguyen (2022) caution that overly rigid controls can stifle innovation, they also note that adaptive systems balance compliance with flexibility. In Nigeria, Mgbame, Aigienohuwa, and Akintoye (2021) highlight the synergy between ICS and forensic accounting in preventing fraud, though Omodero and Ogbonnaya (2023) observe that weak implementation at subnational levels still undermines accountability and financial discipline.

Building on the effectiveness of internal controls and forensic accounting capacity, the concept of fraud likelihood has become central to both research and practice. It represents the perceived or actual probability of fraudulent activity within an organization (Cressey, 1953; Jones, 2010; Wolfe & Hermanson, 2004). The construct includes subjective judgments, such as auditor or management assessments, and objective indicators, such as control weaknesses or irregular transactions (American Institute of Certified Public Accountants, 2002). According to COSO (2013), assessing fraud risk involves recognizing potential fraud types and understanding the incentives, opportunities, and rationalizations that drive them. The Fraud Diamond Theory extends this by introducing a fourth element, capability, which emphasizes that misconduct often depends not only on motive and opportunity but also on an individual's ability to exploit weaknesses in control systems.

2.1.1. Conceptual Diagram

Forensic accounting skills (FAS) and internal control systems (ICS) are modeled as distinct but complementary mechanisms for reducing fraud risk in Nigerian Federal Government-Owned Enterprises. Fraud likelihood (FL) is the endogenous outcome, representing the perceived probability that fraudulent activity may occur within the organization. The structural relationships suggest that FAS enhances ICS, and both FAS and ICS have direct effects on FL. Consequently, ICS functions as a mediating mechanism through which part of the influence of FAS is transmitted to FL.

To align the conceptual and empirical models, a single observed control variable, the presence of a forensic unit (funit), is retained and specified as a manifest predictor of FL. This variable captures the contribution of formal institutionalization of forensic work beyond individual skills and routine controls. Figure 1 illustrates the reflective measurement blocks for each latent construct (FAS: fas1–fas5; ICS: ics1–ics4; FL: fl1–fl5) and the structural paths

FAS → ICS, FAS → FL, ICS → FL, and funit → FL. These elements collectively form the basis for the subsequent CFA and SEM analyses.

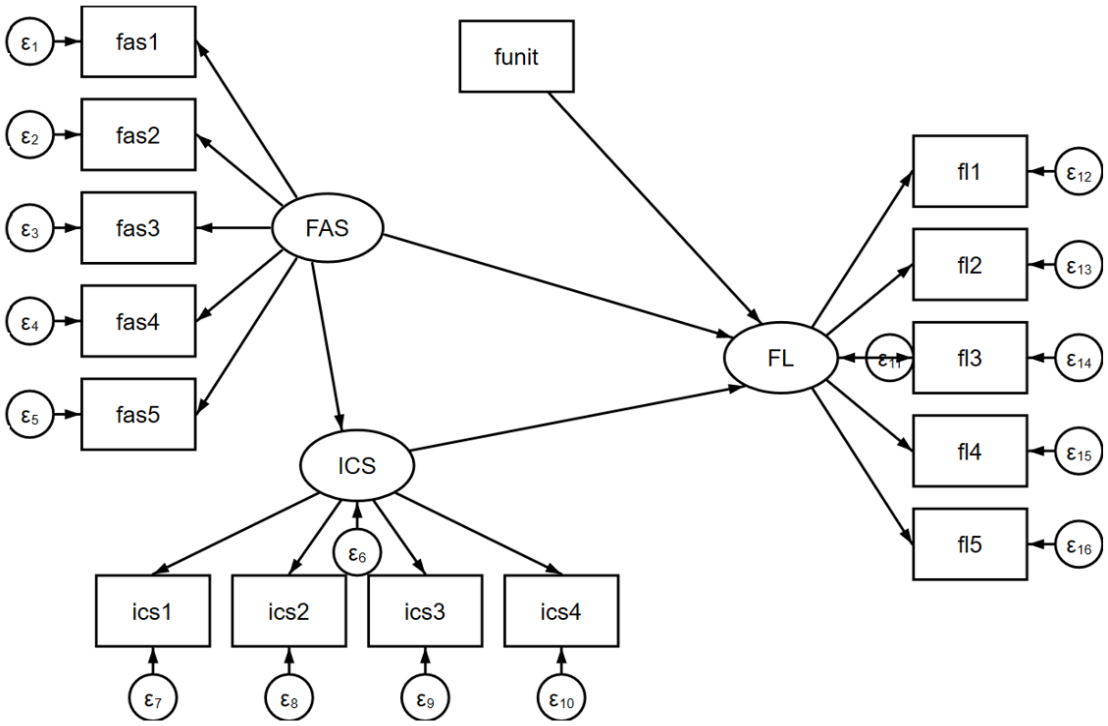

Figure 1. Conceptual model of the relationships among forensic accounting skills, internal control systems, and fraud likelihood.

Note: FAS (Forensic Accounting Skills)
fas1 = Staff trained in forensic investigation techniques
fas2 = Professionals with forensic accounting certifications
fas3 = Staff proficient in forensic tools (e.g., data mining software)
fas4 = Ability to detect manipulation in financial statements
fas5 = Forensic accounting considered essential in audit function
ICS (Internal Control Systems)
ics1 = Control environment promotes ethical behavior
ics2 = Existence of formal risk assessment procedures
ics3 = Enforcement of control activities (e.g., segregation of duties)
ics4 = Regular monitoring and evaluation of controls
FL (Fraud Likelihood)
fl1 = Significant likelihood of fraud occurring
fl2 = High likelihood fraud remains undetected
fl3 = Susceptibility of processes to employee fraud
fl4 = Past experiences of fraud-related losses
fl5 = Risk of fraud from loopholes/weak governance
Funit (Forensic Unit)
= Existence of a dedicated forensic accounting unit

2.2. Theoretical Framework

This study is grounded in three theoretical perspectives that collectively provide insights into fraud prevention within public sector institutions: the Fraud Diamond Theory, Agency Theory, and the Resource-Based View (RBV) of the firm. Together, these frameworks offer a valuable basis for understanding how forensic accounting skills and internal control systems, both individually and in combination, help reduce the risk of fraud within Nigeria's Federal Government-Owned Enterprises.

The Fraud Diamond Theory, proposed by Wolfe and Hermanson (2004), builds upon the traditional Fraud Triangle by identifying four essential conditions that enable fraud: pressure, opportunity, rationalization, and capability. While the earlier model emphasized motivation, justification, and access, the addition of capability highlights the importance of technical expertise, confidence, and positional authority in executing and concealing fraudulent activities. Forensic accounting skills directly address this dimension by equipping professionals with investigative, analytical, and legal competencies required to uncover and prevent fraudulent behavior. Simultaneously, effective internal control systems reduce opportunities for fraud through continuous monitoring,

clear access controls, and strict compliance measures. When these two mechanisms operate together, they limit the conditions that allow fraud to thrive and enhance organizational resilience against misconduct.

Agency Theory, articulated by Jensen and Meckling (1976), provides an additional perspective for understanding fraud risk within Federal Government-Owned Enterprises (FGOEs). It views organizations as a network of principal–agent relationships, where authority is delegated by the principal to the agent. In public institutions, the government or citizens act as principals, while managers and bureaucrats serve as agents. Information asymmetry and misaligned incentives can lead agents to act in their self-interest, sometimes resulting in fraud or financial mismanagement. Forensic auditing and robust internal control frameworks act as institutional safeguards that help mitigate these agency problems. By enhancing transparency, promoting accountability, and reducing the information gap between managers and stakeholders, these mechanisms align agent behavior with the broader public interest and organizational objectives.

The Resource-Based View (RBV) of the firm, articulated by Barney (1991), introduces a strategic perspective by positing that organizations derive sustainable advantages from internal resources that are valuable, rare, inimitable, and effectively organized. In this study, both forensic accounting expertise and a well-structured internal control system are treated as critical intangible resources that enhance organizational capacity to detect and prevent fraud. These capabilities strengthen operational effectiveness, regulatory compliance, and institutional credibility. Within public sector enterprises, such resources also support policy implementation and bolster public confidence in governance.

Collectively, these theoretical perspectives provide a multidimensional understanding of fraud control. The Fraud Diamond Theory identifies the behavioral and environmental conditions that precipitate fraud, Agency Theory explains the governance architecture that mitigates managerial excesses, and the Resource-Based View (RBV) highlights the strategic value of building fraud-resilient institutions. Within Nigerian Federal Government-Owned Enterprises (FGOEs), the integration of forensic skills and internal control systems emerges as a rational and evidence-based approach for enhancing financial discipline and reducing the risk of fraud.

2.3. Empirical Review and Hypothesis Development

This section synthesizes prior empirical evidence on the interplay between forensic accounting skills, internal control systems, and the likelihood of fraud within public sector institutions across emerging economies, particularly Nigeria. The present study adopts a perception-based approach, drawing on the informed assessments of employees in Federal Government-Owned Enterprises.

2.3.1. Forensic Accounting Skill (FAS) and Fraud Likelihood (FL)

Forensic accounting skills are increasingly recognized as a vital mechanism for fraud detection and prevention, especially in public institutions where oversight systems are often weak or compromised. Empirical evidence indicates that forensic accountants in Nigeria's public sector demonstrate superior investigative competence, professional judgment, and effectiveness in fraud detection compared to traditional auditors (Popoola, Che-Ahmad, & Samsudin, 2014). Similar findings have been reported in Ghana, where forensic accounting significantly enhances the fight against financial crimes (Ocansey, 2017), and in Nigeria's Kogi State, where it serves as an indispensable tool for detecting and preventing fraud (Okoye & Gbegi, 2013). Recent studies highlight the importance of complementary competencies such as communication ability, psychosocial intelligence, and auditing expertise, which improve fraud detection confidence (Al Natour, Al-Mawali, Zaidan, & Said, 2025). Behavioral awareness and interpersonal skills strengthen detection processes (Fadilah, Maemunah, Nurrahmawati, Lim, & Sundary, 2019), while analytical reasoning and systems proficiency enable anomaly identification in complex settings (Ubesie, Nnaji, & Okafor, 2023). Nuhu et al. (2025) emphasized the relevance of forensic auditing and anomaly detection in high-risk operations such as procurement and payroll, whereas Sahdan, Cowton, and Drake (2021) noted that limited institutional capacity

continues to hinder the full utilization of forensic accounting. Capraş and Achim (2023) further observed that the effectiveness of forensic practice largely depends on sustained professional training and organizational commitment to anti-fraud strategies. These insights align with the Fraud Diamond Theory (Wolfe & Hermanson, 2004), which posits that fraud occurs when pressure, opportunity, rationalization, and capability coincide, and with Agency Theory (Jensen & Meckling, 1976), which explains how misaligned incentives enable managerial opportunism. Forensic accounting skills directly mitigate these vulnerabilities by reducing opportunities, constraining capabilities, and enhancing transparency between principals and agents.

Based on this evidence, the following hypothesis is proposed.

H_1: There is a significant negative relationship between forensic accounting skills and the likelihood of fraud in Federal Government-Owned Enterprises in Nigeria.

2.3.2. Internal Control Systems (ICS) and Fraud Likelihood (FL)

Internal Control Systems (ICS), as conceptualized by the COSO (2022) framework, play a vital role in reducing the likelihood of fraud (FL) through components such as the control environment (CE), risk assessment (RA), control activities (CA), and top management compliance (TMC). While empirical literature often evaluates individual components of ICS, this study examines the overall effect of internal control systems as a composite construct, consistent with how these systems are operationalized within institutional frameworks, particularly in Federal Government-Owned Enterprises (FGOEs).

The control environment significantly reduces fraud likelihood when it fosters ethical leadership and well-defined job roles (Solomon, Emmanuel, Ajibade, & Emmanuel, 2023; Zeinaba, Adebisi, Sani, & Akoje, 2024). However, some regional studies, such as Salawu, Oyewobi, and Adejumo (2023), found its influence to be statistically insignificant, highlighting contextual differences in leadership commitment and policy enforcement. Risk assessment proved significant in Zeinaba et al. (2024), where documented fraud vulnerabilities corresponded with lower fraud likelihood. Conversely, Solomon et al. (2023) found no significant relationship, attributing the absence of effect to weak risk registers and inadequate assessment practices. While control activities such as segregation of duties and approval procedures were shown to reduce fraud likelihood (Solomon et al., 2023; Zeinaba et al., 2024), observed otherwise, suggesting deficiencies in implementation rather than design. These inconsistencies highlight a persistent gap between the formal structure of controls and their practical enforcement. Moreover, top management compliance was consistently insignificant across studies despite moderate self-reported adherence (Zeinaba et al., 2024), reinforcing the view that symbolic commitment without active enforcement offers little real protection against fraud.

Empirical evidence consistently affirms the fraud-reducing influence of internal control systems. Adebayo, Alaran-Ajape, and Ojelabi (2021) found that effective controls significantly limit both the occurrence and severity of fraud in Nigerian public institutions, with strong monitoring and internal audit oversight linked to fewer incidents. Similarly, Ariyo-Edu (2024) reported that well-implemented control systems enhance fraud deterrence in North Central Nigeria by strengthening asset protection, segregation of duties, approval procedures, and ethical supervision. The study also linked robust controls to improved whistleblowing, accountability, and managerial integrity. Supporting this, Vutumu et al. (2024) examined 43 federal ministries, departments, and agencies (MDAs) and found that information and communication, monitoring, and risk assessment were key deterrents to fraud, whereas control activities showed a negative and control environment an insignificant influence. Correspondingly, Salawu et al. (2023) observed that control activities, information sharing, monitoring, and risk management significantly improved fraud prevention in selected South-Western Nigerian states.

Drawing on the reviewed literature that consistently highlights the protective role of internal control systems in mitigating fraud, the following hypothesis is proposed:

H_2: There is a significant negative relationship between internal control systems and the likelihood of fraud in Federal Government-Owned Enterprises in Nigeria.

2.3.3. Forensic Accounting Skill (FAS), Internal Control Systems (ICS) and Fraud Likelihood (FL)

Empirical studies increasingly affirm that forensic accounting skills enhance the effectiveness of internal control systems, which are vital for mitigating fraud risk. In Nigeria, Okoye and Gbegi (2013) demonstrated that integrating forensic accounting into public institutions strengthens monitoring, oversight, and control processes, thereby reducing opportunities for fraud. Alzoubi (2025) similarly found that combining forensic expertise with sound governance structures significantly improves control effectiveness, while Wahyuandari (2025) reported that forensic auditing not only detects fraud ex post but also supports preventive controls that deter misconduct. Together, these studies highlight the capacity of forensic accounting to provide advanced investigative and risk assessment tools that reinforce internal controls against irregularities. This evidence aligns with the Fraud Diamond Theory (Wolfe & Hermanson, 2004), which links reduced opportunity and capability to lower fraud risk, and with Agency Theory (Jensen & Meckling, 1976), which emphasizes monitoring to limit managerial opportunism. Thus, by strengthening institutional oversight and compliance, forensic accounting skills indirectly lower the likelihood of fraud. Based on this synthesis, the following hypothesis is proposed.

H_3: Internal control systems significantly mediate the relationship between forensic accounting skills and the likelihood of fraud in Federal Government-Owned Enterprises in Nigeria.

3. METHODOLOGY

This study adopts a quantitative, cross-sectional research design to examine the mediating effect of Internal Control Systems (ICS) on the relationship between Forensic Accounting Skills (FAS) and Fraud Likelihood (FL) in Federal Government-Owned Enterprises (FGOEs) in Nigeria. The design is appropriate for theory testing, model estimation, and generalizing results across institutions. Covariance-Based Structural Equation Modeling (CB-SEM) was employed due to its robustness in simultaneously estimating measurement and structural relationships among latent constructs (Hair, Black, Babin, & Anderson, 2013).

Data were obtained from 256 valid responses out of 350 questionnaires distributed, resulting in a response rate of 73.1%. The respondents included accounting officers, internal auditors, and finance managers who are directly involved in fraud detection and prevention. All constructs were operationalized as reflective measures using a five-point Likert scale. The presence of a forensic unit (funit) was included as a control variable, coded as 1 when such a unit existed and 0 otherwise.

Procedural and statistical remedies were implemented to mitigate potential biases. Common Method Bias (CMB) was addressed through respondent anonymity and the procedural separation of questions. Harman's one-factor test indicated that the first factor accounted for less than 50% of the total variance, and all Variance Inflation Factors (VIFs) were below 5, confirming that CMB was not a significant concern (Nasiri, Saunila, Rantala, & Ukko, 2022). Non-response bias (NRB) was examined by comparing early and late responses using independent-sample t-tests, which revealed no significant differences ($p > 0.05$), suggesting that NRB was unlikely to influence the results (Yao, Ye, Yang, Shi, & Zheng, 2021).

All statistical analyses were performed using Stata version 19.5. The analysis proceeded in two major stages. In the first stage, Confirmatory Factor Analysis (CFA) was conducted to evaluate the measurement model. Construct reliability and validity were assessed using Cronbach's alpha, Composite Reliability (CR), Average Variance Extracted (AVE), and discriminant validity via the Fornell–Larcker criterion (Fornell & Larcker, 1981). In the second stage, the structural model was estimated using the maximum likelihood method to test the hypothesized direct and indirect relationships. Model fit was evaluated using multiple indices χ^2, Comparative Fit Index (CFI), Tucker–Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA), and Standardized Root Mean Square Residual (SRMR) consistent with established thresholds (Hu & Bentler, 1999).

To ensure statistical robustness and transparency, bias-corrected bootstrapping with 5,000 replications was employed to derive standard errors and 95% confidence intervals for the direct, indirect, and total effects. The indirect

(mediated) effect was computed as the product of the coefficients for the FAS → ICS and ICS → FL paths, while standardized estimates were derived using estat teffects, standardized. The mediation model was formally expressed as:

$$ICS = \alpha_0 + \alpha_1 FAS + \nu$$

$$FL = \beta_0 + \beta_1 ICS + \beta_2 FAS + \gamma funit + \zeta$$

Where:

ICS = Internal Control Systems (Latent construct).

FAS = Forensic Accounting Skills (Latent construct).

FL = Fraud Likelihood (Latent construct).

funit = Binary control variable (1 = presence of forensic unit; 0 = absence).

α_1, β_1, β_2, and γ = Structural path coefficients.

ν and ζ = Disturbance/error terms.

The indirect, direct, and total effects of FAS on FL were estimated simultaneously, with mediation defined as $\text{Indirect} = \alpha_1 \times \beta_1$ and $\text{Total} = \beta_2 + (\alpha_1 \times \beta_1)$. Statistical significance was evaluated at the 1%, 5%, and 10% levels.

4. RESULTS AND DISCUSSION

4.1. Descriptive Statistics

Table 1 presents the descriptive statistics of the study variables, including measures of central tendency and dispersion. The Forensic Accounting Skill (FAS) items (fas1–fas5) recorded mean scores ranging from 2.94 to 2.99, with standard deviations around 1.40, indicating moderate agreement among respondents and some variability in perceptions of forensic accounting competence.

Table 1. Descriptive statistics.

Variable	Obs.	Mean	Std. dev.	Min.	Max.
fas1	256	2.938	1.399	1	5
fas2	256	2.992	1.420	1	5
fas3	256	2.949	1.409	1	5
fas4	256	2.949	1.415	1	5
fas5	256	2.949	1.398	1	5
ics1	256	3.066	1.425	1	5
ics2	256	3.047	1.433	1	5
ics3	256	3.031	1.411	1	5
ics4	256	2.969	1.400	1	5
fl1	256	2.992	1.420	1	5
fl2	256	2.988	1.424	1	5
fl3	256	2.988	1.416	1	5
fl4	256	2.973	1.437	1	5
fl5	256	2.957	1.398	1	5
funit	256	1.578	0.495	1	2

Internal Control System (ICS) items (ics1–ics4) displayed slightly higher mean values, ranging from 2.97 to 3.07, with standard deviations of approximately 1.40, indicating a similar degree of variability. These results suggest that respondents generally recognized the presence of internal control practices, although the intensity of these practices varied across institutions. Fraud Likelihood (FL) items (fl1–fl5) showed mean values between 2.96 and 2.99, with standard deviations also clustering around 1.40, implying that the perceived risk of fraud within Federal Government-Owned Enterprises (FGOEs) was moderate. The binary variable representing the existence of forensic units (funit) had a mean of 1.58 (SD = 0.50), indicating that approximately 58% of the surveyed organizations reported the presence of a forensic unit, while 42% did not. Overall, the descriptive results suggest moderate levels of forensic

accounting skills, internal control systems, and fraud likelihood across the surveyed organizations, providing a foundation for further correlation and structural analysis.

4.2. Measurement Model Assessment

The measurement model was evaluated through confirmatory factor analysis (CFA) to assess reliability and validity. Internal consistency was satisfactory, with Cronbach's alpha values exceeding the 0.70 benchmark for all reflective constructs (FAS = 0.86, ICS = 0.79, FL = 0.76), indicating acceptable internal reliability (Nunnally & Bernstein, 1994). Composite reliability (CR) values also surpassed the 0.70 threshold (FAS = 0.848, ICS = 0.792, FL = 0.768), confirming convergent validity at the construct level (Hair et al., 2013). Standardized factor loadings were all significant, ranging from 0.55 to 0.80, demonstrating that each indicator contributed meaningfully to its latent construct. Model fit indices demonstrated excellent overall fit: $\chi^2(74) = 72.84$, $p = 0.516$; Comparative Fit Index (CFI) = 1.000; Tucker-Lewis Index (TLI) = 1.000; Root Mean Square Error of Approximation (RMSEA) approximately 0.000; Standardized Root Mean Square Residual (SRMR) = 0.043. All these indices meet the recommended thresholds as outlined by Hu & Bentler (1999). The Average Variance Extracted (AVE) was adequate for FAS (0.528) and ICS (0.490), while slightly below 0.50 for FL (0.401). Despite this, the strong loadings and Composite Reliability (CR) values justify retaining all indicators for the sake of theoretical completeness. Discriminant validity was confirmed through both the Fornell–Larcker criterion and the Heterotrait–Monotrait (HTMT) ratio. The square roots of AVE exceeded inter-construct correlations, and HTMT values were below 0.85 (FAS–ICS = 0.29; FAS–FL = 0.41; ICS–FL = 0.36), confirming the distinctiveness of the constructs (Henseler, Ringle, & Sarstedt, 2015). Collectively, these results support the reliability, validity, and adequacy of the measurement model for subsequent structural and mediation analyses.

4.3. Correlation Analysis

Table 2 reports the Pearson correlation coefficients among the observed indicators of Forensic Accounting Skills (FAS), Internal Control Systems (ICS), Fraud Likelihood (FL), and the control variable, forensic unit (funit). The results reveal moderate to strong positive correlations among the FAS indicators (fas1–fas5), ranging from 0.47 to 0.63, indicating good internal consistency. Similarly, the ICS indicators (ics1–ics4) display positive and substantial intercorrelations (r = 0.39–0.57), suggesting that they reflect a coherent construct.

Table 2. Matrix of correlations.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
(1) fas1	1														
(2) fas2	0.593	1.000													
(3) fas3	0.545	0.549	1.000												
(4) fas4	0.626	0.580	0.545	1.000											
(5) fas5	0.504	0.473	0.521	0.482	1.000										
(6) ics1	0.122	0.192	0.103	0.196	0.103	1.000									
(7) ics2	0.116	0.091	0.116	0.131	0.079	0.444	1.000								
(8) ics3	0.11	0.192	0.135	0.174	0.112	0.553	0.471	1.000							
(9) ics4	0.152	0.189	0.095	0.222	0.091	0.467	0.393	0.566	1.000						
(10) fl1	-0.294	-0.377	-0.230	-0.290	-0.193	-0.304	-0.208	-0.342	-0.294	1.000					
(11) fl2	-0.246	-0.309	-0.212	-0.314	-0.115	-0.290	-0.215	-0.222	-0.194	0.440	1.000				
(12) fl3	-0.267	-0.289	-0.215	-0.293	-0.154	-0.291	-0.180	-0.279	-0.293	0.515	0.481	1.000			
(13) fl4	-0.214	-0.332	-0.277	-0.286	-0.189	-0.226	-0.183	-0.222	-0.254	0.345	0.350	0.388	1.000		
(14) fl5	-0.237	-0.274	-0.179	-0.366	-0.185	-0.360	-0.181	-0.333	-0.309	0.381	0.324	0.441	0.261	1.000	
(15) funit	-0.09	-0.029	-0.040	-0.023	-0.068	-0.057	0.033	0.105	0.016	0.116	0.085	0.085	-0.020	0.027	1.000

The FL indicators (fl1–fl5) are positively correlated with one another, with coefficients ranging from 0.26 to 0.52, demonstrating adequate construct coherence. Importantly, the correlations between FAS and ICS indicators are generally low but positive, consistent with the hypothesized directional relationship in the structural model. Conversely, the correlations between FAS and FL indicators, as well as between ICS and FL indicators, are negative, aligning with theoretical expectations that stronger controls and higher forensic accounting skills reduce the likelihood of fraud.

The forensic unit (funit) exhibits only weak correlations with the other variables, the strongest being with ics3 (r = 0.11). This pattern is consistent with its role as a control variable rather than a substantive construct in the model. Overall, the correlation matrix indicates that multicollinearity is not a concern, while also supporting the distinctiveness of the constructs for further CFA and SEM analysis.

4.4. Structural Model and Mediation Analysis

The structural model was estimated using the maximum likelihood method with robust standard errors in *Stata 19.5* to test the hypothesized relationships among Forensic Accounting Skills (FAS), Internal Control Systems (ICS), Fraud Likelihood (FL), and the observed control variable, *funit* (forensic unit). All estimates were derived from the standardized solution to enhance interpretability.

The results, reported in Table 3, demonstrate that forensic accounting skills (FAS) significantly and positively influence internal control systems (ICS) ($\beta = 0.25$, $p = 0.001$). This indicates that stronger forensic skills are associated with more effective internal control structures within organizations. Furthermore, ICS exerts a significant negative effect on fraud likelihood (FL) ($\beta = -0.48$, $p < 0.001$), confirming that robust control systems effectively reduce the risk of fraud. Additionally, the direct path from FAS to FL remains negative and significant ($\beta = -0.41$, $p < 0.001$), suggesting that forensic competencies lower fraud risk both directly and indirectly through improved internal controls. The control variable, *funit*, also shows a small, negative, but statistically marginal association with FL ($\beta = -0.10$, $p = 0.084$), indicating that the mere presence of a forensic unit modestly enhances fraud deterrence. Overall, these findings highlight the importance of forensic skills and internal control systems in mitigating fraud risk within organizations.

Model-fit indices indicate an excellent fit between the hypothesized and observed data: $\chi^2(87) = 86.88$, $p = 0.484$; RMSEA = 0.000 (90% CI = 0.000–0.034, pclose = 0.999); CFI = 1.000; TLI = 1.000; SRMR = 0.043; and the coefficient of determination (CD) = 0.864. These values meet the conventional thresholds for good fit in covariance-based SEM (Hu & Bentler, 1999).

Table 3. Structural equation model results.

Path	Coefficient	Robust SE	z-value	p-value	95% CI (Lower)	95% CI (Upper)
FAS → ICS	0.25	0.071	3.48	0.001	0.108	0.388
ICS → FL	−0.48	0.062	−7.74	0.000	−0.603	−0.360
FAS → FL	−0.41	0.058	−7.14	0.000	−0.526	−0.300
funit → FL	−0.10	0.059	−1.73	0.084	−0.217	0.014

As reported in Table 4, which complements Table 3, the mediation analysis decomposes the effect of forensic accounting skills on fraud likelihood into direct, indirect, and total effects using bias-corrected bootstrapping. The mediation effect was examined using the product-of-coefficients approach and validated through bias-corrected bootstrapping with 5,000 replications. The estimated indirect effect of FAS on FL via ICS was −0.12 (0.25 × −0.48), while the direct effect was −0.41, resulting in a total effect of −0.53. The bootstrapped 95% bias-corrected confidence interval for the indirect path excluded zero, confirming a statistically significant mediation effect (Preacher & Hayes, 2004, 2008).

Because both the direct and indirect paths were significant and consistent in direction, the findings support partial mediation, indicating that ICS partially transmits the effect of FAS on FL. The results thus corroborate:

H_1: Forensic accounting skills negatively influence the likelihood of fraud.

H_2: Internal control systems negatively influence the likelihood of fraud.

H_3: Internal Control Systems Mediate the Relationship Between Forensic Accounting Skills and Fraud Likelihood in Nigeria's Federal Government-Owned Enterprises.

Collectively, the model demonstrates that enhancing forensic accounting competencies and strengthening COSO-consistent internal control frameworks jointly reduce the likelihood of fraud in the public sector.

Table 4. Direct, indirect, and total effects of forensic accounting skills on fraud likelihood.

Effect type	Pathway	Unstandardized coefficient	Standardized β	Bootstrapped SE	95% Bias-corrected CI (Lower–Upper)	p-value
Direct effect	FAS → FL	−0.385	−0.412	0.063	[−0.507, −0.262]	0.000
Indirect effect	FAS → ICS → FL	−0.111	−0.119	0.037	[−0.194, −0.054]	0.002
Total effect	FAS → FL (Direct + Indirect)	−0.496	−0.531	0.072	[−0.636, −0.392]	0.000

Model estimated using Covariance-Based Structural Equation Modeling (SEM) with Maximum Likelihood estimation in Stata 19.5, employing 5,000 bias-corrected bootstrap replications. Standardized indirect effects and confidence intervals were computed using the estat teffects, standardized command. The bootstrapped indirect path excluded zero, providing robust evidence for partial mediation, as both the direct and indirect effects were significant. The findings demonstrate that internal control systems partially mediate the relationship between forensic accounting skills and fraud likelihood. This suggests that while forensic expertise directly reduces the incidence of fraud, its impact is enhanced when embedded within strong internal control frameworks. The magnitude of the standardized total effect ($\beta = -0.53$) underscores the importance of forensic capacity-building and COSO-aligned internal controls in mitigating fraud risks across public-sector enterprises.

5. CONCLUSION, POLICY IMPLICATIONS, AND DIRECTIONS FOR FUTURE RESEARCH

This study examined the mediating role of Internal Control Systems (ICS) in the relationship between Forensic Accounting Skills (FAS) and Fraud Likelihood (FL) in Nigeria's Federal Government-Owned Enterprises (FGOEs). The findings indicate that FAS significantly enhances ICS and directly reduces the likelihood of fraud, while robust internal controls substantially mitigate fraud risks. The mediation analysis confirms that ICS partially mediates the relationship between FAS and FL, suggesting that forensic competencies are most effective when supported by strong internal control frameworks. These findings demonstrate that technical forensic expertise alone cannot ensure sustainable fraud prevention without corresponding institutional reforms and governance structures.

The study contributes to theory by linking forensic capacity development with systemic control enhancement, providing a conceptual bridge between professional competence and institutional governance mechanisms. For policymakers and reform agencies across Africa and Asia, the findings offer practical strategies for improving public-sector integrity. Fraud prevention should follow a twofold approach that combines continuous training and certification of forensic accountants with COSO-aligned internal control systems that integrate risk assessment, audit monitoring, and accountability processes. African and Asian governments can strengthen governance capacity by institutionalizing forensic units within state-owned enterprises and embedding them within broader internal control

frameworks. Development partners and regional oversight bodies should include forensic capacity-building in their anti-corruption initiatives to enhance transparency, accountability, and public confidence.

Despite its theoretical and empirical contributions, the study acknowledges several methodological and contextual constraints. The cross-sectional research design, which captures associations at a single point in time, limits causal interpretation and temporal generalization. The application of CB-SEM, although appropriate for theory-driven testing and model fit evaluation, presupposes multivariate normality and an adequately large sample, conditions only partially satisfied within the context of Nigerian Federal Government-Owned Enterprises (FGOEs). The purposive sampling procedure, selected for data completeness, restricts statistical representativeness, while the reliance on self-reported Likert-scale measures may have introduced common method bias and social desirability bias despite procedural and statistical controls (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Future research should employ longitudinal or mixed-method designs, triangulate survey data with objective audit or forensic evidence, and test model invariance across national contexts to enhance the external validity and robustness of findings.

In general, the study enhances the global discourse on public-sector governance by demonstrating how forensic competence and robust internal controls collectively deter fraud. It offers a replicable analytical framework that can assist policymakers in Africa and Asia in promoting institutional integrity, transparency, and accountability as essential foundations for sustainable economic development.

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Transparency: The authors state that the manuscript is honest, truthful, and transparent, that no key aspects of the investigation have been omitted, and that any differences from the study as planned have been clarified. This study followed all writing ethics.
Data Availability Statement: Upon a reasonable request, the supporting data of this study can be provided by the corresponding author.
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Appendix 1: Questionnaire.

Appendix 1 presents the questionnaire used to collect data for the study.

Survey on Forensic Accounting Skills, Internal Controls, and Fraud Likelihood in Nigeria's Federal Government-Owned Enterprises (FGOEs)

Form Description

This questionnaire is part of an academic research study examining how forensic accounting skills and internal control systems influence the likelihood of fraud in Nigeria's Federal Government-Owned Enterprises (FGOEs). All responses will be treated with strict confidentiality and will be used solely for research purposes.

SECTION A: Demographic Information

1. What is your current position in the organisation?

Multiple choice

- Internal Auditor
- Financial Controller
- Audit Committee Member
- Accountant
- Other (please specify)

2. How many years of professional experience do you have?

Multiple choice

- Less than 5 years
- 5–10 years
- 11–15 years
- 16–20 years
- More than 20 years

3. What is your highest academic qualification?

Multiple choice

- B.Sc./HND
- MBA/M.Sc.
- PhD
- Professional Certification (e.g., ICAN, ANAN, CFE)

4. Does your enterprise have a dedicated forensic accounting unit?

Multiple choice

- Yes
- No

5. Is your enterprise fully owned or majority owned by the Federal Government of Nigeria?

Multiple choice

- Yes
- No

SECTION B: Forensic Accounting Skills (FAS)

Instruction: Please indicate your level of agreement with each statement by selecting a number from 1 to 5, where: 1 = Strongly Disagree | 2 = Disagree | 3 = Neutral | 4 = Agree | 5 = Strongly Agree

6. Our accounting staff are trained in forensic investigation techniques. (fas1)
7. The enterprise employs professionals with forensic accounting certifications (e.g., CFE). (fas2)
8. Staff are proficient in using forensic tools such as data mining and digital audit software. (fas3)
9. Our team can detect manipulation in financial statements using forensic techniques. (fas4)
10. Forensic accounting skills are considered essential in our internal audit function. (fas 5)

SECTION C: Internal Control Systems (ICS)

Use same 1–5 scale

11. The control environment in our enterprise promotes ethical behaviour. *(Control Environment – ics1)*
12. A formal risk assessment procedure exists to identify and address fraud risks. *(Risk Assessment – ics2)*
13. Control activities (e.g., authorisation, segregation of duties) are consistently enforced. *(Control Activities – ics3)*
14. Internal audit regularly monitors and evaluates the effectiveness of controls. (Monitoring – ics4).

SECTION D: Fraud Likelihood (FL)

Use same 1–5 scale

15. There is a significant likelihood of fraud occurring in our organisation. (fl1)
16. There is a high likelihood that fraud within our operational system may remain undetected. (fl2)
17. Internal processes are susceptible to employee fraud. (fl3)
18. We have previously experienced fraud-related losses or misstatements. (fl4)
19. Our organisation is at risk of fraud due to loopholes in controls or weak governance. (fl5)

SECTION E: Open-Ended (Optional)

20. In your opinion, what are the key obstacles to effective fraud prevention in your enterprise?
21. How would you improve the use of forensic accounting practices in your enterprise?