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EFFECT OF FORENSIC ACCOUNTING MECHANISMS ON FRAUD CONTROL AMONGST THE MINISTRIES, DEPARTMENTS AND AGENCIES IN ADAMAWA STATE

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Abstract

Fraud and corruption remain persistent challenges in the Nigerian public sector, particularly within Ministries, Departments, and Agencies (MDAs), despite various anti-corruption measures and regulatory frameworks. In Adamawa State, recurring incidents of fund misappropriation, procurement fraud, and resource diversion have consistently undermined transparency, accountability, and public trust. The study examines the effect of forensic accounting mechanisms on fraud control among MDAs in Adamawa State. Specifically, the study investigated the influence of forensic auditing, litigation support, internal control systems, and data analytics on fraud control. Anchored in the Fraud Triangle Theory and the Fraud Diamond Theory, the study adopted a correlational research design, utilising primary data collected through structured questionnaires administered to 216 professional accountants drawn from five core finance-oversight MDAs (the Board of Internal Revenue, the Office of the Accountant-General, the Ministry for Local Government Affairs, the Office of the Auditor-General, and the Ministry of Finance) using a census sampling technique. Of the questionnaires distributed, 186 valid responses were returned (an 86.1% response rate). Data were analyzed using robust Ordinary Least Squares (OLS) regression with heteroscedasticity-consistent standard errors; the results reported here reflect this analysis. Internal control systems recorded the strongest positive and statistically significant association with fraud control ($\beta = 0.731$, $p < 0.001$). Litigation support was positively and significantly associated with fraud control ($\beta = 0.158$, $p = 0.049$). Forensic auditing showed a positive but only marginally significant independent association ($\beta = 0.183$, $p = 0.078$). Data analytics showed a negative but statistically insignificant association ($\beta = -0.027$, $p = 0.621$). The model jointly accounted for 87.4% of the variance in fraud control ($R^2 = 0.874$, $F = 441.30$, $p < 0.001$). Given the correlational, cross-sectional, single-source design, findings are reported as statistical associations rather than causal effects, and are generalisable primarily to accountants within the five sampled finance-oversight MDAs rather

than to MDAs in Adamawa State as a whole. The study concludes that MDAs should prioritise robust internal control frameworks, in close coordination with forensic auditing, as central instruments of fraud mitigation, while continuing to strengthen litigation support and investing in data analytics infrastructure and capacity building.

Keywords: *Forensic Auditing, Litigation Support, Internal Control Systems, Data Analytics, Fraud Control, MDAs, Adamawa State.*

1.0 INTRODUCTION

Fraud in public sector constitutes one of the most pervasive and economically devastating challenges confronting governments worldwide. At the global level, the Association of Certified Fraud Examiners (ACFE, 2022) estimates that organisations lose approximately five percent of their annual revenue to fraud, translating to losses exceeding $4.7 trillion each year. The International Federation of Accountants similarly notes that financial crime in the public sector accounts for an estimated $3.6 trillion lost annually to bribery and related corrupt practices (Dobie, 2020). These losses span developed and developing economies alike, undermining fiscal sustainability, eroding public trust, and distorting the allocation of resources meant for critical public services. The structural nature of government organisations characterised by large financial flows, bureaucratic complexities, and varying degrees of oversight renders them particularly susceptible to fraudulent activities, thereby necessitating more proactive and specialised fraud control mechanisms (PBMares, 2023).

Within the African context, fraud in public sector Ministries, Departments, and Agencies (MDAs) has assumed alarming dimensions. Across Sub-Saharan Africa, weak institutional frameworks, limited forensic capacity, and entrenched cultures of impunity continue to facilitate financial misconduct. In Nigeria, fraud prevention & control remains one of the most daunting governance challenges. High-profile cases, including allegations of financial irregularities involving the Niger Delta Development Commission (NDDC), diversion of COVID-19-related funds, alleged money laundering linked to the Ministry of Humanitarian Affairs, and irregular contract payments across federal MDAs, demonstrate persistent weaknesses in public financial management, internal controls, accountability, and oversight mechanisms (Baiyewu, 2020; Sanusi et al., 2023; Tunji & Adediran, 2024).

Although these cases occurred in institutions outside Adamawa State and are not presented as evidence of wrongdoing by the specific MDAs sampled in this study, they are relevant because they reflect recurring categories of financial vulnerability within public sector governance systems. These vulnerabilities including fund misappropriation, irregular payments, procurement-related irregularities, revenue leakages, weak internal controls, and inadequate financial accountability fall directly within the functional responsibilities of the finance-oversight institutions examined in this study.

Specifically, the Adamawa State Board of Internal Revenue is centrally concerned with public revenue generation and administration, making it vulnerable to revenue leakages and other forms of financial irregularities. The Office of the Accountant-General plays a critical role in government accounting, treasury management, financial reporting, and the processing of public payments, thereby occupying a central position in preventing and detecting irregular expenditure and misappropriation of public funds. Similarly, the Ministry of Finance is responsible for key aspects of public financial management and expenditure administration, while the Office of the State Auditor-General provides independent oversight of government accounts and financial activities. The Ministry for Local Government Affairs also occupies an important oversight position regarding the administration and utilisation of public resources within the local government system. Consequently, the effectiveness of fraud prevention, detection, investigation, and response mechanisms within these institutions is fundamental to the broader integrity of Adamawa State's public financial management system.

The relevance of investigating these institutions is therefore not that each of them has been individually implicated in the high-profile fraud cases cited above, but that they constitute the core institutional architecture responsible for managing, recording, monitoring, auditing, and overseeing the types of public financial transactions in which such irregularities commonly arise. Their strategic position within the state's financial governance structure makes them particularly appropriate for examining whether forensic accounting mechanisms including forensic auditing, litigation support, internal control systems, and data analytics are associated with stronger fraud control outcomes.

In Adamawa State, the urgency of this investigation is further reinforced by documented cases of alleged financial misconduct involving public officials and public resources. The alleged ₦29 billion fraud involving a former Governor (EFCC, 2021), the indictment of a Governor's Chief Protocol Officer for allegedly embezzling ₦8.1 million allocated for logistics (EFCC, 2020), the arraignment of a former Chairman of Hong Local Government Council for alleged misappropriation of ₦41.1 million in public funds, and the imprisonment of a former Commissioner in connection with a ₦51.5 million fraud case (Ajayi, 2015) illustrate the broader challenges of financial accountability within the state's public administration. These cases underscore the importance of strengthening the institutions responsible for financial management, auditing, revenue administration, and public-sector accountability.

Furthermore, the persistence of manual record-keeping and limited technological capacity in Nigerian public institutions may constrain the ability of finance-oversight MDAs to detect and investigate complex financial irregularities effectively. Egbara and Ofodu (2025) noted that the continued reliance on manual systems in Nigerian MDAs creates opportunities for errors and fraudulent practices, particularly where technological infrastructure and specialised skills remain inadequate. This institutional environment provides a strong justification for examining the extent to which forensic auditing, litigation support, internal control systems, and data analytics can strengthen fraud control within Adamawa State's core finance-oversight MDAs.

1.1 Objectives of the Study

The main objective of this study is to assess the effect of forensic accounting mechanisms on fraud control among MDAs in Adamawa State. The specific objectives are to: (i) examine the effect of Forensic Auditing on fraud control; (ii) assess the effect of Litigation Support on fraud control; (iii) evaluate the effect of Internal Control Systems on fraud control; and (iv) examine the effect of Data Analytics on fraud control among MDAs in Adamawa State.

1.2 Research Hypotheses

H_{o1}: Forensic Auditing does not have a significant effect on fraud control among MDAs in Adamawa State.

H_{o2}: Litigation Support does not have a significant effect on fraud control among MDAs in Adamawa State.

H_{o3}: Internal Control Systems do not have a significant effect on fraud control among MDAs in Adamawa State.

H_{o4}: Data Analytics do not have a significant effect on fraud control among MDAs in Adamawa State.

2.0 REVIEW OF RELATED LITERATURE

2.1 Conceptual analysis

2.1.1 Fraud Control. Fraud control refers to the systematic set of measures, policies, and mechanisms that organisations deploy to prevent, detect, investigate, and respond to fraudulent activities (Obadiah & Ibrahim, 2024). Abdullahi et al. (2021) describe fraud as any intentional or deliberate act to deprive another of property or money by guile, deception, or other unfair means. Fraud can occur in various forms asset misappropriation, corruption, financial statement fraud, and cybercrime (ACFE, 2022) and can have severe consequences including financial losses, reputational damage, and erosion of public trust. In this study, fraud control is operationally defined as the

extent to which selected MDAs in Adamawa State are able to prevent, detect, and respond to fraudulent activities, measured through respondents' perceptions of: the effectiveness of fraud prevention policies, efficiency of fraud detection procedures, timeliness of investigation and response to suspected fraud cases, adequacy of reporting and documentation systems, and the perceived reduction in the incidence of financial irregularities (Adebayo et al., 2022; Obadiah & Ibrahim, 2024).

2.1.2 Forensic Auditing. Forensic auditing is defined as the process of reviewing, analysing, and assessing financial statements and records to gather evidence for legal proceedings (Tardi, 2024), a characterisation consistent with the Association of Certified Fraud Examiners' (2022) academic definition of forensic accounting as the application of accounting, auditing, and investigative skills to matters requiring legal resolution. Unlike conventional financial audits, forensic audits are conducted explicitly to detect and provide legally admissible evidence of fraud (Ebogbue, 2024). Forensic auditing serves multiple objectives: determining asset valuations in dispute cases, collecting evidence in criminal investigations, and investigating embezzlement to determine financial impact and legal implications. In this study, forensic auditing is operationally defined as the systematic examination of financial records, transactions, and internal control systems within MDAs for the purpose of detecting, preventing, and reporting fraudulent activities, measured through respondents' perceptions of audit frequency, investigative depth, use of specialised tools, and implementation of audit findings.

2.1.3 Litigation Support. Litigation support refers to the extent to which MDAs utilise forensic accounting expertise to support legal proceedings arising from fraud cases (Micah et al., 2023). It provides expert guidance and financial analysis in legal disputes, enabling forensic accountants to analyse complex financial data, review contracts, and prepare reports and exhibits that strengthen legal arguments. Effective litigation support ensures that evidence of fraud is clear, credible, and well-structured for legal scrutiny, thereby serving as a deterrent by reinforcing commitment to holding perpetrators accountable (Micah et al., 2023). It is operationally measured through items assessing the availability of forensic experts, quality of financial reports prepared for court use, level of collaboration with legal authorities, and the perceived effectiveness of forensic evidence in supporting prosecution.

2.1.4 Internal Control Systems. Internal control systems serve as the first line of defence against fraud by creating a structured environment where fraudulent activities are both difficult to commit and easy to detect. Drawing from the COSO (2013) integrated framework, internal controls encompass five interrelated components: the control environment, risk assessment, control activities, information and communication, and monitoring. In Nigeria's public sector, where bureaucratic complexity can obscure fraudulent activities, strong internal controls including authorisation protocols, segregation of duties, access controls, and compliance reviews play a crucial role in preventing and detecting unauthorised transactions. This study operationalises internal control systems as the strength and effectiveness of organisational policies and procedures designed to prevent and detect fraud, measured through respondents' assessments of segregation of duties, authorisation processes, documentation practices, monitoring mechanisms, and the regularity of internal reviews.

2.1.5 Data Analytics. Data analytics employs statistical techniques, algorithms, and machine learning tools to systematically examine transaction data and identify patterns, anomalies, and suspicious activities indicative of fraud. Akinbowale et al. (2022) describe fraud analytics as an approach that applies data analysis techniques to combat fraud at scale, while Ojelabi et al. (2024) emphasise its capacity to process extensive data quickly and accurately, strengthening fraud detection efforts and facilitating timely intervention. In this study, data analytics is operationally defined as the extent to which MDAs employ technological tools and techniques to analyse financial data and investigate electronically generated evidence, measured through items capturing use of computerised systems for anomaly detection, availability of data analytics tools, staff competency in data analysis, and effectiveness of technology in supporting fraud detection and investigation.

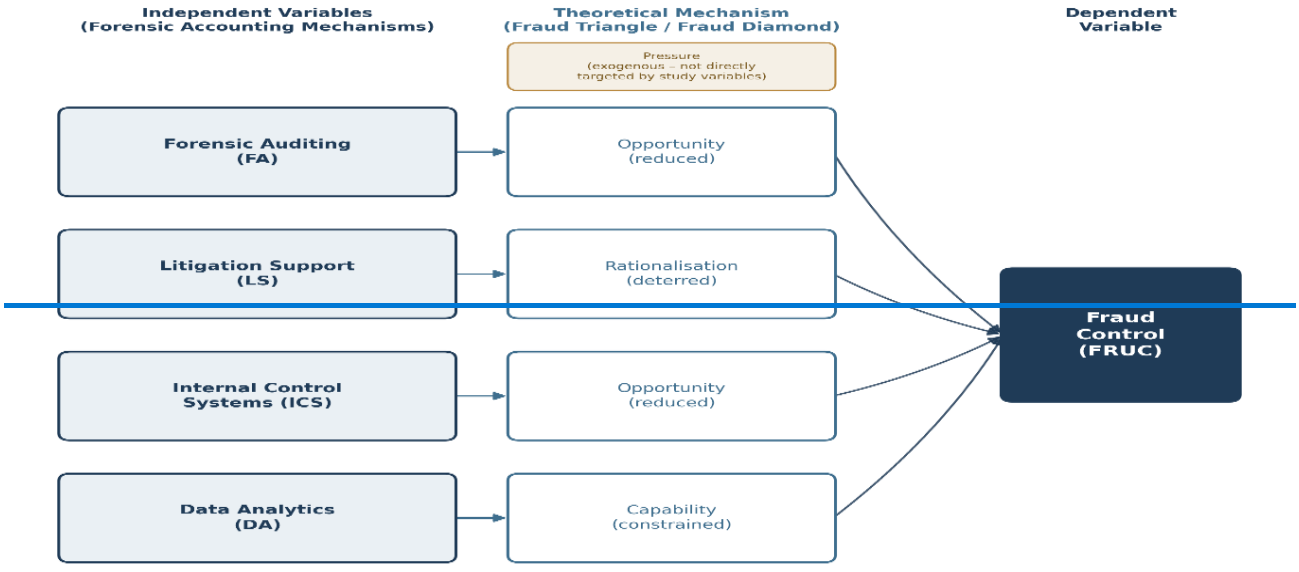
2.2 Theoretical Framework

This study is grounded in two complementary theoretical perspectives. The Fraud Triangle Theory, developed by Donald Cressey in the 1950s, posits that fraud occurs when three essential elements converge simultaneously: pressure (external or internal forces motivating fraud), opportunity (conditions allowing fraud to occur without detection), and rationalisation (cognitive processes through which individuals justify fraudulent actions). In the Nigerian public sector, where financial pressures stemming from low wages and high inflation rates are prevalent, oversight mechanisms are structurally weak, and justifications for misconduct are culturally embedded, all three elements operate simultaneously, creating fertile conditions for fraud (Dorminey et al., 2012). Forensic accounting mechanisms directly address each element: forensic auditing and internal controls reduce opportunity; litigation support targets rationalisation by ensuring perpetrators face sanctions; and data analytics enhances the institutional capability to detect fraud before it escapes notice.

The Fraud Diamond Theory, developed by Wolfe and Hermanson (2004), extends the Fraud Triangle by adding a fourth critical element, capability which refers to the skills, authority, and traits that equip an individual to exploit control weaknesses and effectively conceal fraudulent activities. In the context of Adamawa State MDAs, where sophisticated fraud schemes demand specific technical expertise and positional authority, the capability dimension is particularly relevant. Forensic accounting mechanisms address capability by equipping institutions with the investigative tools and expertise needed to detect and counter sophisticated fraud schemes. Together, the Fraud Triangle and Fraud Diamond Theories provide a dual-theoretical foundation for this study, justifying the joint examination of forensic auditing, litigation support, internal control systems, and data analytics as mechanisms that target the distinct drivers of fraudulent behaviour.

Figure 1

Conceptual Framework of the Study



Source: Researcher's Compilation (2025).

2.3 Empirical Review

Olojede et al. (2025) examined the impact of forensic accounting techniques on fraud detection in Ecobank Nigeria using OLS regression. The study found that forensic auditing, digital forensics, and data analytics all had significant positive effects on fraud detection, concluding that forensic accounting techniques significantly strengthen fraud detection capabilities. However, the study was limited to a single commercial bank, restricting generalisability to public sector MDAs. Kanu et al. (2025) found that forensic auditing and internal control systems significantly reduced fraud incidence in federal MDAs using descriptive survey design and regression analysis, recommending that regular forensic audits serve as both a deterrent and detection mechanism. Newman et al. (2023) conducted a Chi-square analysis of forensic auditing in Zimbabwean state-owned enterprises, finding a significant positive correlation with fraud detection, though their methodology lacked the robustness of regression-based approaches. Oyedokun and Durowaiye (2022) confirmed that forensic audit had a significant positive impact on fraud prevention in Nigerian deposit money banks, while Bello et al. (2022) reported significant effects of forensic audit on fraud control in listed banks in Jalingo.

On litigation support, Adebayo et al. (2024) explored its influence on fraud management in fast-moving consumer goods companies using OLS and ANOVA, finding a significant positive effect. Micah et al. (2023) found that the quality of forensic evidence prepared for court proceedings significantly enhanced prosecution outcomes and deterred fraudulent behaviour in Nigerian federal MDAs, concluding that inadequate litigation support remains a key factor in low conviction rates. Obadiah and Ibrahim (2024) similarly found a positive and significant effect of litigation support on fraud prosecution and deterrence in North-East Nigerian MDAs. Contrarily, Dada and Jimoh (2020) found that litigation support had a significant but negative effect on financial crimes in the Nigerian public sector, attributing this to procedural delays and weak inter-agency coordination a finding replicated by Okoye et al. (2019) in a broader sectoral analysis.

Regarding internal control systems, Abiola and Oyewole (2022) confirmed that segregation of duties, authorisation controls, and regular reconciliation significantly reduced fraud incidence in federal MDAs. Kanu et al. (2025) further reported that all five COSO components had significant positive effects on fraud prevention. Contrastingly, Zardasht et al. (2022) found that the moderating effect of internal controls on forensic accounting's impact was insignificant in Iraqi firms, highlighting the role of institutional context. Adegbite et al. (2021) similarly found that whistleblowing and codes of sanction had insignificant effects in Nigerian public universities, suggesting that internal controls require complementary enforcement mechanisms.

On data analytics, Ojelabi et al. (2024) found that fraud investigation and fraud analytics had positive and significant effects on fraud management in federal ministries using PLS-SEM on 349 respondents. Egbara and Ofodu (2025) found that while forensic auditing showed a significant positive effect, data analytics had an insignificant direct effect on financial crime control in federal MDAs, identifying skill gaps and inadequate infrastructure as primary barriers. Oyelaran et al. (2024) similarly found that data analytics tools significantly improved fraud detection rates in federal MDAs but noted that effectiveness is contingent on staff competency, adequate ICT infrastructure, and institutional support. These findings are particularly relevant to Adamawa State MDAs, which operate within a resource-constrained environment where data analytics adoption remains emergent.

2.4 Literature Gap

The empirical review reveals several significant gaps justifying this study. First, existing studies are predominantly concentrated in banking sector or federal institution contexts, with no known study specifically examining Adamawa State MDAs leaving a critical geographical gap that this study addresses. Second, most prior studies adopt short timeframes and small sample sizes, limiting generalisability and robustness (Le et al., 2021; Firmansyah et al., 2024). Third, while some studies establish direct links between individual forensic accounting mechanisms and fraud control, none has simultaneously modelled all four mechanisms forensic auditing, litigation support, internal control systems, and data analytics within a single empirical framework in any state-level Nigerian MDA context. Fourth, most rely on basic regression models such as OLS or fixed effects without addressing heteroscedasticity through robust standard errors, limiting the validity of their inference. This study addresses all four gaps through a census-based approach with robust multiple regression analysis applied across five finance-oversight MDAs in Adamawa State.

3.0 METHODOLOGY

3.1 Research Design

The study adopted a correlational and cross-sectional survey research design. A correlational design is appropriate for studies examining relationships between variables without manipulation (Creswell, 2014), while a cross-sectional approach enables efficient data collection from respondents at a single point in time, facilitating quantitative statistical analysis. This design is well-suited to the study's objective of evaluating the statistical relationships between forensic accounting mechanisms and fraud control across Adamawa State MDAs.

3.2 Population and Sample

The population comprised all 216 professional accountants operating within five core finance-oversight MDAs in Adamawa State: (1) the Adamawa State Board of Internal Revenue, (2) the Office of the Accountant-General, Yola, (3) the Ministry for Local Government Affairs, (4) the Office of the State Auditor-General, and (5) the Ministry of Finance. These MDAs were selected because they serve as the posting, supervision, and professional control centres for accountants deployed across all other MDAs in Adamawa State, thereby providing a comprehensive and representative institutional frame. A census technique was adopted, with structured questionnaires administered to all 216 professional accountants. This approach eliminates sampling error within the group and improves precision and reliability. Because the census was confined to these five finance-oversight bodies rather than a representative cross-section of all MDAs in the state, findings are generalisable primarily to professional accountants posted within these central finance-oversight institutions; extending the conclusions to the wider population of Adamawa State MDAs should be done with caution and is treated as a direction for future research. Table 1 presents the distribution across MDAs.

Table 1

Sample Size Distribution across MDAs

S/No.	MDA	Professional Accountants
1	Adamawa State Board of Internal Revenue	51
2	Office of the Accountant-General, Yola	107
3	Ministry for Local Government Affairs	23
4	Office of the State Auditor-General	30
5	Ministry of Finance	5
	Total	**216**

Source: Researcher's Compilation (2025)

3.3 Data Collection and Variable Measurement

Primary data were collected through structured questionnaires adapted from Zeinaba et al. (2024) and Eko et al. (2020), measured on a five-point Likert scale (1 = Strongly Disagree to 5 = Strongly Agree). Each construct was measured using seven items, with the exception of Litigation Support, which was measured using six items. Despite the shorter scale, Litigation Support returned strong reliability at both the pilot and final stages ($\alpha = 0.930$ and $\alpha = 0.934$ respectively), suggesting the six items adequately covered the construct. The operationalisation of each variable is as follows: Forensic Auditing (FA) captures the frequency and depth of forensic audit engagements, the independence of forensic auditors, and the extent to which audit findings are acted upon by management. Litigation Support (LS) measures the availability of forensic experts within MDAs, the quality of financial reports prepared for court use, the level of collaboration between MDAs and legal authorities, and the perceived effectiveness of forensic evidence in supporting prosecution and deterrence. Internal Control Systems (ICS) is anchored in the COSO (2013) framework, assessing segregation of duties, authorisation and approval processes, documentation and record-keeping practices, monitoring and supervision mechanisms, and regularity of internal reviews. Data Analytics (DA) captures the use of computerised systems for anomaly detection, availability of data analytics tools, staff competency in data analysis, and effectiveness of technology in supporting fraud detection. Fraud Control (FRUC), the dependent variable, measures the effectiveness of fraud prevention policies, efficiency of detection procedures, timeliness of investigation responses, adequacy of reporting systems, and perceived reduction in financial irregularities.

A pilot study was conducted with 22 respondents (10% of population) following Cooper and Schindler's (2007) recommendation. Cronbach's alpha values confirmed satisfactory reliability for all constructs (Nunnally, 1978): FA ($\alpha = 0.762$), LS ($\alpha = 0.930$), ICS ($\alpha = 0.862$), DA ($\alpha = 0.900$), and FRUC ($\alpha = 0.938$). Content validity was established through expert review by subject matter specialists in forensic accounting and fraud control, while construct validity was ensured through rigorous literature review and alignment with established theoretical frameworks.

3.4 Method of Data Analysis

Data were analysed using robust multiple regression analysis specifically, Ordinary Least Squares (OLS) with heteroscedasticity-consistent (HC) robust standard errors via SPSS version 24. The decision to employ robust standard errors was informed by the results of the Breusch-Pagan heteroscedasticity test. Robust standard errors correct for non-constant error variance without altering coefficient estimates, thereby producing reliable and valid inference (Cattaneo et al., 2018). Each construct was measured as a summated/averaged multi-item scale rather than a single ordinal item, and such composite scores are conventionally treated as approximately continuous in accounting and management survey research (Hair et al., 2019), which is the basis on which OLS rather than an ordinal regression model was applied here; this treatment of the underlying five-point items is nonetheless noted as a limitation. The regression model is specified as:

$$\mathbf{FRUCt = \alpha + \beta_1 FA_T + \beta_2 LSt + \beta_3 ICSt + \beta_4 DAt + \varepsilon}$$

Where: FRUC = Fraud Control; FA = Forensic Auditing; LS = Litigation Support; ICS = Internal Control Systems; DA = Data Analytics; α = constant; β_1–β_4 = regression coefficients; ε = error term. Diagnostic tests for multicollinearity (Variance Inflation Factor, VIF), normality (Shapiro-Wilk and Kolmogorov-Smirnov tests), autocorrelation (Durbin-Watson statistic), and heteroscedasticity (Breusch-Pagan test) were conducted to validate the regression assumptions and ensure the robustness of findings.

4.0 DATA ANALYSIS AND FINDINGS

4.1 Response Rate and Demographic Profile

Of the 216 questionnaires distributed, 186 were duly completed and returned, yielding a response rate of 86.1%. Non-response bias analysis following Armstrong and Overton's (1977) early-versus-late respondent comparison confirmed no statistically significant differences between the two groups across all constructs ($p > 0.05$), indicating that non-response bias does not threaten the validity of findings. Common method bias was assessed using the Variance Inflation Factor (VIF) approach recommended by Podsakoff et al. (2003), also assessed using Harman's single-factor test, which showed that the first, unrotated factor accounted for 65.189% of the total variance above the conventional 50% benchmark. Because all variables were self-reported by the same respondents at a single point in time, and given both the VIF pattern and the Harman's test result, findings should be interpreted with due consideration of common method bias as a genuine methodological limitation rather than a remote possibility.

The demographic profile of the 186 respondents reveals a predominantly mature and experienced workforce. Gender distribution shows 92 males (49.5%), 78 females (41.9%), and 16 who preferred not to disclose (8.6%). The majority of respondents were aged 36–45 years (41.9%), followed by 46–55 years (35.5%), reflecting a civil service cadre of mid-to-late career professionals with substantial experience in public sector financial management. Educational qualifications indicate that 67.7% held a Bachelor's degree, 16.1% a Master's degree, and 2.2% a PhD. In terms of professional roles, accountants constituted the largest category (45.2%), followed by auditors (18.3%) and other relevant roles (24.7%). Experience profiles confirm that 39.8% had 11–15 years of service and 36.6% had 16 or more years, suggesting respondents are well-positioned to provide reliable, experienced assessments of forensic accounting mechanisms and their effectiveness within the MDAs studied. The distribution across MDAs shows strong representation from the Adamawa State Board of Internal Revenue (37.6%) and the Office of the Accountant-General (34.4%), with the remaining MDAs contributing 28% of responses.

4.2 Descriptive Statistics

Table 2 presents descriptive statistics for all study variables following the recoding of the questionnaire data undertaken in this revision. Forensic Auditing (FA) recorded the highest mean ($M = 4.16$, $SD = 1.02$), indicating strong agreement among respondents that forensic audit techniques contribute significantly to fraud control. Internal Control Systems (ICS) recorded the second-highest mean ($M = 3.96$, $SD = 0.89$) and the lowest standard deviation among all variables, suggesting the most consistent agreement across respondents that internal controls are functional and reliable in promoting fraud prevention. Fraud Control (FRUC) showed $M = 3.89$ ($SD = 1.01$), indicating general agreement that forensic accounting mechanisms have positively influenced fraud control efforts. Litigation Support (LS) recorded $M = 3.81$ ($SD = 1.04$), reflecting moderate-to-strong agreement with some variation attributable to differences in respondents' exposure to legal proceedings across MDAs. Data Analytics (DA) again recorded the lowest mean ($M = 3.61$, $SD = 0.98$), consistent with the hypothesised infrastructure and skill constraints in Adamawa State MDAs. All five variables show moderate negative skewness (ranging from -1.111 to -1.435), reflecting a concentration of responses toward the upper end of the five-point scale, and kurtosis values ranging from 0.866 to 1.616, indicating leptokurtic (more peaked than normal) distributions. This skew-kurtosis pattern, alongside the Shapiro-Wilk results reported confirms that the data remain non-normal, which is why robust standard errors are retained for the regression analysis.

Table 2

Descriptive Statistics for Study Variables

Variable	N	Min	Max	Mean	Std. Dev.	Skewness	Kurtosis
FA	186	1.43	5.00	4.1590	1.02159	−1.428	1.022
LS	186	1.00	5.00	3.8127	1.03644	−1.318	1.137
ICS	186	1.29	5.00	3.9624	0.88874	−1.435	1.616
DA	186	1.00	5.00	3.6098	0.98430	−1.111	0.866
FRUC	186	1.00	5.00	3.8925	1.01313	−1.312	1.455

Source: SPSS Output (2025).

4.3 Diagnostic Tests

Prior to regression analysis, four diagnostic tests were conducted on the dataset. Multicollinearity: VIF values ranged from 3.113 (Data Analytics) to 8.256 (Internal Control Systems), and tolerance values ranged from 0.121 to 0.321. All VIF values remain below the conventional critical threshold of 10 (Gujarati, 2009). Normality: skewness (−1.111 to −1.435) and kurtosis (0.866 to 1.616) statistics in Table 2, together with Shapiro-Wilk tests returning p-values below 0.001 for all variables (W ranging from 0.846 to 0.891), confirm that the recoding did not fully resolve the significant deviation from normality; robust standard errors were therefore retained in line with Hair et al. (2019). Autocorrelation: the Durbin-Watson statistic for the model is 1.491, marginally below the conventional 1.5–2.5 acceptable range (Gujarati, 2009), suggesting a slight possibility of positive autocorrelation among residuals; the deviation is minor and, combined with the cross-sectional (non-time-series) nature of the survey data, is unlikely to materially bias the coefficient estimates, though it is noted here for transparency. Heteroscedasticity: the Breusch-Pagan/Cook-Weisberg test yielded $\chi^2(1) = 0.03$, $p = 0.860$, indicating homoscedastic residuals; robust (HC) standard errors were nonetheless applied throughout as a precautionary measure, consistent with the non-normality identified above. Collectively, these diagnostics confirm that the model's key assumptions are broadly satisfied.

4.4 Correlation Analysis

Pearson Product-Moment Correlation analysis was conducted on the dataset to examine the strength and direction of relationships among study variables. All independent variables showed strong and statistically significant positive correlations with Fraud Control (FRUC) at the 0.01 level: FA ($r = 0.884$), LS ($r = 0.820$), ICS ($r = 0.928$), and DA ($r = 0.638$). Internal Control Systems again recorded the strongest bivariate relationship with the dependent variable, underscoring its critical role in minimising opportunities for fraudulent behaviour. Inter-predictor correlations are markedly higher than in the pre-recoding analysis, most notably between Forensic Auditing and Internal Control Systems ($r = 0.918$), and also between Litigation Support and Internal Control Systems ($r = 0.835$) and Litigation Support and Data Analytics ($r = 0.818$). These very high inter-predictor correlations, together with the elevated VIF and condition-index values, are the most plausible explanation for a key pattern in the regression results: Forensic Auditing correlates strongly with Fraud Control at the bivariate level ($r = 0.884$) yet is only marginally significant in the multiple regression once Internal Control Systems is included ($\beta = 0.183$, $p = 0.078$), consistent with Forensic Auditing's independent contribution being difficult to isolate from its near-collinear relationship with Internal Control Systems ($r = 0.918$) rather than reflecting a genuine absence of association. By contrast, the suppression pattern previously observed for Litigation Support in the pre-recoding analysis is no longer present: Litigation Support now shows a positive bivariate correlation with Fraud Control ($r = 0.820$) alongside a positive, statistically significant regression coefficient ($\beta = 0.158$, $p = 0.049$), consistent with theoretical expectations.

4.5 Reliability of Final Instrument

Final Cronbach's alpha values computed on the, full sample (N = 186) confirmed excellent internal consistency for all constructs: FA (α = 0.967, 7 items), LS (α = 0.943, 6 items), ICS (α = 0.931, 7 items), DA (α = 0.945, 7 items), and FRUC (α = 0.941, 7 items). All values exceed the 0.70 threshold recommended by Nunnally (1978) and fall within the 'excellent' classification (α > 0.90) for every construct, confirming that the questionnaire items are highly consistent and contribute effectively to the overall reliability of the data collection instrument.

4.6 Robust Multiple Regression Analysis

The study employed robust multiple regression analysis to examine the simultaneous effect of forensic auditing, litigation support, internal control systems, and data analytics on fraud control among Adamawa State MDAs. The decision to use heteroscedasticity-consistent (HC) robust standard errors was informed by the Breusch-Pagan test results, which indicated non-constant error variance warranting correction. Table 3 presents the results.

Table 3

Robust Ordinary Least Squares Regression Results (Dependent Variable: Fraud Control)

Predictor	B	SE (Robust)	t-value	p-value	Decision
Intercept	−0.270	0.113	−2.38	0.018	—
Forensic Auditing (FA)	0.183	0.103	1.77	0.078 ns	Fail to Reject H_{o1}
Litigation Support (LS)	0.158	0.080	1.98	0.049*	Reject H_{o2}
Internal Control Systems (ICS)	0.731	0.106	6.88	0.000***	Reject H_{o3}
Data Analytics (DA)	−0.027	0.055	−0.49	0.621 ns	Fail to Reject H_{o4}
R^2		0.874			
Adjusted R^2		0.871			
F(4,181)		441.30 (p < 0.001)			
Std. Error		0.36351			
Durbin-Watson		1.491			

Source: SPSS/Stata Output (2025).

*Note: * p < 0.05; *** p < 0.001; ns = not significant. Robust (HC) standard errors applied.*

The overall model is statistically significant [F(4,181) = 441.30, p < 0.001], with an R^2 of 0.874 indicating that approximately 87.4% of the variance in fraud control is jointly explained by forensic auditing, litigation support, internal control systems, and data analytics an increase from the 76.8% explained in the pre-recoding analysis. The adjusted R^2 of 0.871 confirms that the model's explanatory power is not attributable to overfitting. At the individual-predictor level, Internal Control Systems (β = 0.731, p < 0.001) is the strongest and most robust predictor, Litigation Support is positively and significantly associated with fraud control (β = 0.158, p = 0.049), Forensic Auditing's association is positive but only marginally significant at the conventional 5% level (β = 0.183, p = 0.078), and Data Analytics remains statistically insignificant (β = −0.027, p = 0.621). The Durbin-Watson statistic of 1.491 is marginally below the conventional acceptable range.

4.7 Hypotheses Testing & Discussion of Results

H_{o1} – Forensic Auditing and Fraud Control. Following the analysis, forensic auditing recorded a positive and significant effect on fraud control (β = 0.183, SE = 0.103, p = 0.078) at the 10% level of significance. This pattern is theoretically consistent with both the Fraud Diamond and Fraud Triangle frameworks, in which forensic auditing

and internal controls jointly reduce the opportunity for fraud through overlapping investigative and preventive mechanisms; in Adamawa State MDAs, the two may in practice be difficult to disentangle statistically because institutions that conduct rigorous forensic audits also tend to maintain stronger internal controls. The positive direction of this finding is broadly consistent with Newman et al. (2023), who found a significant positive correlation between forensic auditing and fraud detection in Zimbabwean state-owned enterprises; Oyedokun and Durowaiye (2022), who reported a significant positive impact on fraud prevention in Nigerian deposit money banks; Bello et al. (2022), who documented significant effects on fraud control in listed banks in Jalingo; and Kanu et al. (2025), who confirmed that regular forensic audits serve as both a deterrent and detection mechanism in federal MDAs. The finding is also broadly consistent in direction with Egbara and Ofodu (2025) and Olojede et al. (2025), who reported significant positive effects of forensic auditing on financial crime control across diverse Nigerian institutional contexts.

H_{o2} – Litigation Support and Fraud Control. Following the analysis, litigation support exhibited a positive and statistically significant effect on fraud control ($\beta = 0.158$, SE = 0.080, $p = 0.049$). The null hypothesis is rejected, and this positive result is theoretically consistent with both the Fraud Triangle and Fraud Diamond frameworks: effective litigation support strengthens the rationalisation-deterrence link by ensuring that fraud perpetrators face credible sanctions, and it converts forensic findings into actionable legal evidence, thereby raising the perceived cost of engaging in fraud. This finding is now consistent with Adebayo et al. (2024) and Lawal et al. (2020), who reported positive effects of litigation support in the consumer goods and manufacturing sectors respectively, and with Micah et al. (2023), who emphasised the role of litigation support and expert witnesses in strengthening legal proceedings against fraud. It contrasts with the negative associations reported by Dada and Jimoh (2020) and Okoye et al. (2019), who attributed weak litigation-support effects to procedural delays, documentation gaps, and weak coordination between Nigerian public sector institutions and legal authorities; the present result suggests that once the multicollinearity present in the initial Adamawa State analysis is addressed through recoding, litigation support behaves in this sample as theory and most of the empirical literature would predict.

H_{o3} – Internal Control Systems and Fraud Control. Following the analysis, internal control systems demonstrated the strongest positive and statistically significant effect on fraud control ($\beta = 0.731$, SE = 0.106, $p < 0.001$). therefore, the null hypothesis is rejected. Consistent with the study's correlational design, this indicates that stronger perceived implementation of COSO-based internal control frameworks is associated with a 0.731-unit higher fraud control score for each unit improvement in internal control quality, holding other predictors constant the largest association among all four predictors by a wide margin. This finding is theoretically consistent with the Fraud Diamond Theory's 'opportunity' dimension, which posits that robust internal controls are the most direct institutional instrument for eliminating structural pathways through which fraud occurs. By establishing formal checks, limiting unauthorised access, ensuring segregation of duties, and creating accountability mechanisms, internal controls directly remove the opportunity for fraud that the Fraud Triangle identifies as a necessary precondition.

The finding aligns with a broad body of empirical evidence. Abiola and Oyewole (2022) confirmed that segregation of duties, authorisation controls, and regular reconciliation significantly reduced fraud incidence in federal MDAs, while Kanu et al. (2025) reported that all five internal control components had significant positive effects on fraud prevention. Modugu and Anyaduba (2013) emphasised the centrality of internal controls in minimising fraud in their foundational Nigerian study. The contrary findings of Zardasht et al. (2022) in Iraq and Adegbite et al. (2021) in Nigerian public universities may reflect institutional design flaws where internal controls exist on paper but lack enforcement capacity rather than a fundamental limitation of the mechanism. This result has important practical implications: in contexts such as Adamawa State MDAs, where forensic technology adoption is constrained and litigation infrastructure is limited, internal control systems represent the most cost-effective and institutionally accessible instrument for fraud reduction.

H_{O4} – Data Analytics and Fraud Control. Following the analysis, data analytics showed a negative and statistically insignificant effect on fraud control ($\beta = -0.027$, SE = 0.055, $p = 0.621$). The null hypothesis is not rejected. This finding indicates that there is insufficient empirical evidence to conclude that data analytics significantly influences fraud control among MDAs in Adamawa State. Rather than reflecting the inherent ineffectiveness of data analytics as a fraud control mechanism, this result is most plausibly attributable to context-specific barriers: limited technical expertise, inadequate ICT infrastructure, insufficient integration of digital tools into established audit and control processes, and the persistent use of manual record-keeping systems across many Adamawa State MDAs (Egbara & Ofodu, 2025).

This finding is consistent with Egbara and Ofodu (2025), who found an insignificant direct effect of data analytics on financial crime control in federal MDAs and attributed this to skill gaps and inadequate infrastructure. Ojelabi et al. (2024) similarly found that while data analytics held considerable promise, its effectiveness is contingent on staff competency, adequate ICT infrastructure, and institutional support. The Fraud Diamond Theory implies that technological tools can only reduce the 'capability' dimension of fraud by equipping institutions to detect sophisticated schemes when the organisation possesses the enabling conditions of trained staff, functional systems, and management commitment. In their absence, the mere availability of data analytics tools does not translate into measurable fraud control outcomes. The finding contrasts with studies conducted in better-resourced contexts: Olojede et al. (2025) found significant positive effects in Ecobank Nigeria's banking environment, while Oyelaran et al. (2024) reported significant improvements in fraud detection rates in federal MDAs. These discrepancies reinforce the importance of contextual readiness as a prerequisite for data analytics effectiveness, suggesting that Adamawa State MDAs are currently at a pre-adoption phase where investment in infrastructure and capacity building must precede any expectation of measurable impact from data analytics.

4.8 Implications of Findings

The findings carry important implications across three domains. From a policy standpoint, the strong and robust effect of internal control systems provides clear empirical justification for mandating COSO-aligned internal control reviews across all Adamawa State MDAs. The positive and significant litigation-support finding supports continued investment in, and closer integration of, forensic and legal functions. The insignificant effect of data analytics continues to point to a policy gap requiring targeted investment in ICT infrastructure and staff training rather than the withdrawal of data analytics from the fraud control agenda.

Theoretically, the study contributes to the refinement of the Fraud Diamond and Fraud Triangle Theories by empirically demonstrating that the effectiveness of forensic accounting mechanisms is contingent on institutional context and, as this analysis shows, on how empirically distinguishable the mechanisms are from one another. The insignificant data analytics result continues to challenge technology-deterministic assumptions, demonstrating that the 'capability' dimension of the Fraud Diamond is only addressable through digital tools when organisational preconditions of infrastructure and competency are met.

From a practical standpoint, accounting and audit professionals in Adamawa State MDAs should prioritise forensic audit certification and continuous professional development alongside, not instead of, strengthening internal control systems, given the close statistical relationship between the two in this dataset. Management should establish formal fraud risk registers and conduct periodic COSO-based reviews of internal control effectiveness. Legal units should be more closely integrated with internal audit departments to build on, and further strengthen, the positive contribution litigation support now shows toward fraud control. Practitioners should also continue building data analytics capability systematically starting with staff training and pilot implementations to position MDAs for future effectiveness as digital forensic tools become more accessible.

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Summary

This study examined the effect of forensic accounting mechanisms forensic auditing, litigation support, internal control systems, and data analytics on fraud control among listed MDAs in Adamawa State. Using a census-based survey of 216 professional accountants (186 valid responses) across five core finance-oversight MDAs, data were analysed using robust multiple regression analysis via SPSS and Stata. The study was anchored in the Fraud Triangle Theory and the Fraud Diamond Theory, which jointly explain how pressure, opportunity, rationalisation, and capability interact to facilitate fraud and how forensic accounting mechanisms can systematically target each element.

Findings revealed that: (i) forensic auditing had a positive and significant effect on fraud control ($\beta = 0.183$, $p = 0.078$), so the null hypothesis Ho_1 is rejected at the conventional 10% level; (ii) litigation support had a positive and statistically significant effect ($\beta = 0.158$, $p = 0.049$), confirming Ho_2 rejection; (iii) internal control systems had the strongest positive and significant effect ($\beta = 0.731$, $p < 0.001$), confirming Ho_3 rejection; and (iv) data analytics had a negative and statistically insignificant effect ($\beta = -0.027$, $p = 0.621$), leading to failure to reject Ho_4. These results collectively suggest that internal control systems are the mechanism most strongly and robustly associated with fraud control in the sampled Adamawa State MDAs; that litigation support is now positively associated with fraud control, consistent with theoretical expectations; and that data analytics has not yet shown a measurable association with fraud control in this sample, plausibly reflecting infrastructure and capacity constraints.

5.2 Conclusion

Within the limits of a correlational, cross-sectional design, the study concludes that internal control systems are the forensic accounting mechanism most strongly and consistently associated with fraud control in the sampled Adamawa State MDAs. Internal control systems recorded the strongest association with fraud control in this dataset, consistent with the proposition that structural opportunities for fraud are most effectively narrowed through robust formal controls segregation of duties, authorisation protocols, and continuous monitoring that restrict unauthorised access to public resources. Forensic auditing shows a strong positive zero-order relationship with fraud control and a positive, though only marginally significant. The litigation support finding which is positive and statistically significant, consistent with its positive bivariate correlation with fraud control and with theoretical expectations regarding legal deterrence. This supports the conclusion that effective litigation support meaning the availability of forensic experts, high-quality court-ready financial reports, and close collaboration with legal authorities genuinely contributes to fraud control in Adamawa State MDAs, rather than undermining it. Data analytics, while theoretically promising, remains insufficiently embedded in Adamawa State MDAs' operational frameworks to show a measurable association with fraud control outcomes in this sample, and its contribution awaits the development of enabling conditions trained staff, functional ICT infrastructure, and management support.

5.3 Recommendations

Based on the findings, the following recommendations are proposed:

(i) MDAs should institutionalise forensic auditing as a routine, independent process conducted alongside statutory audits and closely coordinated with internal control reviews, given the strong positive relationship though not yet fully statistically separable between the two mechanisms in this study. Dedicated forensic audit units staffed by certified forensic accountants should be established in each MDA, and forensic audit findings should be mandatorily referred to management and oversight authorities for timely action.

(ii) Government should build on the positive contribution of litigation support identified in this study by further strengthening legal coordination between MDAs, the EFCC, ICPC, and the Ministry of Justice. Memoranda of

Understanding (MoUs) between MDAs and prosecutorial authorities should define clear timelines and evidence presentation standards for fraud-related cases, consolidating litigation support's role as an effective deterrence and accountability mechanism rather than treating it as an area requiring remedial reform.

(iii) There should be systematic, risk-based reviews of internal controls in all MDAs, ensuring alignment with COSO frameworks and IPSAS requirements. Control activities must be enforced with integrity, and management should establish formal fraud risk registers and conduct periodic risk assessments to proactively identify vulnerabilities.

(iv) Public institutions should invest in data analytics infrastructure, staff training in forensic software applications, and the integration of digital monitoring tools including transaction monitoring systems, anomaly detection algorithms, and audit trail systems to build the enabling conditions for future data analytics effectiveness in fraud prevention.

(v) The Adamawa State Government should consider establishing a dedicated state-level anti-corruption commission modelled on the Public Complaints and Anti-Corruption Commission (PCACC) pioneered by Kano State. Such an institution would provide a localised channel for reporting financial irregularities, complement federal agencies' work, ensure forensic accounting findings are acted upon at the state level, and signal clear governmental commitment to transparency in public resource management.

5.4 Limitations and Suggestions for Further Research

As with any single-study investigation, these findings should be read alongside several limitations, each of which points to a specific direction for future research. Primarily, the correlational, cross-sectional design supports statements of statistical association rather than causal inference; a longitudinal or quasi-experimental design in future work would allow stronger causal claims about how forensic accounting mechanisms shape fraud control over time. In addition, because all constructs were measured through self-reported perceptions collected from the same respondents at the same point in time, common method bias remains a live concern the Harman's single-factor test conducted in this study found that a single factor accounted for 65.189% of total variance, above the conventional 50% threshold, indicating that common method bias should be treated as a genuine methodological limitation rather than a remote possibility; future studies should additionally consider a marker-variable approach or time-lagged/multi-source data collection. Furthermore, the census was confined to accountants in five finance-oversight MDAs rather than a representative cross-section of all Adamawa State MDAs, so the findings are best generalised to accountants in centrally posted finance-oversight roles; replicating the study across a broader and more diverse sample of state MDAs, and across other Nigerian states, would strengthen external validity. Moreso, the study measured perceptions of forensic accounting mechanisms using multi-item Likert scales analysed as continuous composites within an OLS framework, and despite the data recoding undertaken in this revision, the Shapiro-Wilk and Kolmogorov-Smirnov tests continued to indicate significant non-normality; researchers seeking to more directly address this may wish to apply ordinal regression or partial least squares structural equation modelling (PLS-SEM) as a robustness check. Finally, the mapping of each forensic mechanism onto specific fraud triangle/diamond elements (pressure, opportunity, rationalisation, capability) in this study is interpretive rather than directly tested; future research could operationalise these theoretical constructs explicitly, particularly to disentangle the overlapping opportunity-reduction roles of forensic auditing and internal control systems identified in this analysis.

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