



Forensic Audit Procedures and Internal Control Effectiveness in Tanzania's Public Sector

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ABSTRACT

Purpose - This study examines the association between forensic audit procedures and perceived enhancement of internal control systems in a large Tanzanian public utility.

Methodology - A cross-sectional survey was administered to personnel in finance, internal audit and management at Tanzania Electric Supply Company Limited (TANESCO) Headquarters. The analysis used 172 responses and combined descriptive statistics with simple linear regression.

Findings - Respondents reported high perceived use of forensic audit procedures ($M = 4.15$, $SD = 0.65$) and high perceived enhancement of internal controls ($M = 4.02$, $SD = 0.71$). Forensic audit procedures were positively associated with internal-control enhancement ($R = .685$, $R^2 = .470$, adjusted $R^2 = .467$; $F(1, 170) = 151.25$, $p < .001$). The estimated slope was positive ($B = .690$, $\beta = .685$, $t = 12.30$, $p < .001$).

Practical implications - TANESCO and comparable public entities should embed risk-based forensic capability, data analytics, evidence-preservation protocols and systematic follow-up within their control-monitoring arrangements while safeguarding internal-audit independence.

Originality/value - The study provides organisation-specific evidence from a strategically important public utility in a setting where empirical work on forensic audit procedures remains limited. Because the measures are self-reported and the design is cross-sectional, the findings establish association rather than causation.

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1. INTRODUCTION

Fraud risk in public organisations has become more difficult to manage as procurement, payment and asset-management processes move into interconnected digital systems. Collusion, management override and the deliberate fragmentation of transactions can defeat controls that appear adequate when tested through periodic, sample-based assurance. Global evidence continues to associate well-designed anti-fraud controls with earlier detection and lower losses, but it also shows that no single control eliminates occupational fraud (Association of Certified Fraud Examiners [ACFE], 2024). The contemporary policy question is therefore not whether conventional audit should be replaced, but how investigative procedures, data analytics and credible reporting mechanisms can be integrated into a coherent fraud-risk-management programme.

Forensic audit procedures differ from routine assurance work in purpose and depth. They are directed towards identifying anomalies, reconstructing transactions, preserving evidence, tracing assets and establishing facts that can support disciplinary, civil or criminal processes. Relevant procedures may include full-population transaction testing, exception analysis, digital-forensic examination, document authentication, structured interviewing and linkage analysis. The 2023 Fraud Risk Management Guide places these techniques within a broader programme that also includes governance, fraud-risk assessment, preventive and detective controls, reporting channels, investigation and corrective action (Committee of Sponsoring Organizations of the Treadway Commission [COSO] & ACFE, 2023). Thus, forensic work is most defensible when it strengthens the full internal-control system rather than operating as an isolated response after losses occur.

This issue is especially salient in state-owned utilities. Such entities combine public-service obligations with high-value procurement, geographically dispersed assets, complex contracting and substantial capital expenditure. In Tanzania, the Controller and Auditor General's consolidated report for public authorities for financial year 2023/24 covered 217 audits and underscores the continuing importance of governance, control, procurement and follow-up arrangements across the public-authority sector (National Audit Office of Tanzania [NAOT], 2025). TANESCO is a critical national utility within this environment. Its operational scale and transaction complexity make the quality of fraud-risk monitoring a matter of organisational stewardship and public confidence.

Evidence on forensic accounting has grown, but much of it comes from private firms, financial institutions or public-sector settings outside East Africa. A systematic review by Kaur et al. (2023) concludes that forensic accounting contributes to fraud detection and prevention, while also identifying fragmented methods and a need for more context-specific empirical work. Recent public-sector studies report that internal audit, internal control and fraud-

prevention arrangements are mutually reinforcing (Nadirisyah et al., 2024) and that organisational, technological and behavioural factors affect fraud-detection capability (Junaidi et al., 2024). These findings are informative, but they cannot simply be assumed to apply to a Tanzanian power utility.

This study addresses that gap by examining whether employees' perceptions of the use of forensic audit procedures are associated with their perceptions of enhanced internal control systems at TANESCO Headquarters. It contributes in three ways. First, it provides evidence from a strategically important public utility. Second, it positions forensic procedures as a complement to internal control and internal audit, rather than treating them as a stand-alone cure for fraud. Third, it offers practical recommendations that recognise contemporary data-analytics opportunities alongside the requirements for independence, competence, due process and management follow-up.

Problem Statement and Research Objective

An internal control system provides reasonable, not absolute, assurance. Even a formally complete system can be undermined by collusion, override, weak segregation of duties, poor-quality data or delayed corrective action. Routine internal and external audits are indispensable, but their assurance objectives, materiality thresholds and periodic testing do not necessarily provide the investigative depth required to reconstruct concealed schemes or preserve evidence for enforcement. The gap is therefore functional: organisations need a credible mechanism that converts anomalies and allegations into well-scoped, legally defensible enquiries and then feeds the resulting control lessons back into risk assessment, control activities and monitoring.

At TANESCO Headquarters, staff in finance, internal audit and management operate close to processes that generate, review and respond to fraud-risk information. Their experience provides an important, though perceptual, basis for assessing whether forensic procedures are embedded in the control environment and whether those procedures are associated with stronger controls. Prior work in other jurisdictions suggests a positive relationship, but organisation-specific evidence remains limited. The study therefore asks: What is the relationship between perceived use of forensic audit procedures and perceived enhancement of internal control systems at TANESCO Headquarters? The objective is to estimate the direction and strength of that association.

2. LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT

3.1 Forensic audit procedures and internal control

COSO's Internal Control-Integrated Framework organises internal control around five interrelated components: control environment, risk assessment, control activities, information and communication, and

monitoring (COSO, 2013). Forensic procedures can contribute to each component. Investigations signal accountability within the control environment; case typologies improve fraud-risk assessment; transaction analytics test control activities; protected reporting and evidence protocols strengthen information flows; and root-cause reviews improve monitoring and remediation. This contribution is iterative: a forensic engagement should not end with identifying an individual allegation, but should also establish why the relevant controls failed and whether similar exposure exists elsewhere.

The technological case for forensic capability is compelling but must be stated carefully. Full-population testing, process mining and anomaly detection can identify patterns that sampling may miss. Digitally preserved audit trails can accelerate transaction reconstruction and support chain-of-custody requirements. Yet an anomaly is not proof of fraud. Benford-type tests and machine-learning scores are screening devices whose results require contextual investigation, corroboration and professional judgement. Poor data quality, opaque models and uncontrolled access to personal information can create false positives, privacy risks and procedural unfairness. The contemporary standard is therefore human-led, risk-based analytics supported by documented rules, validation and escalation protocols, not unreviewed automated accusation (COSO & ACFE, 2023).

A further distinction concerns institutional roles. Internal audit evaluates governance, risk management and control, whereas a forensic investigation may require specialist legal, accounting, interviewing and digital-evidence skills. The Global Internal Audit Standards emphasise competence, appropriate resources, independent positioning and freedom from undue influence (Institute of Internal Auditors [IIA], 2024). A dedicated forensic unit can be valuable, but only if mandates, reporting lines and case-acceptance criteria are clear. In smaller or resource-constrained organisations, an approved panel of internal and external specialists may provide the same capability without creating a duplicative silo.

2.2 Theoretical framework

Agency theory explains why monitoring is necessary when principals and agents have different interests and access to information. In a state-owned enterprise, citizens and the state act as ultimate principals, while managers and employees exercise delegated authority over resources. Information asymmetry can allow agents to conceal self-interested behaviour, creating monitoring and residual losses (Jensen & Meckling, 1976). Forensic audit procedures can reduce this asymmetry by increasing the probability that concealed transactions are reconstructed and by producing evidence that supports corrective action. Their value, however, depends on credible follow-up; detection without consequence does not materially alter agency incentives.

The fraud triangle complements this governance perspective by focusing on perceived

pressure, opportunity and rationalisation (Cressey, 1953). Internal control and forensic monitoring most directly influence opportunity: effective segregation, access controls, exception review and investigation can make concealment more difficult and detection more likely. The model is used here as a practical heuristic rather than a complete causal explanation. Fraud can involve collusion, organisational culture, capability and external networks that extend beyond three individual-level conditions. This broader interpretation supports a system response rather than a narrow focus on employee motivation.

2.3 Empirical evidence and hypothesis

The empirical literature generally reports a positive connection between forensic capability, internal audit quality, fraud prevention and governance. Kaur et al.'s (2023) systematic review identifies investigative accounting, data analysis and litigation-support competence as recurrent contributions to detection and prevention. Nadirsyah et al. (2024), studying the Indonesian public sector, find that internal audit and internal control play important roles in fraud prevention and governance. Junaidi et al. (2024) likewise show that fraud detection in public institutions depends on a combination of organisational and technical conditions. Collectively, the literature suggests complementarity: forensic tools add value when embedded in a functioning control and governance architecture.

However, reported effects vary by mandate, competence, data access, leadership support and enforcement context. Cross-sectional perception studies also risk common-method bias because respondents evaluate both the predictor and outcome. Accordingly, the present study tests an association rather than a causal effect. The proposed hypothesis is: H1: Perceived use of forensic audit procedures is positively associated with perceived enhancement of internal control systems at TANESCO Headquarters.

3. METHODOLOGY

3.1 Research design and setting

The study used a cross-sectional, descriptive-correlational survey design. This designation reflects the evidence reported in the manuscript: quantitative questionnaire responses analysed at one point in time. The design is appropriate for estimating the direction and strength of an association between measured perceptions, but it does not establish temporal ordering or causality. The setting was TANESCO Headquarters in Dar es Salaam, Tanzania.

3.2 Population, sampling and respondents

The target population comprised employees whose work exposes them to financial controls, fraud risk or governance oversight, specifically personnel in Finance, Internal Audit and management. Stratified random sampling was used to represent these functional groups, followed by simple random selection

within each stratum. The analytic sample comprised 172 usable responses, consistent with the regression total degrees of freedom reported in the study ($df = 171$).

3.3 Measures and data collection

Data were collected using a structured questionnaire with five-point Likert response options ranging from 1 (strongly disagree) to 5 (strongly agree). The forensic audit procedures (FAP) construct captured respondents' perceptions of the extent and usefulness of investigative audit practices. The enhancement of internal control systems (EICS) construct captured perceptions that controls, accountability and responses to identified weaknesses had improved. Higher composite scores represented stronger perceived FAP and EICS. Because item-level psychometric statistics were not available in the source manuscript, the results should be read as evidence based on the reported composite measures.

3.4 Data analysis

The data were analysed in SPSS. Means and standard deviations summarised the two composite variables.

Simple ordinary least squares regression estimated the association between FAP (predictor) and EICS (outcome). Model fit is reported using R , R^2 , adjusted R^2 , the standard error of the estimate and the F test. Coefficients are reported as unstandardised B , standardised β and t statistics. Statistical significance was evaluated at $\alpha = .05$, and software output shown as .000 is reported correctly as $p < .001$. Because the design is observational and cross-sectional, terms such as association and prediction are used instead of causal effect.

4. RESULTS

4.1 Descriptive statistics

Respondents reported high levels on both constructs. The mean FAP score was 4.15 ($SD = 0.65$), while the mean EICS score was 4.02 ($SD = 0.71$). On a five-point scale, both means fall between agree and strongly agree, indicating favourable staff perceptions. The modest standard deviations suggest that responses were not widely dispersed, although the summary statistics do not by themselves establish that the procedures caused stronger controls.

Table 1. Descriptive statistics for the study variables

Variable	N	Mean	SD
Forensic audit procedures (FAP)	172	4.15	0.65
Enhancement of internal control systems (EICS)	172	4.02	0.71

Note. Scores range from 1 (strongly disagree) to 5 (strongly agree).

4.2 Regression results

The model summary in Table 2 shows a positive correlation between FAP and EICS ($R = .685$). The model accounted for 47.0% of the observed variance

in EICS ($R^2 = .470$; adjusted $R^2 = .467$). This is substantial explanatory power for a single-predictor perception model, but the proportion should not be interpreted as a causal percentage.

Table 2. Model summary for FAP predicting EICS

Model	R	R^2	Adjusted R^2	SE of estimate
1	.685	.470	.467	.521

Note. Predictor: forensic audit procedures. Outcome: enhancement of internal control systems.

The omnibus regression test was statistically significant, $F(1, 170) = 151.25$, $p < .001$ (Table 3). The data therefore reject the null hypothesis that the estimated slope is zero in the sampled population and support H1.

Table 3. Analysis of variance for the regression model

Source	Sum of squares	df	Mean square	F	p
Regression	41.05	1	41.05	151.25	$< .001$
Residual	46.12	170	.271	-	-
Total	87.17	171	-	-	-

Note. Small differences arising from recomputation may reflect rounding in the source output.

The unstandardised coefficient for FAP was positive ($B = .690$) and statistically significant ($\beta = .685$, $t = 12.30$, $p < .001$). A one-point increase in the FAP composite score was associated with an estimated 0.690-point increase in the EICS composite score. The fitted

equation was $EICS = 1.157 + 0.690(FAP)$. This coefficient describes the sample relationship; it is not evidence that changing FAP alone will mechanically produce the same increase in practice.

Table 4. Regression coefficients for FAP predicting EICS

Predictor	B	β	t	p
Constant	1.157	-	4.89	< .001
Forensic audit procedures	.690	.685	12.30	< .001

Note. B = unstandardised coefficient; β = standardised coefficient.

5. DISCUSSION

The findings support the proposed positive association between perceived use of forensic audit procedures and perceived enhancement of internal control systems at TANESCO Headquarters. The relationship is both statistically significant and practically meaningful within the reported model. Staff who rated forensic procedures more favourably also tended to rate internal-control enhancement more favourably. This result is consistent with the broader literature linking investigative competence, internal audit and fraud-prevention arrangements to stronger governance (Kaur et al., 2023; Nadirsyah et al., 2024).

From an agency perspective, the association is plausible because forensic procedures increase information available to overseers and can raise the expected probability that concealed conduct will be detected. From a fraud-triangle perspective, transaction tracing, access review and credible investigation can reduce perceived opportunity. The results do not, however, demonstrate that monitoring alone resolves agency problems. Management follow-up, sanctions applied through due process, remediation of control weaknesses and oversight by those charged with governance determine whether investigative information changes behaviour.

The 47.0% explained variance should be interpreted as evidence that FAP is an important correlate, not as proof that it is the sole or dominant driver of control quality. Internal control also depends on leadership ethics, staffing, segregation of duties, system configuration, procurement governance, whistleblowing arrangements and the implementation of audit recommendations. In addition, the same respondents rated both constructs. A favourable organisational climate or general confidence in management could inflate the observed relationship. This makes the result a strong basis for further testing and a cautious basis for policy, rather than a causal impact estimate.

The study also supports a more contemporary conception of forensic auditing. The practical value lies less in occasional high-profile investigations than in a repeatable learning cycle: assess fraud risk, analyse relevant data, investigate prioritised anomalies, preserve evidence, identify root causes, remediate

controls and monitor implementation. This cycle aligns with COSO and ACFE's (2023) programme approach and with the IIA's (2024) emphasis on competent, independent and properly resourced assurance. It also addresses a common implementation failure: purchasing analytics software without establishing data ownership, alert thresholds, investigation protocols or accountability for closing findings.

For TANESCO, the implication is not necessarily that every anomaly should become a formal forensic case. A tiered response is more proportionate. Routine exceptions can remain with operational control owners; higher-risk patterns can be escalated to internal audit or a fraud-risk function; and allegations requiring evidentiary reconstruction can be assigned to trained investigators with legal support. This structure protects internal audit's independence, reduces duplication and concentrates scarce specialist resources on cases with the highest potential impact.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

This study finds a strong positive association between forensic audit procedures and perceived enhancement of internal control systems at TANESCO Headquarters. The evidence supports treating forensic capability as an important part of fraud-risk monitoring in a large public utility. It does not justify a claim that forensic procedures alone caused better controls, because the study is cross-sectional, self-reported and based on one organisation. The defensible conclusion is that FAP and perceived control enhancement move together and that this relationship warrants structured implementation and more rigorous evaluation.

6.2 Recommendations

1. Establish an approved forensic capability model. TANESCO should define whether cases will be handled by a dedicated unit, a specialist pool or a co-sourced panel. The charter should specify authority, independence, reporting lines, legal liaison, case acceptance and safeguards against conflicts of interest.

2. Embed risk-based analytics in the control cycle. Priority use cases should focus on high-value procurement, vendor and employee master data, duplicate or split payments, unusual overrides, contract variations and access conflicts. Alerts should be validated and documented before escalation.
3. Strengthen evidence governance. The organisation should adopt protocols for secure data acquisition, chain of custody, access logging, retention, privacy and reproducibility so that analytical findings can withstand disciplinary or legal scrutiny.
4. Invest in multidisciplinary competence. Internal auditors and investigators require continuing development in data analysis, digital evidence, interviewing, procurement fraud, report writing and relevant law. Training should be supported by supervised casework and quality review, not treated as a one-off course.
5. Create a closed-loop remediation process. Every substantiated case should include a root-cause assessment, named control owner, implementation deadline and verification of corrective action. The audit committee or equivalent oversight body should receive trend information without compromising case confidentiality.
6. Evaluate implementation with objective indicators. In addition to staff perceptions, TANESCO should track alert precision, investigation cycle time, recoveries, prevented losses, recurrence, overdue remediation and the proportion of high-risk processes covered by continuous testing.

7. LIMITATIONS AND FUTURE RESEARCH

Four limitations shape interpretation. First, the study concerns one headquarters setting, limiting generalisation to other TANESCO units or public entities. Second, both variables are self-reported perceptions and may be affected by social-desirability and common-method bias. Third, cross-sectional data do not establish whether forensic procedures preceded control improvements; reverse causation is possible because stronger control environments may also support better forensic practice. Fourth, the reported model includes one predictor and the source manuscript does not provide item-level validity, reliability or regression-diagnostic statistics.

Future research should use multi-entity and longitudinal designs, combine staff surveys with administrative outcomes, and test whether leadership support, internal-audit independence, data quality or implementation of audit recommendations moderates the relationship. Quasi-experimental evaluation of phased analytics deployment would provide stronger evidence of impact. Qualitative interviews could also

explain how legal authority, organisational culture and resource constraints affect the conversion of forensic findings into sustainable control improvements.

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