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DIGITAL FORENSICS IN AUDITING: A REVIEW OF GHANA'S PUBLIC SECTOR

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ABSTRACT: *Auditing in the public sector remains vital for accountability, transparency, financial integrity, and economic growth. However, Ghana still faces challenges like procurement irregularities, fund misappropriation, cyber fraud, and weak enforcement of audit recommendations. Traditional audit methods are mainly manual reviews, retrospective reconciliations, and sampling; hence are becoming less effective against complex financial crimes and digital fraud. This study conducts a systematic literature review of over 80 scholarly articles, institutional reports, and policy documents from 2015 to 2025. It also explores how digital forensics can improve public sector auditing in Ghana. Using global and African experiences, the review emphasizes the transformative role of technologies such as big data analytics, artificial intelligence, blockchain, and robotic process automation in detecting fraud, protecting public resources, and building trust. Findings show that while digital forensics offers a proactive, evidence-based way to detect fraud and promote accountability, Ghana faces systemic barriers, including limited technical expertise, weak legal frameworks, institutional resistance, and high implementation costs. The study recommends strategies for capacity building, technology investment, legal reforms, and cultural change in public institutions. Integrating digital forensics into Ghana's audit system could reduce revenue losses, promote fiscal sustainability, and position Ghana as a regional leader in digital public accountability.*

KEYWORDS: Digital forensics, Public sector auditing, Fraud detection, Accountability, Digital transformation.

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INTRODUCTION

Public sector auditing is widely recognised as a vital tool for accountability, transparency, and the careful management of public finances. In developing countries like Ghana, where state revenues are crucial for national development, effective auditing plays a central role in ensuring that resources are not lost through mismanagement, waste, or corruption. The constitutional mandate of the Auditor-General of Ghana, along with Parliament's Public Accounts Committee, reflects this global focus on audit institutions as pillars of governance (INTOSAI, 2020; OECD, 2019). Despite these frameworks, there are ongoing issues of financial irregularities, procurement malpractices, and weak enforcement mechanisms that continue to undermine the integrity of Ghana's public financial management system (Asare, 2022; Transparency International, 2020).

Historically, auditing in Ghana has relied on manual reconciliation, sampling, and retrospective inspections of financial data. Critics are arguing that these methods, although useful for compliance checks, can't catch more complex forms of fraud, especially digitally enabled fraud (Elumilade et al., 2021; Sikka & Lehman, 2015). The Auditor-General has recorded several anomalies in their findings. Unreported spending, procurement violations, and the employment of "ghost workers" on government payrolls are all examples of such practices. In earlier studies (Auditor-General, 2021; Osei-Tutu et al., 2010), these problems were emphasised. According to UNECA (2019) and Oyerogba (2021), these problems endanger economic stability and diminish public trust in government.

As a result of the government of Ghana being digital, auditing has become more complicated. World Bank (2018) and Antipova (2019) state that in order to make things more efficient, transparent, and responsible, the following systems were put in place: Ghana Electronic Procurement System (GHANEPS), Ghana Integrated Financial Management Information System (GIFMIS), and Ghana Integrated Payroll and Personnel Database (GIPPD), which stand for Ghana Integrated Payroll and Personnel Database. However, these systems have also opened new avenues for cyber-enabled fraud, such as unauthorised access, data tampering, and collusion between officials and contractors (Kshetri, 2021; González et al., 2020). For instance, payroll fraud involving ghost names remains an ongoing issue despite electronic payroll systems (Asare, 2022), and procurement irregularities continue to feature prominently in Auditor-General reports even after the adoption of e-procurement (OECD, 2020). Without implementing more sophisticated forensic audit tools, these vulnerabilities are likely to persist.

Globally, digital forensics has become a promising approach to tackling these challenges. A step beyond paper-based verification and sample testing, digital forensics enables auditors to analyse entire electronic datasets. It is defined as the systematic process of collecting, preserving, analysing, and presenting digital evidence in ways that are legally admissible (Casey, 2019; Kessler, 2010). According to Kruse, Heiser, and Strickland (2018) and Quick and Choo (2018), auditors can find hidden fraud schemes with the use of forensic imaging, log analysis, and transaction reconstruction. More and more, digital forensic techniques are being used by Supreme Audit Institutions (SAIs) in Europe, North America, and some areas of Asia to enhance their oversight. In order to improve procurement audits, the UK National Audit Office uses data analytics and blockchain verification (OECD, 2019). On the other hand, e-governance platforms in Estonia that are built on blockchain provide safe audit trails, which greatly decrease the likelihood of data manipulation (World Bank, 2018).

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Another example of how digital forensics has the ability to revolutionise an industry is the use of AI and big data analytics in audits. According to Alles et al. (2018), AI-driven anomaly detection has made continuous auditing and real-time monitoring a reality. Likewise, Casino et al. (2019) demonstrate how auditors might benefit from blockchain applications by ensuring the immutability of records and providing tamper-proof evidence. Jans, Alles, and Vasarhelyi (2014) and Brown-Liburd, Issa, and Lombardi (2015) show how data-driven approaches and process mining can detect fraud predictively, rather than reactively. Appelbaum et al. (2017) and Antipova (2019) note that these innovations have improved accountability and efficiency by cutting down on the time and money needed for conventional auditing processes.

The literature on forensic auditing in Africa indicates a robust interest in the profession alongside considerable challenges to its extensive implementation. Institutional resistance, insufficient training, and weak legal enforcement have curtailed the efficacy of forensic auditing in Nigeria, exposing systematic corruption in public procurement and tax management (Oyerogba, 2021; Okoye & Gbegi, 2013). South Africa cannot effectively apply cutting-edge auditing methodologies due to political interference and capacity constraints (KPMG, 2016; Transparency International, 2020). Digital forensics is a potent tool against fraud; however, its successful application in developing contexts relies on institutional readiness, technical proficiency, and socio-political factors, as evidenced by these cases (Otia & Bracci, 2022; Iipumbu et al., 2023).

In South Africa and Nigeria, there is more scholarly interest in forensic auditing than there is in Ghana. Asare (2022) and Otia and Bracci (2022) exemplify research that fails to thoroughly analyse the entire public sector, favouring financial institutions or the Ghana Revenue Authority (GRA). There is a serious lack of academic discussion and policy action in Ghana since there isn't enough rigorous research on digital forensics in the public sector. There is also a paucity of solid evidence on how digital tools can be used in real life or how they could be used in more government departments, even if the Auditor-General's office has said they could be useful. The high costs of buying and keeping forensic technologies (Antipova, 2019) and the weak legal rules for how digital evidence can be used in court (Kessler, 2010) make this difference even bigger.

In this regard, the study team performed a thorough literature review (SLR) of 80 documents from 2015 to 2025, which included academic journals, government reports, and institutional directives. Its purpose is to compile local and worldwide data about the enhancement of public sector auditing through digital forensics, particularly focusing on the institutional context in Ghana. Three connected questions serve as the basis for the review. First, what is the current state of public sector auditing in Ghana, and what limitations exist in traditional audit approaches for addressing contemporary fraud? Second, what opportunities does digital forensics offer for improving accountability, transparency, and compliance across Ghana's public sector institutions? Third, what institutional, legal, and cultural challenges need to be addressed to enable the effective integration of digital forensics into Ghana's audit framework?

By addressing these questions, the study aims to close an important knowledge gap. While international research has shown the transformative effect of digital forensics on auditing practices (Alles et al., 2018; Casino et al., 2019; OECD, 2019), and African studies have highlighted the increasing need for forensic interventions (Oyerogba, 2021; Elumilade et al., 2021), little work has tailored these insights to Ghana's wider public sector. This research thus contributes by not only summarising evidence but also placing it within Ghana's specific

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institutional challenges and governance setting. In doing so, it offers practical recommendations for policymakers, practitioners, and oversight agencies on how digital forensics can be embedded to enhance accountability and protect public resources.

Ultimately, the argument here is that digital forensics is not just an added technical layer to existing audit practices but a fundamental shift in public accountability. Successful adoption depends on aligning technology, human skills, organisational culture, and legal frameworks in line with the sociotechnical systems view (Trist & Bamforth, 1951; Bostrom & Heinen, 1977). For Ghana, integrating digital forensics into the national audit system could change auditing from a backwards-looking process that records irregularities after they happen into a proactive tool that can detect, prevent, and reduce fraud in real time. Such a change could not only boost fiscal discipline and rebuild public trust but also help Ghana become a regional leader in digital public sector accountability.

METHODOLOGY

This study uses a Systematic Literature Review (SLR) to gather information on how digital forensics improves public sector audits worldwide and in Ghana. SLR was chosen because present research focused on financial institutions or tax authorities in Africa, leaving broader public sector implications unexplored. By combining academic and grey literature, the report gives a comprehensive and repeatable review of Ghana's audit framework's digital forensics adoption trends, difficulties, and possibilities.

Research Design

The research employs a systematic literature review to synthesize empirical evidence. The SLR methodology ensures transparency and repeatability by facilitating the systematic identification, appraisal, and incorporation of relevant studies. The review procedure was governed by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework. This enabled the development of a methodical strategy for literature selection, the reduction of bias, and the improvement of methodological integrity.

The research reviewed multiple electronic databases to ensure gathering comprehensive data. Major and credible databases such as Scopus, Web of Science, ProQuest, JSTOR, and Google Scholar were used. All of these are good venues to get peer-reviewed academic sources. The review incorporated grey literature to derive practice-oriented insights, including Auditor-General's reports from Ghana, INTOSAI and AFROSAI-E guidelines; OECD publications, World Bank reports, Public Accounts Committee proceedings, and policy papers from the Ministry of Finance and the Ghana Audit Service. This triangulation of sources guaranteed that the evaluation included both theoretical contributions and practical experiences relevant to the Ghanaian context.

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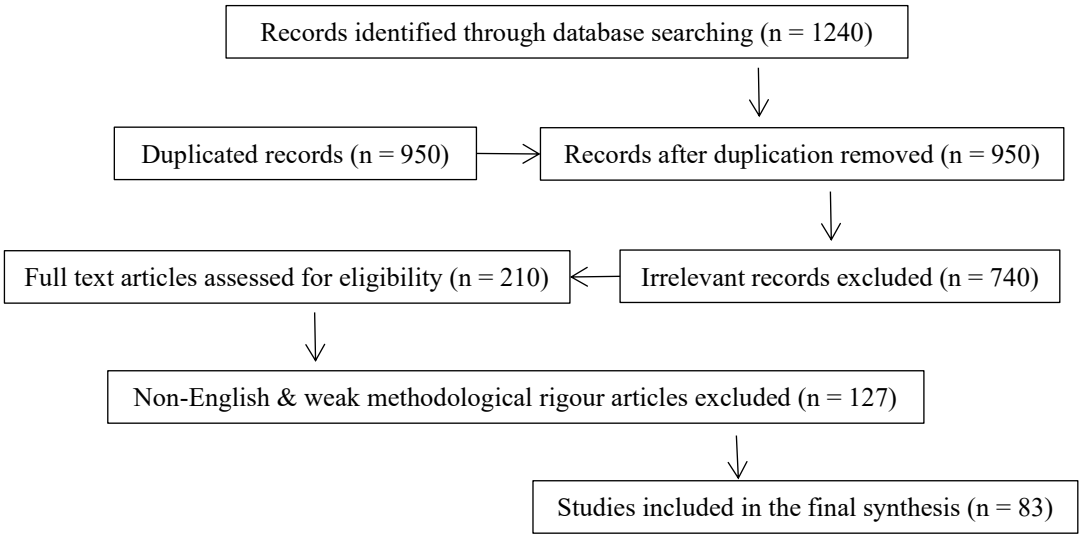
Search Strategy and Review Process

"Ghana Audit Service," "GIFMIS," "GHANEPS," "forensic auditing," "public sector auditing," "fraud detection," and "supreme audit institutions" were among the terms used in the search, which also made use of Boolean operators. This evaluation looked at the years 2015–2025, which is a whole decade of major digital change in the way Ghana's public finances are handled. The initial search retrieved 1,240 records, which were refined through a four-stage PRISMA process: identification, screening, eligibility, and inclusion. Duplicate entries, non-English texts, and sources lacking methodological rigour were excluded. Ultimately, 83 studies and reports were included in the final synthesis.

Figure 1 is a PRISMA flow diagram that illustrates the review process:

Figure 1. PRISMA flow diagram for the literature review process



Data Extraction and Analysis

The selected studies were reviewed using thematic analysis. Key themes included: (i) limitations of traditional audit approaches in detecting digital fraud; (ii) opportunities offered by digital forensics, including big data analytics, artificial intelligence, and blockchain; (iii) contextual challenges faced in developing economies such as cost, auditor skills, and the legal admissibility of digital evidence; and (iv) comparative international lessons relevant to Ghana. Each theme was coded and refined iteratively to ensure alignment with the study's research questions. Special attention was given to Ghana-specific evidence from Auditor-General's reports and policy documents to ground the findings in the local institutional environment.

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RESULTS

The systematic literature review identified a total of 83 peer-reviewed journal articles, institutional reports, and policy documents published between 2015 and 2025. The distribution of sources reflected both the breadth of global scholarship on digital forensics and the emerging, though still limited, body of research specific to Africa and Ghana. Approximately 45 percent of the included studies (n = 37) came from global and comparative perspectives, focusing on innovations such as blockchain-enabled audit trails, artificial intelligence–driven anomaly detection, and the integration of big data analytics into public financial oversight. These studies laid a conceptual and technological foundation for understanding how digital forensics can transform auditing systems in advanced governance contexts. A further 30 percent (n = 25) originated from African settings, including Nigeria, South Africa, and Kenya, where forensic auditing has been used to uncover corruption and procurement fraud but has often faced limitations due to institutional resistance, insufficient capacity, and weak enforcement mechanisms. The remaining 25 percent (n = 21) concentrated on Ghana's public sector, drawing from Auditor-General's reports, Ministry of Finance policy documents, AFROSAI-E assessments, and scholarly analyses of public financial management reforms such as GIFMIS, the Ghana Integrated Payroll and Personnel Database (GIPPD), and the Ghana Electronic Procurement System (GHANEPS).

To ensure analytical clarity, these diverse sources were synthesised into three broad domains of evidence that align with the study's research questions. First, the review examined global developments in digital forensics and public sector auditing, highlighting technological innovations and institutional models that demonstrate the transformative potential of forensic approaches. Second, it assessed regional experiences within Africa, where forensic auditing has gained traction but remains unevenly applied, revealing both opportunities and systemic barriers in governance systems similar to Ghana's. Thirdly, the review zeroed in on the public sector in Ghana, drawing on the findings of the Auditor-General, grey literature, and audit cases that were specific to certain sectors to show how financial irregularities persist, how digitisation reforms present opportunities, and how obstacles to forensic technology adoption prevent their widespread use.

This tripartite structure ensured that the findings not only documented what is happening globally but also contextualised international best practices within regional realities and Ghana's specific institutional environment. The synthesis, therefore, directly addressed the guiding questions of the study, which are as follows:

(i) what are the limitations of traditional audit approaches in 'the Ghanaian context?

(ii) What opportunities does digital forensics offer for strengthening accountability?

(iii) What institutional, legal, and cultural factors must be addressed for successful adoption?

Figure 2 provides the geographical distribution of studies. The distribution is categorised into global (44.6%), Africa (30.1%), and Ghana (25.3%).

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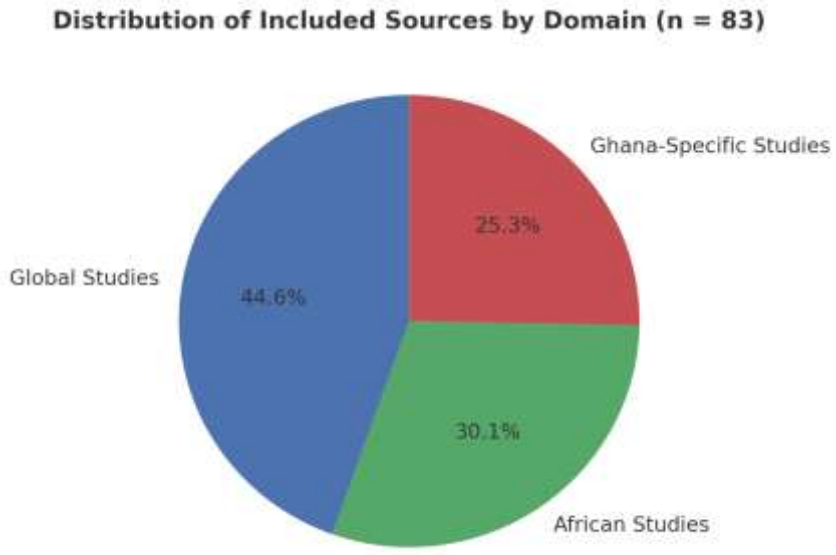
Figure 2: Distribution of the 83 included sources by domain



Global Insights: Digital Forensics and Public Sector Auditing

The literature worldwide reveals a clear change in how people think about and do public sector auditing. Auditing in many advanced economies has shifted from compliance checks and retrospective reviews to real-time, technology-driven supervision, with digital forensics emerging as a crucial component of this transformation (Casey, 2019; Alles, Brennan, Kogan, & Vasarhelyi, 2018). Digital forensics, which is the collection, preservation, analysis, and legal presentation of electronic evidence (Kessler, 2010), has made audit work more than just manual reconciliations and paper records. It now includes full analysis of electronic transactions, metadata, and system logs.

Technological Innovations in Audit Practice

The integration of artificial intelligence (AI), blockchain, and big data analytics into forensic auditing represents a significant improvement in global audit practice. Alles et al. (2018) contend that AI-driven anomaly detection facilitates continuous auditing, permitting the identification of abnormalities in real-time rather than during retrospective evaluations months later. Jans, Alles, & Vasarhelyi (2014) underscore the efficacy of process mining techniques in reconstructing audit trails and identifying fraudulent trends within extensive and intricate datasets.

Blockchain, renowned for its immutability and transparency, has undergone evaluation in audit environments throughout Europe and Asia. Casino, Dasaklis, and Patsakis (2019) demonstrate that blockchain ensures immutable audit trails, providing auditors with digital data that cannot be modified without detection. The World Bank (2018) identifies Estonia's e-governance approach as a global standard, wherein blockchain-based registries provide safe, auditable, and citizen-accessible records of governmental transactions. These examples illustrate how technology is altering both the evidentiary basis and the extent of audit activities.

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Supreme Audit Institutions (SAIs) and Digital Forensics

Globally, Supreme Audit Institutions have begun utilising digital forensics to hold governments to account. According to Brown-Liburd, Issa, and Lombardi (2015), forensic data analytics are used by the United States Government Accountability Office (GAO) to track down welfare and procurement system fraud, identify recipients who are either fake or duplicates, and monitor federal programs. Blockchain verification and data analytics platforms are employed by the UK's National Audit Office (NAO) to oversee large-scale procurement initiatives (OECD, 2019).

The International Organisation of Supreme Audit Institutions has issued recommendations on forensic analytics and big data in recognition of the significance of technology-driven auditing in the battle against illicit financial flows, tax evasion, and cross-border fraud (INTOSAI, 2020). According to these principles, digital forensics allows SAIs to shift from reactive audits to proactive governance, which involves detecting and reducing risks before they cause financial losses.

Impact on Efficiency, Accountability, and Public Trust

Global studies underscore the fact that digital forensics enhance the efficiency and rapidity of audits, as well as fraud detection. Complete datasets are analysed rather than samples, as demonstrated by Appelbaum, Kogan, and Vasarhelyi (2017), which reduces the duration of an audit and the probability of disregarding irregularities. The utilisation of forensic methods has also been associated with an increase in citizen trust in governance, as transparent, data-driven investigations provide more robust evidence against corruption (OECD, 2020). For instance, Estonia's public confidence in government has increased in tandem with the heightened visibility of blockchain-secured audit systems (World Bank, 2018).

Challenges and Limitations

Despite its successes, global evidence shows ongoing challenges. Casey (2019) points out that digital forensic investigations demand costly tools (such as EnCase, FTK, and X-Ways) and highly specialised skills that are not always accessible even in advanced economies. Kessler (2010) emphasises legal issues, especially the admissibility of digital evidence in courts, which often fall behind technological developments. Institutional resistance to change remains a concern worldwide; as Sikka & Lehman (2015) state, deeply rooted organisational cultures may oppose forensic methods that reveal hidden networks of corruption.

Furthermore, while AI and blockchain offer objectivity and accuracy, they also raise concerns about algorithmic bias, data privacy, and cybersecurity vulnerabilities (González, De Fuentes, & Ribagorda, 2020). This highlights that technology alone does not ensure accountability—successful outcomes rely on supportive legal, institutional, and ethical frameworks.

Lessons for Emerging Economies

The global evidence base offers at least three lessons for countries such as Ghana. First of all, technology adoption must be combined with institutional reform. Forensic tools are only effective if they are integrated within audit institutions that have the independence, mandate, and resources to act on findings. In addition, capacity building is essential. The successes of GAO, NAO, and Estonia demonstrate that forensic adoption relies on ongoing auditor training

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and multidisciplinary expertise in law, IT, and finance. More so, transparency and citizen engagement enhance impact. When forensic audits are publicised and accessible, as in Estonia, they boost not only compliance but also public trust in governance.

African Experiences: Opportunities and Challenges

African literature on digital forensics and public sector auditing highlights both increasing interest and notable structural challenges. Although numerous countries have initiated digitisation efforts in public financial management, the implementation of forensic auditing varies widely, influenced by governance capacity, institutional independence, and legal structures. Nigeria, South Africa, and Kenya are the primary cases discussed in academic discourse, along with regional efforts like AFROSAI-E.

Nigeria: Expanding Forensic Practice but Weak Enforcement

Nigeria has served as a prominent example in Africa's forensic auditing literature. Okoye & Gbegi (2013) illustrate how forensic accounting tools were used to detect procurement fraud and financial mismanagement in government ministries and parastatals. Likewise, Oyerogba (2021) highlights the contribution of forensic auditing in identifying tax evasion, fraudulent procurement, and payroll irregularities.

But both researchers point out a problem that keeps coming up: the insufficient enforcement of audit recommendations. Forensic audits often reveal extensive fraud; but, political influence and legal delays hinder charges. Resistance from established elites within institutions diminishes the practical efficacy of forensic evidence. Research highlights the dichotomy in Nigeria's context: it demonstrates the efficacy of forensic methods while simultaneously indicating that, in the absence of governance reforms, their findings rarely lead to accountability. (Transparency International, 2020).

South Africa: Advanced Tools Amidst Institutional Capture

South Africa has been acknowledged as one of the most advanced adopters of forensic audit technologies in Africa. According to KPMG (2016), the Auditor-General of South Africa (AGSA) and private audit firms employ forensic data analytics to identify irregular procurement, fraudulent invoicing, and collusion in public contracts. The utility of digital auditing tools is further demonstrated by the integration of forensic techniques into investigations of state-owned enterprises (SOEs) like Eskom and Transnet. However, Transparency International (2020) and UNECA (2019) emphasise that South Africa's effectiveness has been degraded by institutional capture and corruption at the topmost levels of government, despite its technical capacity. Enforcement is impeded by political protection of key individuals, even when forensic evidence reveals misconduct. This demonstrates that forensic capacity alone is insufficient in the absence of political will and independent institutions.

Kenya: Digitisation Without Forensic Integration

Another notable example is Kenya, which has transformed its financial systems and e-procurement practices through the use of information and communication technology. The Integrated Financial Management Information System (IFMIS) in Kenya was an effort to guarantee openness and electronic audit trails; it was highlighted by UNECA (2019). However,

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research into procurement scandals (such as the corruption cases involving the National Youth Service) has shown that forensic auditing was underutilised and that anomalies persisted even after the use of digital systems.

According to Otia and Bracci (2022), a key difference is shown by Kenya's experience: forensic auditing and digitalisation are different. Systematised forensic capability, including tools, training, and regulatory frameworks, is crucial for ensuring that digital systems do not introduce new, more complicated fraud risks that human audits are ill-equipped to uncover.

Regional Initiatives: AFROSAI-E and Capacity Building

Regional organisations have acknowledged the imperative of expanding forensic audits beyond the limitations of sovereign states. The African Organisation of English-Speaking Supreme Audit Institutions (AFROSAI-E) has created guidelines, training manuals, and means for its member Supreme Audit Institutions (SAIs) to share information so they can do better at forensic work (AFROSAI-E, 2020). The goal of these operations is to make forensic methodologies more consistent, help auditors better handle digital evidence, and fill in the gaps in national assessments.

AFROSAI-E programs have had varying effects in different places. Some SAIs have included forensic techniques to their audit manuals, but others still have issues since they don't have the money or the required tools to utilise them correctly. According to Iipumbu, Nhamu, and Chitauro (2023), many African auditors have trouble balancing their old audit tasks with the new ones that need them to collect forensic evidence. This often means they have to collaborate with the police and the courts.

Key Themes Emerging from African Evidence

The African literature points to three recurring themes. Firstly, potential vs. practice gap: forensic audits have exposed major fraud in Nigeria, South Africa, and Kenya, but enforcement and follow-through remain weak. Secondly, institutional constraints: even where tools exist, political interference, corruption, and lack of independence in SAIs undermine forensic impact. Thirdly, capacity building needs: regional bodies like AFROSAI-E provide training and frameworks, but adoption remains limited by skills shortages and financial constraints.

Implications for Ghana

The evidence from Africa offers valuable lessons for Ghana. Firstly, adopting technology without accompanying institutional reforms—like in Kenya—will not ensure accountability. Secondly, forensic evidence needs to be supported by independent enforcement mechanisms; otherwise, it may lead to a Nigerian-style issue where exposure occurs, but no action follows. Thirdly, regional efforts such as AFROSAI-E offer a solid foundation that Ghana can use to strengthen its own forensic capabilities.

Ghanaian Context: Persistent Irregularities and Emerging Reforms

Ghana’s public sector reflects a microcosm of the wider African experience—digitisation reforms are progressing, but forensic integration into auditing remains limited. The literature and Auditor-General’s reports highlight both ongoing irregularities and the emerging potential of digital forensics to enhance oversight.

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Persistent Financial Irregularities in Auditor-General Reports

Annual reports from the Auditor-General consistently highlight systemic weaknesses in Ghana's public financial management. For example, the 2023 Auditor-General's Report on Public Boards, Corporations, and Statutory Institutions documented irregularities amounting to GH¢8.8 billion, mainly due to procurement breaches, payroll anomalies, and unaccounted-for expenditures. Previous reports covering ministries, departments, and agencies (MDAs) identified recurring issues such as payroll fraud — including "ghost names" and double salaries within the Ghana Integrated Payroll and Personnel Database (GIPPD). In addition, procurement violations include non-competitive tendering, splitting of contracts, and inflated pricing across ministries and SOEs (Osei-Tutu, Boadu, & Owusu, 2010). Further, revenue leakages — particularly in state-owned enterprises such as the Electricity Company of Ghana (ECG) and Ghana Cocoa Board (COCOBOD), where billing irregularities and unaccounted-for cocoa revenues were documented. Also, unsupported expenditures across MDAs are often linked to weak internal controls and poor documentation.

These findings highlight the limitations of traditional auditing, which depends on sample testing and retrospective reconciliations that cannot sufficiently detect irregularities embedded within digital financial systems.

State-Owned Enterprises (SOEs) as Risk Hotspots

SOEs have consistently been identified in both academic and policy analyses as high-risk zones for financial misconduct. The 2021 Auditor-General's Report documented irregularities in SOEs worth billions of Ghana cedis, such as procurement issues at COCOBOD and contract mismanagement at ECG. Likewise, investigations into the Social Security and National Insurance Trust (SSNIT) uncovered problems with IT system investments and payroll verification failures. These examples demonstrate the extensive and complex nature of financial irregularities in entities heavily reliant on electronic transactions, underscoring the urgent need for digital forensic tools to examine electronic trails.

Sectoral Irregularities: Education, Health, and Procurement

Beyond SOEs, sectoral audits further underscore Ghana's vulnerabilities in the education and health sectors and procurement generally. Audits have revealed procurement irregularities in textbook supply and ghost teachers on payroll, despite the existence of electronic HR systems. Also, audits show persistent issues with procurement of medical supplies, uncompetitive tenders for infrastructure projects, and mismanagement of donor funds. Moreover, public procurement generally continues to dominate audit findings. Despite the rollout of the Ghana Electronic Procurement System (GHANEPS), Auditor-General reports still document contract splitting, inflated bids, and lack of due diligence in vendor selection. These sectoral irregularities persist because digital platforms have not yet been paired with systematic forensic analysis capable of flagging anomalies in real-time.

Digitisation Reforms: GIFMIS, GIPPD, and GHANEPS

Ghana has made significant progress in digitising public financial management. The Ghana Integrated Financial Management Information System (GIFMIS) offers a platform for budget execution and reporting across MDAs, enhancing transparency and consistency in data collection (World Bank, 2018). The GIPPD was created to prevent payroll fraud by centralising

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personnel records, while GHANEPS digitises procurement to boost competition and traceability.

However, studies (Asare, 2022; Otia & Bracci, 2022) indicate that these platforms remain underused in forensic auditing. Although they produce detailed datasets, auditors often lack the capacity, tools, or authority to perform log analysis, metadata examination, or anomaly detection. In effect, digitisation has increased the volume and complexity of public sector data, but the audit culture has not yet adapted to fully utilise forensic possibilities.

Barriers to Digital Forensic Adoption in Ghana

The Ghanaian evidence highlights three major barriers, including capacity gaps, legal constraints, and institutional resistance. Auditors in the Ghana Audit Service are primarily trained in traditional financial methods, with limited exposure to forensic tools such as EnCase, FTK, or process mining software (Antipova, 2019; Kshetri, 2021). Also, Ghana's Evidence Act and cybercrime legislation do not fully address the admissibility of digital evidence in court, limiting the utility of forensic findings (Kessler, 2010). Studies note that entrenched bureaucratic cultures and vested interests resist reforms that would expose systemic corruption (Sikka & Lehman, 2015).

Emerging Opportunities for Forensic Integration

Despite these barriers, Ghana is well-positioned to incorporate digital forensics into its audit framework. The Auditor-General is increasing focus on technology-based audits, along with support from the World Bank and AFROSAI-E, and establishes a basis for capacity enhancement. Sector-specific cases—such as eliminating payroll "ghost names" and reviewing electronic procurement—highlight the potential effectiveness of forensic techniques when applied. Furthermore, Ghana's commitment to digitisation provides the necessary infrastructure for forensic analysis; the missing element is institutionalisation. Table 1 presents the audit approach, technology adoption, key opportunities, challenges, and impact on accountability of various studies analysed.

Table 1: Comparative Analysis of Digital Forensics Studies on Public Sector Auditing

Themes	Global	Africa	Ghana
Audit Approach	Shift from retrospective, sample-based audits to real-time, data-driven auditing using AI, blockchain, and big data.	Traditional audits supplemented by some forensic methods, but adoption uneven (Nigeria, South Africa, Kenya).	Dominated by retrospective manual audits; Auditor-General reports highlight recurring irregularities.
Technology Adoption	Advanced adoption of AI, blockchain, process mining, forensic imaging (US GAO, UK NAO, Estonia).	Growing but limited use of forensic data analytics and e-procurement tools.	Digitisation reforms (GIFMIS, GIPPD, GHANEPS) but limited forensic integration.

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Key Opportunities	Continuous auditing, predictive fraud detection, immutable audit trails, enhanced public trust.	Exposure of procurement fraud and payroll anomalies; AFROSAI-E training initiatives.	Rich datasets from digitised systems could enable forensic log analysis and real-time fraud detection.
Key Challenges	High costs of forensic tools, legal admissibility issues, algorithmic bias, institutional resistance.	Weak enforcement of findings, political interference, limited technical capacity, underfunded SAIs.	Capacity gaps, legal constraints on digital evidence admissibility, bureaucratic resistance.
Impact on Accountability	Strengthened fraud detection, increased efficiency, improved citizen trust in governance.	Forensic audits expose corruption but often fail to lead to prosecutions or systemic reforms.	Potential to transform accountability if digital forensics is embedded in Ghana Audit Service and SOEs.

DISCUSSION

This review reveals a growing gap between traditional public sector auditing and the needs of a digital governance environment. Although Ghana has advanced in implementing electronic financial management systems, the lack of systematic digital forensic auditing allows irregularities to persist, undermining accountability. There are significant opportunities and significant challenges to integrating digital forensics, as shown by comparing these findings with global and African experiences.

Global Lessons for Public Sector Auditing

Global data indicates that digital forensics has become an essential component of contemporary public sector audits. Supreme Audit Institutions (SAIs) in advanced economies employ technology such as blockchain, artificial intelligence (AI), and big data analytics to identify anomalies and enhance oversight. The United Kingdom's National Audit Office utilises blockchain verification for procurement contracts to guarantee the integrity of records (OECD, 2019). Estonia's e-governance framework, supported by blockchain-secured registries, has significantly diminished potential for fraud and enhanced citizen trust (World Bank, 2018). The Government Accountability Office (GAO) in the United States uses forensic data analytics to oversee federal programs and detect duplicate beneficiaries or fraudulent vendors (Brown-Liburd, Issa, & Lombardi, 2015).

These instances illustrate that digital forensics transforms auditing from a retrospective compliance function into a proactive risk management instrument. According to Alles, Brennan, Kogan, and Vasarhelyi (2018), AI-driven anomaly detection facilitates real-time auditing and predictive monitoring. Similarly, Casino, Dasaklis, & Patsakis (2019) show that blockchain-enabled systems provide tamper-proof audit trails, offering reliable evidence for accountability. However, global studies also highlight ongoing challenges, including high costs of forensic tools (Casey, 2019), legal admissibility of digital evidence (Kessler, 2010), and concerns around data privacy and algorithmic bias (González, De Fuentes, & Ribagorda, 2020).

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For Ghana, these lessons provide a roadmap: investment in technology must be matched by reforms in training, law, and institutional independence to achieve meaningful accountability.

African Experiences and Their Relevance to Ghana

African case studies illustrate both the potential and challenges of forensic auditing. In Nigeria, forensic accounting has uncovered procurement fraud and payroll irregularities (Okoye & Gbegi, 2013; Oyerogba, 2021). However, weak enforcement of audit findings, political interference, and judicial delays have often hindered accountability (Transparency International, 2020). The utilisation of forensic data analytics by state-owned firms such as Eskom and Transnet exemplify South Africa's superior forensic auditing capabilities (KPMG, 2016). However, due to widespread corruption and "state capture," forensic evidence has had limited impact; sanctions have not been imposed in many exposed cases (UNECA, 2019).

Kenya's Integrated Financial Management Information System (IFMIS) and e-procurement reforms established audit trails but lacked integration with forensic methodologies. As Otia & Bracci (2022) note, digitisation without forensic analysis created complex fraud opportunities that remained undetected, such as those documented in the National Youth Service scandal.

AFROSAI-E has worked to strengthen the capacity of African Supreme Audit Institutions (SAIs) through training in forensic data analytics and digital evidence management (AFROSAI-E, 2020). Despite these efforts, adoption levels vary, and many SAIs continue to face challenges due to a lack of infrastructure or necessary skills to fully utilise forensic methods (Iipumbu, Nhamu, & Chitauro, 2023).

For Ghana, these African experiences highlight three lessons: (i) technology adoption must be coupled with enforcement; (ii) forensic findings must be shielded from political interference; and (iii) capacity-building through regional platforms is vital for scaling up.

Ghanaian Context and Implications

The Ghana-specific findings confirm that irregularities remain widespread despite digitisation reforms. Auditor-General reports consistently document procurement breaches, payroll fraud, and unaccounted-for expenditures. The 2023 Auditor-General's Report on Public Boards and Corporations revealed irregularities totalling GH¢8.8 billion, mainly involving procurement and administrative lapses. Payroll audits also continue to uncover "ghost names" on the government payroll, despite the Ghana Integrated Payroll and Personnel Database (GIPPD) (Auditor-General, 2021).

State-Owned Enterprises (SOEs) such as the Electricity Company of Ghana (ECG), the Ghana Cocoa Board (COCOBOD), and the Social Security and National Insurance Trust (SSNIT) have been highlighted for revenue leakages, weak contract management, and IT system failures (Asare, 2022). In the health and education sectors, audits have identified irregularities in the procurement of medical supplies and ghost teachers, respectively (Osei-Tutu, Boadu, & Owusu, 2010).

Digitisation initiatives such as the Ghana Integrated Financial Management Information System (GIFMIS) and the Ghana Electronic Procurement System (GHANEPS) have generated structured datasets that could support forensic analysis (World Bank, 2018). However, the Ghana Audit Service has not yet systematically adopted forensic tools such as log analysis,

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anomaly detection, or metadata examination (Otia & Bracci, 2022). Instead, audits remain largely manual and retrospective, restricting their ability to detect fraud in real-time.

The barriers identified include capacity gaps (Antipova, 2019), legal constraints regarding the admissibility of digital evidence (Kessler, 2010), and institutional resistance to reforms that might expose entrenched corruption (Sikka & Lehman, 2015). Nevertheless, opportunities exist: Ghana's strong digitisation drive, combined with support from the World Bank and AFROSAI-E, provides the infrastructure and frameworks needed to integrate digital forensics into national audit practices.

Addressing the Research Questions

Limitations of traditional audits in Ghana: Traditional audits are still manual, retrospective, and sample-based, and therefore fail to detect irregularities in digitised systems. Auditor-General reports highlight recurring procurement breaches, payroll anomalies, and revenue losses, demonstrating the inadequacy of current methods.

Opportunities of digital forensics: Digital forensics enables comprehensive testing, metadata analysis, blockchain verification, and predictive fraud detection. As shown worldwide, forensic integration can elevate Ghana's audit function from a mere compliance task to an active system for preventing fraud.

Institutional, legal, and cultural barriers: Ghana faces auditor capacity deficits, weak evidence laws, and resistance from bureaucratic and political actors. Without reforms in training, law, and institutional independence, forensic adoption risks to be symbolic rather than transformative.

Synthesis and Policy Implications

The comparative evidence indicates that although Ghana faces similar challenges as other African nations, its digitisation initiatives offer a distinctive chance to leapfrog into proactive forensic auditing. The main policy implications include capacity building—investment in forensic auditing training for staff of the Ghana Audit Service and SOEs is critical. Additionally, legal reforms—updating the Evidence Act to explicitly recognise digital evidence would strengthen the prosecutorial impact of forensic findings. Furher, institutional reforms—ensuring the independence of the Auditor-General and enforcing Public Accounts Committee recommendations would reduce political interference. Moreover, technology investment—adoption of forensic tools (AI-driven analytics, blockchain, process mining software) would unlock the value of datasets from GIFMIS, GIPPD, and GHANEPS. If effectively implemented, these reforms could minimise revenue leakages, enhance accountability, and establish Ghana as a regional leader in digital public sector auditing.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study examined the role of digital forensics in enhancing public sector auditing in Ghana by reviewing 83 scholarly articles, institutional reports, and policy documents from 2015 to 2025. The results show that although Ghana has advanced in digitising its public financial

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management—using systems like GIFMIS, GIPPD, and GHANEPS—the full advantages of these reforms are limited by a lack of systematic digital forensic auditing.

At the global level, data from advanced economies such as the United States, the United Kingdom, and Estonia show that digital forensics revolutionises auditing by enabling real-time fraud detection, creating tamper-proof audit trails, and rebuilding public trust. In Africa, countries like Nigeria, South Africa, and Kenya demonstrate both the possibilities and challenges of forensic auditing, especially dealing with issues like weak enforcement, political meddling, and lack of capacity. Ghana's situation reflects similar problems: Auditor-General reports still expose procurement violations, payroll irregularities, and revenue losses despite digitisation efforts.

The synthesis of evidence results in three key conclusions. Firstly, traditional auditing methods in Ghana are inadequate to tackle the complexities of fraud in a digital environment. Secondly, digital forensics offers transformative opportunities to improve accountability, efficiency, and transparency in public sector governance. Thirdly, institutional, legal, and cultural obstacles currently impede its adoption, encompassing deficiencies in auditor competency, antiquated evidentiary statutes, and opposition to reform.

For Ghana, the incorporation of digital forensics is not merely an optional improvement but a strategic need to protect public resources, boost fiscal sustainability, and cultivate citizen trust in governance.

Recommendations

Based on the findings and discussion, the following recommendations are suggested.

Capacity Building and Professional Development: The Ghana Audit Service and other oversight bodies should put money into specialised training programs for cyber investigations, data analytics, and digital forensics. Also, collaborations with universities and professional organisations should be encouraged to develop certification programs in forensic auditing specifically designed for the Ghanaian environment.

Legal and Regulatory Reforms: The admissibility of digital evidence in judicial proceedings should be expressly recognised by Ghana's Evidence Act and related laws. In order to guarantee that forensic discoveries are translated into accountability, sanctions that are more severe should be implemented for noncompliance with audit recommendations.

Institutional Strengthening: The Auditor-General's independence should be strengthened by giving them enough money and people to work with, which will make them less likely to be influenced by politics. The Public Accounts Committee (PAC) should always follow up on the Auditor-General's reports to make sure that the recommendations are carried out.

Investment in Technology and Infrastructure: The state should allocate dedicated funding for acquiring forensic tools (e.g., EnCase, FTK, AI-driven anomaly detection software, blockchain applications). Integration of forensic analytics into existing platforms such as GIFMIS, GIPPD, and GHANEPS should be prioritised to maximise the value of existing digitisation reforms.

Regional and International Collaboration: Ghana should leverage AFROSAI-E and INTOSAI platforms for knowledge sharing, joint training, and technical support. Bilateral partnerships

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with SAIs in countries with advanced forensic capacity, such as Estonia or the UK, could support peer learning and mentorship.

Public Engagement and Transparency: Forensic audit reports should be made accessible to the public to foster transparency and strengthen citizen trust. Civil society organisations and media should be engaged as accountability partners in disseminating and monitoring forensic audit outcomes.

DIRECTIONS FOR FURTHER RESEARCH

While this study offers a comprehensive overview of global, African, and Ghanaian literature on digital forensics in public sector auditing, several gaps still need further academic and policy-related investigation.

Most existing Ghanaian literature depends largely on Auditor-General reports and secondary data. There is a lack of empirical research on how digital forensic tools can be practically implemented within Ghana's ministries, departments, agencies (MDAs), and state-owned enterprises (SOEs). Future studies should focus on case studies and pilot projects involving forensic analytics in institutions like the Electricity Company of Ghana (ECG), Ghana Cocoa Board (COCOBOD), and Social Security and National Insurance Trust (SSNIT).

The admissibility of digital evidence remains a grey area in Ghana's legal system. While global studies highlight legal frameworks supporting forensic evidence, Ghana-specific research on how the Evidence Act and cybercrime legislation interact with forensic auditing is limited. Future work should explore legal reforms needed to ensure forensic findings lead to effective prosecutions.

Most African studies concentrate on Nigeria, South Africa, and Kenya. Comparative research including Ghana and other West African nations (e.g., Sierra Leone, Liberia, Côte d'Ivoire) would offer valuable insights into how regional settings influence the adoption and success of forensic auditing. This would also enhance Ghana's engagement in AFROSAI-E and similar regional knowledge-sharing platforms.

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