Fairness

Vol 01 (1) 2025 P. 47-63

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Received 25 April 2025;
Accepted 24 May 2025;
Published 28 May 2025.

Conflict of interest statement:
Author(s) reported no conflict of interest

DOI: http://doi.org/10.70764/gdpu-fr.2025.1(1)-04

FORENSIC AUDITING IN FRAUD DETECTION AND PREVENTION: INTEGRATION OF TECHNOLOGY, INTERNAL AUDIT, AND ANTI-FRAUD REGULATION

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ABSTRACT

Objective: This study aims to analyze fraud trends and patterns in the banking and corporate sectors, evaluate the effectiveness of internal audits in detecting fraud, and examine the role of technology and regulation in improving audit fraud detection.

Research Design & Methods: This research uses a systematic literature review (SLR) method with a qualitative descriptive approach. Data was collected from the Scopus database using the Publish or Perish tool, resulting in 93 articles related to forensic audit, auditing, and fraud detection. The articles obtained were then filtered down to the 20 most relevant ones and analyzed in four main aspects.

Findings: The findings suggest that fraud in the banking and corporate sectors is becoming increasingly complex, involving financial statement manipulation, money laundering, and the use of advanced technology. Internal audits with forensic auditing have proven more effective in detecting fraud, especially with the involvement of specialists and technologies such as AI, big data, and blockchain. Anti-fraud regulations play a crucial role; however, their implementation still faces challenges, including policy harmonization and limited forensic auditor resources.

Implications & Recommendations: This research emphasizes the importance of strengthening internal control systems, using advanced technology in audits, and increasing the capacity of forensic auditors to increase audit effectiveness in detecting and preventing fraud.

Contribution & Value Added: This research makes an academic contribution by identifying the latest trends in fraud detection and evaluating the effectiveness of forensic auditing in facing modern challenges.

Keywords: Forensic Auditing, Fraud Detection, Internal Audit.

JEL codes: M42, G34, K42
Article type: research paper

INTRODUCTION

Over the past fifty years, global business communities have encountered numerous ethical breaches, including highly costly financial statement fraud cases (Albrecht et al., 2015). This has an impact on economic stability and public trust. Based on the ACFE survey in 2022, the banking and financial services sector recorded the highest number of fraud cases among all industries, namely 351 cases, which accounted for 22.30% of the total cases recorded (Putri and Astuti, 2024). Domestically, data from the Financial Services Authority (OJK) shows that fraud cases in the banking sector have increased by 17% in the last five years, with total losses reaching billions of rupiah each year (OJK, 2025).

A clear example is the banking fraud case involving PT Bank Maybank Tbk 2020, where IDR 22 billion in customer funds disappeared due to the abuse of authority by bank employees (Intan, 2020). Another case is the alleged corruption at PT Pertamina (Persero), currently in the spotlight, with alleged state losses reaching IDR 193.7 trillion due to corrupt practices in the management of crude oil and refinery products during the 2018-2023 period (Agungnoe, 2025). This shows that fraud not only harms companies financially but also reduces the level of public trust in Indonesia's financial system. Fraud not only occurs due to weak internal control systems but also due to the lack of application of technology in forensic auditing, such as artificial intelligence (AI) and blockchain, which can increase the effectiveness of early detection of financial anomalies (Romero-Carazas et al., 2024).

To overcome this problem, internal audit is a primary instrument for detecting and preventing fraud. An effective internal audit can help identify weaknesses in the internal control system, evaluate fraud risks, and provide recommendations for improvements to increase corporate accountability and transparency (Melinda et al., 2022). Furthermore, although internal and external auditing contribute to fraud prevention, many organizations still struggle to implement forensic auditing effectively, resulting in the prevalence of fraud cases in various sectors (Fauzi et al., 2024). Forensic audits are conducted to trace the source and movement of funds and identify the party responsible for a transaction. Forensic auditors not only analyze numbers but also understand the business reality behind a case, making specific skills and techniques crucial to carrying out their duties (Imhonopi and Ugochukwu, 2013).

Recently, the application of forensic auditing and technology-based data analytics has become an innovative solution in detecting suspicious transaction patterns that indicate fraud (PWC, 2023). Given the magnitude of fraud worldwide, it is not surprising that stakeholders, including auditing standard setters, professional auditors, regulatory agencies, and investors, express a strong desire to improve the mechanisms employed by forensic auditors to detect fraud earlier and more effectively (Carpenter et al., 2016). The OJK has issued regulations related to strengthening internal audits in the banking industry through POJK Number 39/POJK.03/2019, concerning the Implementation of Risk Management in the Use of Information Technology by commercial banks. This regulation requires banks to improve their technology-based audit systems (OJK, 2020).

This study aims to analyze fraud trends and patterns in the banking and corporate sectors, evaluate the effectiveness of internal audits in detecting fraud, and examine the role of technology and regulation in improving audit fraud detection. This research makes several significant contributions to the current state of knowledge in forensic auditing. By understanding how forensic auditing and the application of technology can strengthen audit systems, this study provides strategic recommendations for regulators, auditors, and companies to improve fraud detection and prevention. Consequently, this study is expected to provide policymakers with insights for designing stricter regulations, as well as encouraging the wider adoption of technology in forensic auditing to create a more transparent and accountable financial system.

LITERATURE REVIEW

Agency Theory and Forensic Accounting

Agency theory explains the relationship between the principal, who holds authority, and the agent, who acts on behalf of the principal's interests (Linder and Foss, 2015; Tan, 2014). Husen (2014) states that corruption is a rational decision made by agents to maximize their personal or group interests. The need for audit services stems from agency theory, particularly in the supervisory function of managing financial resources and implementing policies entrusted to the agent by the principal to achieve specific goals (Ologbenla, 2021). The agents' potential to commit corruption for personal gain increases the urgency for effective auditing. Along with the public demand in the fight against corruption, the role of audit services has expanded beyond the examination of periodic financial statements prepared by agents to also detect and reveal fraudulent practices committed by agents (Aksoy and Uzay, 2021). These audit services include investigative

audits designed to identify indications of corruption in various financial activities (Alissa et al., 2014).

Priantara (2013) notes that the boundaries between forensic auditing and forensic accounting are increasingly blurred, as forensic accounting now includes the audit function. Huber and DiGabriele (2014) define forensic accounting as a multidisciplinary field that spans professions and industries, focusing on economic and financial claims, both civil and criminal, within a defined legal, social, and political context. This definition emphasizes that forensic accounting requires expertise across multiple disciplines, including law, economics, psychology, sociology, and criminology. The complexity and uniqueness of each case means that it is difficult for one individual to be an expert in all aspects of forensic accounting.

Forensic Auditing Concept

Forensic auditing has evolved into a specialized field that combines accounting, auditing, and investigative techniques to detect and analyze financial cases related to litigation and legal disputes (Omar et al., 2012). The concept was first introduced by Kutilya, who identified various forms of financial embezzlement, which later underwent modifications over time (Agrawal and Chadha, 2015; Philna and Lawrens, 2017). The American Institute of Forensic Auditors (2004), defines forensic auditing as the collection, verification, processing, and analysis of data to obtain facts and evidence in a legal or financial context, and to provide recommendations for fraud prevention. Thus, forensic auditing not only functions as a financial investigation tool but also as a preventive measure against fraudulent practices.

Forensic auditors are tasked with uncovering financial crimes, such as asset misappropriation and money laundering, through the analysis of complex financial transactions (Ijewereme, 2015). They not only trace the flow of funds and identify responsible parties, but also evaluate the business background that allows fraud to occur (Imhonopi and Ugochukwu, 2013). Unlike routine financial audits, forensic auditing is conducted specifically when allegations of fraud or legal disputes necessitate strong evidence (Bonn, 2004). In practise, forensic auditing integrates various disciplines, such as accounting, auditing, law, and quantitative and analytical investigative methods to collect and assess evidence that can be used in legal proceedings (Ezeagba et al., 2017; Gottschalk, 2011). Forensic auditors must possess specialized skills, including interviewing, data analysis, and written and oral communication, to present their findings in court or during other investigations (Philna and Lawrens, 2017). Additionally, skeptical mindset and the ability to identify data manipulation are important competencies for forensic auditors in ensuring the accuracy and reliability of the information they analyze (Digabriele, 2008).

Fraud Detection in Forensic Auditing

Fraud detection is the primary step after prevention efforts fail, aiming to identify fraudulent acts and perpetrators as soon as possible (Agrawal and Chadha, 2015). This process must be carried out on an ongoing basis, as fraud incidents continue to occur in various organizations, including those in the banking, manufacturing, and government sectors (Glover and Aono, 1995). Compared to regular audits, fraud detection requires more complex skills, techniques, and experience. One modern approach employed is forensic auditing, which incorporates technology-based investigative methods, such as computer forensics, to uncover financial crimes (Ibietan, 2013).

Fraud detection in practice encompasses various methods, including card verification, payment authentication, device identification, transaction analysis, and risk assessment (Messmer, 2004). Additionally, analytical models are used to recognize common patterns and characteristics of fraudsters based on their previous history and actions. Fraud also encompasses various forms of illicit transactions, including embezzlement, bribery, and money laundering, which can often be uncovered through whistleblowing mechanisms (Okafor et al., 2020).

Forensic accountants play a crucial role in the legal system by analyzing invoice forgery, suspicious bankruptcies, and financial documents in fraud schemes (Curtis, 2008). Fraud investigations are conducted systematically through a process that includes evidence collection, analysis, reporting, and loss recovery. Forensic auditing must also meet legal standards so that the results can be used in court (Udoayang and James, 2004). Forensic accountants are increasingly in demand in the public sector to support the government in detecting, preventing, and investigating fraud cases, making them a vital tool in enhancing the country's financial transparency (Tetlock, 1992).

METHODS

This research uses the Systematic Literature Review (SLR) method to review various studies related to forensic auditing, internal auditing, technology in auditing, and regulations and policies in fraud auditing. Data were collected from Scopus, one of the largest academic databases that provides access to reputable scientific journals and conferences. During the data collection process, the Publish or Perish (PoP) tool was used to extract articles featuring the keywords "forensic audit, "auditing," "fraud detection," and other relevant terms. From the search results, 93 articles were obtained that had been published in scientific journals and conferences between 2015 and 2024. After data collection, a selection was made based on the relevance of the topic, research methods, quality of sources, and contribution to strengthening fraud auditing. Only articles from reputable journals and conferences were retained. From this process, 20 articles were selected as the most suitable for further analysis.

The selected articles were qualitatively reviewed to identify key findings, research methods used, and their respective contributions to the development of forensic auditing and fraud detection. The synthesized results of these articles were then compared to obtain a comprehensive picture of the development of trends, technology, audit effectiveness, and regulation in support of a stronger anti-fraud system. This method enables the research to provide a more focused and in-depth analysis by connecting forensic auditing theory and practice, based on empirical studies conducted in various countries and industry sectors.

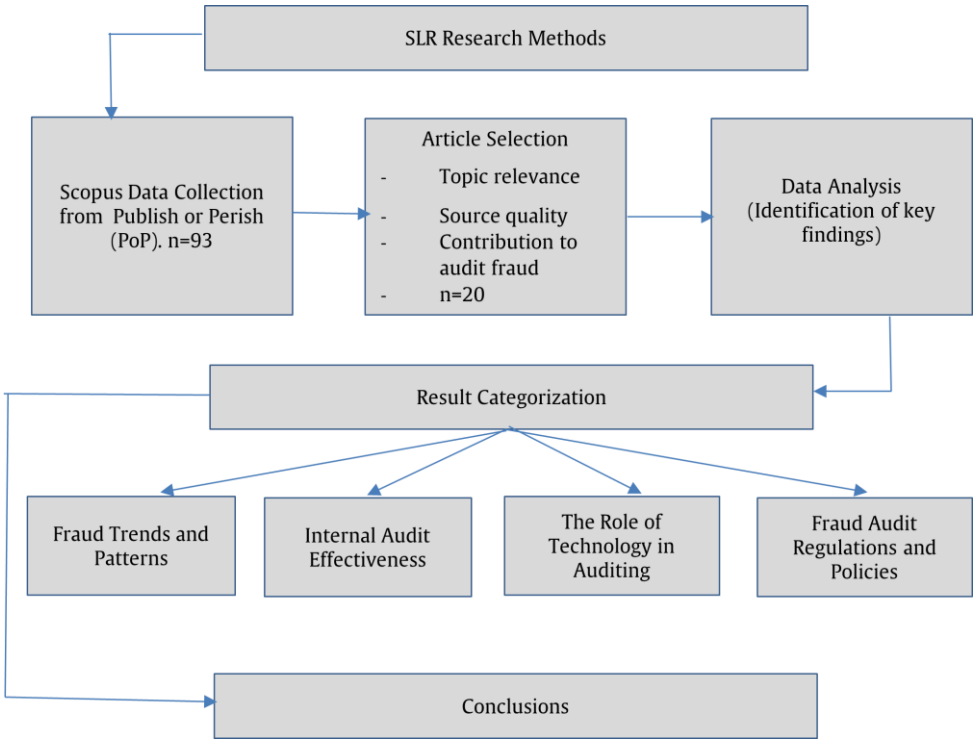

Figure 1. Research Framework

RESULT

The analysis reveals that fraud in the banking and corporate sectors typically takes various forms, including the manipulation of financial statements, misuse of assets, and internal corruption. The modus operandi used in each case tends to evolve in tandem with technological advances, allowing criminals to conceal illegal activities more effectively. The application of forensic auditing techniques is becoming increasingly important for identifying and analyzing fraud patterns that are difficult to detect with conventional audit methods. Visualization of keyword linkages in forensic auditing, as shown in Figure 2. The relationship between various key concepts in forensic audit research, which is divided into three main groups. First, the auditing and investigation group focuses on the methodological aspects of forensic auditing with keywords such as auditing, forensic audits, investigation, and application. This highlights the significance of the investigation process in uncovering fraudulent cases. Second, the fraud detection and prevention group highlights the role of forensic auditors in detecting and preventing fraud, with keywords such as fraud detection, prevention, and forensic auditors. This shows that early detection and risk mitigation are the main focus of forensic audit research. Third, the forensic accounting skill set highlights the need for specialized competencies in financial statement analysis and fraud investigation, with keywords such as forensic accountant, forensic accounting techniques, and related skills.

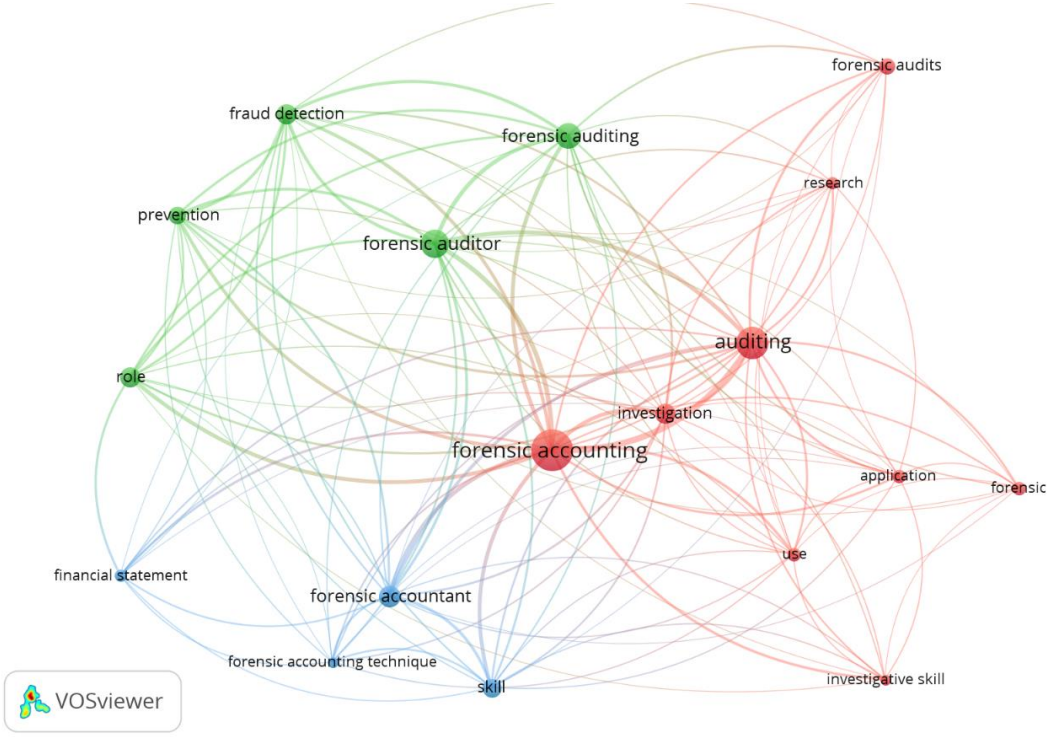

Figure 2. The main concept of forensic audit in fraud detection

Additionally, "forensic accounting" emerged as a central concept that connects various aspects of forensic auditing, suggesting that an accounting-based approach is a key foundation in fraud investigation. The close relationship between "fraud detection" and "prevention" with the role of forensic auditors also indicates that research in this field increasingly emphasizes the importance of prevention efforts rather than just detecting fraud after it occurs. Research trends also indicate that technology is increasingly playing a role in fraud detection audits, requiring auditors to possess more complex skills in analyzing and identifying indicators of fraud. In addition, regulations and policies related to forensic audits are an important element in improving the effectiveness of financial investigations; therefore, future research can further highlight regulatory innovation and the application of technology in strengthening fraud audits. Furthermore, this study analyzed 20 selected articles from a total of 93 articles collected from the Scopus database using the

Publish or Perish tool. The selected articles are divided into four categories, focusing on forensic auditing, internal auditing, the role of technology in auditing, and anti-fraud regulations, which are summarized in Table 1.

Table 1. Summary of key articles on forensic auditing and their practical implications

No.	Article Title	Main Findings	Implications
1.	Fraud Risk Brainstorming at Tesla Motors (Hess and Andiola, 2018)	- Brainstorming improves detection of potential fraud in financial statements - Auditors need a systematic approach in identifying fraud risks	- Auditors must be more active in brainstorming to anticipate fraud risks - More objective evaluation methods are needed in fraud detection
2.	Money Laundering and Forensic Accounting in Indonesia (Prabowo, 2016)	- Money laundering practices in Indonesia are prevalent due to weak regulation and supervision - Forensic accounting is effective in detecting suspicious transactions	- Forensic accounting has strategic roles in the fight against money laundering, but challenges in regulation, human resources, and technology are still the main obstacles that need to be addressed
3.	Financial Shenanigans: The Importance of Anti-Fraud Education (Jamieson et al., 2019)	- Lack of understanding about fraud leads to high cases of financial manipulation - Anti-fraud education plays a role in shaping the awareness of auditors and company executives	- Companies should increase anti-fraud training for auditors and management - Financial education that includes forensic accounting should be more widely implemented
4.	Getting Comfortable on Audits: Understanding Firms' Usage of Forensic Specialists (Jenkins, 2018)	- Auditors increasingly rely on forensic specialists to improve audit quality, especially in high-risk situations such as financial statement restatements and regulatory investigations - Although additional costs are required, the benefits of using forensic specialists are considered to outweigh the costs incurred, even in cases without significant findings.	- The involvement of forensic specialists can improve fraud detection, reduce financial statement errors, and strengthen internal control systems. - The use of forensic auditing should be further integrated into the standard audit process to increase effectiveness and efficiency in identifying financial crimes.
5.	Facilitating Decision Making through Forensic Audit for Granting Loans and Detecting Frauds in Banks (Kini et al., 2022)	- Forensic auditing plays a role in improving the reliability of the lending process and detecting potential fraud in the banking sector - The use of forensic auditing helps improve the transparency and stability of the banking system by detecting financial anomalies early.	- Banks need to integrate forensic auditing in credit assessment procedures to reduce the risk of default due to fraud. - Wider implementation of forensic auditing can strengthen internal control systems and increase trust in financial institutions.
6.	High fidelity data reduction for big data security dependency analyses (Xu et al., 2016)	- Big data can help reduce audit data redundancy and improve efficiency in security analysis.	- Big data-based auditing can improve anomaly detection and fraud risk faster.

No.	Article Title	Main Findings	Implications
			- Preserving event dependencies during data reduction, this method improves the ability to detect and analyze complex multi-step attacks such as Advanced Persistent Threats (APTs).
7.	CUSTOS: Practical Tamper-Evident Auditing of Operating Systems Using Trusted Execution (Paccagnella, Datta, et al., 2020)	- Trusted execution technology can detect unauthorized changes in audit systems. - CUSTOS is proven to secure over one million events per second, with low performance overhead (2-7%) compared to insecure logging.	- Implementing CUSTOS can improve system security by ensuring log integrity, reducing the effectiveness of anti-forensic attacks, and enabling early detection of data manipulation attempts. This technology has the potential to be adopted by enterprises with large infrastructures to improve compliance with data security regulations and mitigate the risk of increasingly sophisticated cyberattacks.
8.	Logging to the Danger Zone: Race Condition Attacks and Defenses on System Audit Frameworks (Paccagnella, Liao, et al., 2020)	- Audit logs are vulnerable to race condition attacks, which can be manipulated to hide fraud. - KennyLoggings implementation on the Linux kernel shows an overhead of between 8% to 11% on log-intensive application workloads.	- Need for improved security systems in audit log storage for better fraud detection. - Implementation of a system like KennyLoggings can improve the reliability of logs in security investigations, ensure that events are securely logged as soon as they occur, and prevent manipulation by unauthorized parties.
9.	Public Auditing of Log Integrity for Cloud Storage Systems via Blockchain (Wang et al., 2019)	- Blockchain can ensure the integrity of audit logs in cloud storage systems and prevent falsification of log data and ensure that during public audits, log content is not leaked.	- The increasing adoption of cloud storage, ensuring log integrity has become crucial for incident tracking and digital forensics. This blockchain-based approach offers a secure and efficient solution for log integrity auditing, allowing third-party auditors to verify without compromising data privacy, and increasing trust in cloud storage services.
10.	Cybersecurity tools for IS auditing (Al-Matari et al., 2018)	- Cybersecurity technology can strengthen the company's internal audit system to collect the necessary information in the final information system audit report.	- Applying the right automated cybersecurity audit tool can improve the efficiency and effectiveness of the information system audit process. This helps organizations detect and prevent cyberattacks, and ensure compliance with applicable security standards.

No.	Article Title	Main Findings	Implications
11.	Artificial Intelligence for Audit, Forensic Accounting, and Valuation: A Strategic Perspective (Naqvi, 2020)	- AI can improve the accuracy of fraud detection by automating data analysis. - AI helps in asset and risk valuation with predictive modeling that is more accurate than traditional methods.	- Implementation of AI in forensic audit can improve audit efficiency and reliability.
12.	The Effects of Big Data on Forensic Accounting Practices and Education (Kılıç, 2020)	- Big data helps forensic accountants detect suspicious transactions. - Integrating big data in the forensic accounting education curriculum equips students with the data analysis skills necessary to face challenges in the field.	- Forensic accounting education should include big data analytics as part of the curriculum. - Adoption of big data enables forensic accounting professionals to identify fraud patterns that were previously difficult to detect, increasing the reliability of investigations.
13.	Detection of Accounting Frauds Using the Rule-Based Expert Systems within the Scope of Forensic Accounting (Öztürk and Usul, 2020)	- Rule based expert system is able to identify fraud patterns with high accuracy. - The application of a rule-based expert system allows companies to more effectively detect existing fraud and prevent future irregularities.	- The use of expert systems in internal audit can improve scenario-based fraud detection. - The implementation of a rule-based expert system allows companies to detect existing fraud more effectively and prevent future irregularities from occurring.
14.	FAuST: Striking a Bargain between Forensic Auditing's Security and Throughput (Inam et al., 2022)	- FAuST model can improve forensic auditing efficiency without compromising security. - FAuST testing with eight log reduction modules demonstrated efficient performance and identification of synergistic combinations of reduction techniques, thus simplifying the evaluation and application of log reduction techniques.	- The implementation of FAuST can significantly reduce the size of audit logs without sacrificing critical information, improve the efficiency of data storage and transmission, and facilitate more effective forensic investigations.
15.	Access Control Audit and Traceability Forensics Technology Based on Blockchain (Shang et al., 2022)	- Blockchain can be used to track audit access transparently and irreversibly. - By using blockchain, the system enables real-time tracking of user activity, thereby simplifying the forensic investigation process when a security incident occurs.	- The application of this technology can increase integrity and transparency in access management, which is important for organizations that prioritize data security. - With access records stored on the blockchain, audits and forensic investigations can be conducted more efficiently and accurately, reducing the time and resources required.
16.	Use of specialists on audit engagements: A research synthesis and directions	- The involvement of specialists in audits can improve the effectiveness of fraud	- Regulations need to clarify when and how specialists should be used in fraud audits.

No.	Article Title	Main Findings	Implications
	for future research (Hux, 2017)	detection, but regulations regarding their use are mixed.	- Auditors need training to work effectively with specialists to improve audit quality.
17.	Forensic auditing mechanism and fraud detection: The case of the Nigerian public sector (Oyerogba, 2021)	- Forensic auditing improves transparency and accountability in public financial management.	- Public sector audit regulations should be more stringent in their application of forensic auditing. - Educational institutions and audit agencies should increase forensic auditing training to strengthen internal control systems.
18.	The anti-money laundering expectations gap in Iran: Auditor and judiciary perspectives (Imeny et al., 2021)	- Auditors and legal officials have different understandings of AML regulations, leading to inefficiencies in fraud detection.	- AML regulations need to be clarified to better align auditors and the legal system. - Urgent training in forensic accounting and compliance with international reporting standards is needed for the audit profession in Iran.
19.	A Survey on Forensics and Compliance Auditing for Critical Infrastructure Protection (Henriques et al., 2024)	- The application of forensics and compliance auditing is essential to protect critical infrastructure from cybersecurity threats. - the need to develop comprehensive standards and frameworks to ensure the effectiveness of forensic and audit processes in protecting critical infrastructure.	- Regulations should be stricter in integrating compliance auditing with cybersecurity. - Investment in more sophisticated forensic auditing systems is needed to detect and prevent security threats to critical infrastructure.
20.	Auditor's skepticism, forensic accounting, investigation audit and fraud disclosure of corruption cases (Laupe et al., 2022)	- Good forensic accounting and investigative audit practices can reduce the level of fraud disclosure. - Auditor skepticism strengthens the relationship between forensic accounting and fraud disclosure, as well as between investigative auditing and fraud disclosure.	- Regulations should encourage auditor skepticism in fraud investigations. - Auditor skepticism should be strengthened to increase effectiveness in detecting and uncovering fraud.

The effectiveness of forensic auditing is highly dependent on three main factors: auditor competence, the technology used, and company policy support. Auditors with forensic accounting certification are better able to identify suspicious transactions compared to conventional auditors. Additionally, companies that utilize technologies such as big data analytics and artificial intelligence (AI) in their audit processes are shown to have higher fraud detection rates. This demonstrates that the use of technology in forensic auditing not only enhances efficiency but also improves accuracy in identifying suspicious transaction patterns.

Technological developments are also a key aspect of forensic auditing. The use of AI and machine learning enables real-time data analysis to detect anomalies that are difficult to identify using traditional methods. Blockchain is also being applied in auditing, enhancing the transparency and accuracy of financial data. The study found that companies that have adopted these technologies tend to be more resilient in the face of fraud risks compared to those still using traditional approaches.

DISCUSSION

Banking and corporate fraud trends and patterns

Fraud trends and patterns in the banking and corporate sectors are evolving in tandem with technological advancements and the growing complexity of the financial system. Fraud in the banking world is not only limited to asset embezzlement and manipulation of financial statements, but also includes more sophisticated forms of crime, such as money laundering, fictitious transactions, and exploitation of digital systems for personal gain (Jamieson et al., 2019). Research conducted by Hess and Andiola (2018) highlights that weak internal control systems and lack of transparency in financial reporting often cause the increased risk of fraud in companies. This suggests that stricter supervision and more effective audit systems are necessary to minimize the likelihood of fraud in organizations.

Additionally, the use of technology in the financial sector has created new opportunities for fraudsters to exploit. According to Prabowo (2016), digital technologies such as cryptocurrencies and blockchain-based transaction systems, while providing benefits in terms of financial efficiency, have also become tools for fraudsters to conduct illegal transactions anonymously and are difficult to detect. Therefore, more innovative strategies are needed to detect and prevent fraud, including the application of artificial intelligence (AI), machine learning, and big data analytics in corporate audit systems (Hess and Andiola, 2018). These technologies enable auditors to detect anomalous patterns in financial transactions more accurately and quickly, thereby increasing the effectiveness of forensic audits.

On the other hand, regulations and policies also play an important role in reducing fraud in the banking sector. A study conducted by Jamieson et al. (2019) shows that stricter regulations on financial transparency can reduce the risk of fraud by strengthening the oversight of firms' financial activities. However, the effectiveness of this regulation is highly dependent on the implementation and compliance of firms in establishing an internal control system that meets auditing standards. Therefore, the combination of strengthening regulations, increasing auditor capacity, and using advanced technology in forensic auditing is the main strategy to overcome the challenges of fraud in the financial sector and companies (Prabowo, 2016).

Based on evolving fraud trends and patterns, this study emphasizes the need for internal audit and forensic auditing to continually adapt to technological and regulatory developments. Utilizing AI and big data to detect fraud can help prevent it and mitigate future financial losses (Naqvi, 2020). Thus, the most important steps to address fraud issues in banks and companies are to enhance the capabilities of auditors, strengthen regulatory frameworks, and utilize advanced technology in forensic auditing.

Internal Audit Effectiveness in Detecting Fraud

In increasingly complex audit environments, internal auditors are increasingly engaging forensic specialists to help identify and assess fraud risks in financial statements (Jenkins, 2018). Forensic specialists play a crucial role in various aspects of audits, including identifying fraud, designing more effective audit procedures, and reviewing fraud testing results to detect possible material misstatements or misuse of assets (Brazel et al., 2010). As business and regulatory complexity increase, the involvement of specialists in internal audit is becoming increasingly important to ensure that fraud risks are detected and minimized before they have a wider impact (Glover and Aono, 1995).

One of the primary challenges in implementing forensic auditing is that auditors often lack a comprehensive understanding of the role of specialists. This often results in a lack of coordination between auditors and specialists during the audit process (Bauer and Estep, 2015). Studies have shown that auditors who work with specialists in audits find more fraud compared to auditors who only use traditional audit methods (Hux, 2017). However, there is a risk of over-reliance on specialists. Sometimes, auditors do not critically evaluate the work of specialists. This can reduce the overall effectiveness of the audit (Boritz et al., 2015).

Forensic auditing has proven effective in the public sector. It has been used to detect fraud, especially in cases of budget abuse, corruption in the procurement of goods and services, and manipulation of financial statements (Oyerogba, 2021). Studies in Nigeria found that government institutions have weak internal control mechanisms, which increases the risk of fraud in the management of public funds. Forensic auditors are experts who can analyze financial trends, trace suspicious transactions, and evaluate compliance with applicable regulations. Technology can also help with this. For example, forensic data analysis and big data analytics can improve the effectiveness of audits (Oyerogba, 2021).

Forensic auditing has a significant impact on more than just the public sector. Recent research has found that forensic auditing contributes to improving the quality of lending decisions by conducting a more accurate risk evaluation of the financial background of potential borrowers (Kini et al., 2022). Forensic auditing enables banks to reduce the number of non-performing loans and enhance transparency within the financial system. The study also suggests that incorporating artificial intelligence (AI) and data analytics into forensic auditing can enable banks to identify suspicious transaction patterns more efficiently (Kini et al., 2022).

In Indonesia, research indicates that highly skeptical auditors are crucial for ensuring that auditing and investigating fraud are effective (Laupe et al., 2022). Highly skeptical auditors are better at identifying unusual items in financial statements, following clues of fraud, and rejecting explanations that lack sufficient evidence. Stricter rules and better training for auditors can help strengthen the connection between forensic auditing and fraud disclosure (Laupe et al., 2022).

Based on these findings, this study recommends several steps to enhance the effectiveness of internal audits in detecting fraud. First, auditors need to be given intensive training in interacting with specialists. This will enable them to maximize the benefits of forensic auditing in the audit process (Griffith, 2019). Second, the rules regarding when and how to utilize these specialists need to be clarified (PCAOB, 2017). Third, auditors should utilize technologies such as artificial intelligence (AI) and big data analytics to more effectively detect suspicious transaction patterns (Griffith et al., 2016).

The Role of Technology in Audit and Fraud Detection

The integration of advanced technology in audit practices and fraud detection has brought about significant transformations in today's digital age. One important innovation is the use of big data analytics in the audit process. Xu et al. (2016) emphasized that big data analytics can reduce data redundancy and improve the efficiency of security analysis in audits. By processing large volumes of data, auditors can identify anomalous patterns more quickly and accurately, thus accelerating the fraud detection process. Additionally, trusted execution technology has been integrated into operating system auditing to enhance security. Paccagnella, Datta, et al. (2020) showed that this technology can detect unauthorized changes in the audit system, preventing data manipulation by unauthorized parties. However, another study by Paccagnella, Liao, et al. (2020) found that insecure audit logs remain vulnerable to race condition attacks, which can alter or delete evidence of fraud. Therefore, increased security in audit log storage is necessary to support better audit transparency.

Meanwhile, blockchain technology is increasingly recognized as a tool that can improve audit transparency and reliability. Wang et al. (2019) proposed the use of blockchain to ensure that audit logs in cloud storage systems remain intact and unalterable, which is crucial for maintaining data integrity in the audit process. Additionally, Shang et al. (2022) proposed utilizing blockchain to

track audit access in a transparent and immutable manner, thereby enhancing accountability within the audit environment. Thus, the use of blockchain in auditing can reduce the risk of data manipulation and significantly improve fraud detection. Additionally, cybersecurity also plays an important role in improving audit effectiveness. Al-Matari et al. (2018) emphasized that the use of cybersecurity tools can strengthen a company's internal audit system by detecting network anomalies and protecting audit data from external threats. Additionally, Artificial Intelligence (AI) has accelerated the audit process by automating data analysis and identifying fraud patterns that may not be apparent in manual audits. The role of AI in improving the accuracy of fraud detection through automation of data analysis. AI not only improves audit efficiency but also enables auditors to focus more on complex and high-value investigations (Naqvi, 2020).

Big data has also had a significant impact on forensic accounting. Kılıç (2020) noted that big data assists forensic accountants in detecting suspicious transactions, and Öztürk and Usul (2020) showed that rule-based expert systems are able to identify fraud patterns with high accuracy. With its ability to analyze large amounts of financial transactions in real-time, big data enables auditors to identify suspicious transactions that were previously difficult to find with conventional auditing techniques. Meanwhile, rule-based expert systems have been proven to identify fraud patterns with a high level of accuracy, thereby helping auditors classify and address various types of fraud more effectively. The FAuST model represents a novel approach to forensic auditing. It makes audits more efficient without compromising security. Inam et al. (2022) developed an FAuST model that improves forensic audit efficiency without compromising security. This model enables forensic audits to run faster without compromising the accuracy of fraud detection. It's becoming increasingly important to have this kind of system as fraud cases become more complex, and we need better and faster ways to audit transactions.

Overall, these studies confirm that the integration of technology in auditing, including big data analytics, blockchain, AI, cybersecurity tools, and forensic auditing models, has significantly enhanced the effectiveness of fraud detection. By utilizing these technologies, auditors can increase accuracy, transparency, and efficiency in the audit process, thereby reducing the risk of fraud that could potentially harm the financial system and the business as a whole. Therefore, the application of technology in auditing should be a priority for companies and supervisory institutions to ensure that the financial oversight process can run more effectively and accountably.

Regulation and Policy in Strengthening Fraud Audits

Regulations and policies aimed at strengthening fraud auditing have become a crucial aspect in ensuring financial transparency and accountability across various sectors. Hux (2017) highlights that the involvement of specialists in forensic audits can increase the effectiveness of fraud detection, but regulations regarding the use of these specialists still vary. The lack of clear standards in the appointment of specialists leads to inconsistencies in fraud audits, so policies are needed to ensure that specialists are optimally utilized in financial investigations. In the context of the public sector, the application of forensic auditing can increase transparency and accountability in the management of state finances (Oyerogba, 2021). However, regulations in many developing countries still do not require the systematic use of forensic auditing, which can hinder efforts to fight corruption in the public sector.

Additionally, gaps in Anti-Money Laundering (AML) regulations pose a significant challenge to fraud detection. Imeny et al. (2021) found that auditors and legal officials in Iran have different understandings of AML regulations, which leads to inefficiencies in financial investigations. This disagreement indicates that existing regulations are not fully equipped to bridge the role of auditors with the judicial system in handling money laundering cases. This unsynchronized regulation not only hampers the audit process but also provides loopholes for financial criminals to evade legal sanctions. On the other hand, current regulations are not strict enough in integrating forensic auditing with critical infrastructure protection (Henriques et al., 2024). With the increasing cyber threats to financial and business systems, regulations that link fraud auditing with cybersecurity are becoming increasingly urgent.

In another aspect, Laupe et al. (2022) emphasize that auditor skepticism plays a crucial role in detecting corruption and enhancing the effectiveness of forensic auditing. More skeptical auditors tend to be more thorough in evaluating financial statements and more critical of indications of fraud, which can reduce the risk of audit errors. However, many regulations do not provide sufficient incentives or guidelines to encourage skepticism among auditors. The lack of training and policies that support auditor skepticism has the potential to undermine efforts to strengthen fraud audits in various sectors.

The implications of these research findings suggest that regulatory policy should be strengthened in several key aspects. First, there needs to be standardization in the use of forensic auditing specialists so that their involvement in audits can be more effective and consistent (Hux, 2017). Second, the government needs to encourage the application of forensic auditing in the public sector, accompanied by stricter regulations, to increase the transparency of state finances (Oyerogba, 2021). Third, it is necessary to harmonize AML regulations through joint training and discussion forums between auditors and law enforcement to harmonize understanding of money laundering prevention mechanisms (Imeny et al., 2021). Fourth, regulations should better integrate forensic auditing with cybersecurity, particularly in the protection of critical infrastructure, which is often the target of financial attacks (Henriques et al., 2024). Finally, governments and audit institutions need to adopt policies that encourage auditor skepticism, such as performance evaluations that emphasize the importance of critical analysis in the fraud audit process (Laupe et al., 2022).

Implementing these recommendations will enhance the effectiveness of existing regulations and policies in strengthening the fraud audit system, increasing financial transparency, and preventing financial crime. This will not only help organizations maintain their financial integrity, but will also strengthen public confidence in an audit system that is more accountable and responsive to modern economic and technological challenges.

CONCLUSION

Fraud in the banking and corporate sectors continues to evolve with increasingly complex patterns, primarily due to technological advancements, weaknesses in internal controls, and the ineffectiveness of the audit system in detecting and preventing fraud. Various financial scandals, including financial statement manipulation, money laundering, and asset embezzlement, demonstrate that the existing supervisory system remains suboptimal in mitigating the risk of fraud. To understand and address this issue, this research employs the Systematic Literature Review (SLR) method, collecting and analyzing 93 articles from the Scopus database related to forensic audit, internal audit, fraud detection, and anti-fraud regulations. After going through a selection process based on relevance, research methods, source quality, and contribution to fraud auditing, 20 articles were selected for further analysis. This study clearly aims to provide a comprehensive understanding of the weaknesses in the current fraud prevention systems and to identify strategic directions for improving audit effectiveness and fraud mitigation through an evidence-based literature approach.

The results demonstrate that forensic auditing plays a crucial role in detecting and preventing fraud by leveraging technology-based investigative methods, including big data analytics, artificial intelligence (AI), and blockchain. Effective internal audit can strengthen internal controls and increase transparency, but still faces challenges in the form of a lack of auditor competence in handling increasingly sophisticated fraud cases. Anti-fraud regulations and policies in various countries also play a role in strengthening financial supervision; however, their implementation still faces obstacles, particularly in harmonizing rules and limited resources.

Increasing the effectiveness of forensic auditing requires a synergy among technology, stricter regulations, and strengthening the capacity of auditors to handle fraud. By implementing technology-based forensic auditing and strengthening internal control systems, organizations can enhance the early detection of fraud and mitigate its potential financial impact. In addition, regulators need to encourage policies that are more adaptable to technological developments,

creating an audit system that is more transparent, accountable, and capable of addressing future fraud challenges. These efforts not only help protect organizational assets but also contribute to restoring public trust and reducing systemic risks in the financial ecosystem.

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