DOES INTERNAL CONTROL STRENGTHEN FRAUD DETECTION EFFECTIVENESS? A SYSTEMATIC LITERATURE REVIEW IN THE ROLE OF INTERNAL CONTROL MEASURES IN COMBATING FINANCIAL FRAUD

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Abstract

This study aims to examine the impact of internal control on the effectiveness of financial fraud detection in company financial statements, with a focus on high-volatility sectors. Utilizing a Systematic Literature Review (SLR) approach, the study identifies and analyzes literature related to internal control, technology in fraud detection, and the challenges auditors face in implementing effective internal controls. The results indicate that well-executed internal control systems can significantly enhance a company's ability to detect and prevent fraud. The study also emphasizes the importance of integrating advanced technologies, such as data analytics and artificial intelligence (AI), to improve the accuracy and efficiency of fraud detection. Moreover, key challenges in implementing effective internal control include reliance on auditor expertise and the need to continuously adjust policies to keep pace with rapidly changing market dynamics. These findings provide valuable insights for the future development of internal controls and offer a theoretical foundation for further research in this field.

Keywords: Internal Control, Fraud Detection, Financial Fraud, Internal Control Systems, Big Data, Artificial Intelligence, Audit Technology.

INTRODUCTION

Financial fraud is one of the biggest threats to the integrity of financial statements and market stability. Fraud in financial statements, which can take the form of manipulation of figures, embezzlement of assets, or recording of false transactions, often goes undetected in traditional auditing processes. This poses a major risk to companies, investors, and other stakeholders. For example, the fraud case that occurred at Enron in the early 2000s shows how financial statement manipulation can lead to the bankruptcy

of large companies and harm thousands of employees and investors. In the Enron case, financial statements that were manipulated using non-transparent accounting techniques led to losses of $74 billion, which ultimately triggered a major scandal that affected the entire stock market and global financial system (Healy & Palepu, 2003). Another case, the accounting scandal at WorldCom in 2002, also illustrates the enormous impact of financial statement fraud, which can lead to huge losses for both the company itself and the industry as a whole.

The existence of a strong internal control system is very important in preventing and detecting fraud early on. Internal control serves to ensure that financial reports published by companies comply with applicable accounting standards and are free from material errors due to fraud. According to Rezaee (2005), effective internal control can reduce the opportunity for fraud by identifying and addressing risks in the financial reporting process.

COSO (2013) developed a framework for internal control consisting of five main components: control environment, risk assessment, control activities, information and communication, and monitoring. These components serve to ensure that all aspects of the organization are well managed to prevent fraud and ensure that existing risks are minimized. However, even though internal control has been implemented in many organizations, its effectiveness in detecting financial fraud remains a topic of debate in the literature. Research by Kassem & Omoteso (2023) shows that weak internal controls often open opportunities for individuals to manipulate financial statements without being detected.

Modern technologies, such as data analytics and artificial intelligence (AI), are increasingly being used to detect fraud, but experienced auditors still rely more on traditional audit methods. Glover et al. (2015) and Bierstaker et al. (2006) highlight the importance of audit procedures such as analytical analysis and positive confirmation for detecting fraud. However, the use of these procedures is often less than optimal in everyday audit practice. This shows that although technology can speed up the fraud detection process, the expertise and experience of auditors remain very important in analyzing and identifying more complex fraud. According to research by Kassem &

Omoteso (2023), auditors' understanding of their clients' industries and businesses plays a very important role in detecting fraud that may not be detected by automated systems.

The effectiveness of internal controls in detecting fraud is greatly influenced by external and internal factors within an organization. Sari (2021) emphasizes that clear segregation of duties and multi-layered supervision are key components of internal controls that can reduce the risk of fraud in large and small companies. In addition, Kassem et al. (2021) show that anti-fraud controls implemented at the management level also play an important role in preventing financial statement manipulation.

Although the literature on internal control and fraud detection has grown significantly, there are still substantial research gaps. First, most previous studies are fragmented and focus on specific aspects, such as audit committees, auditor skepticism, or audit technology, without providing a comprehensive synthesis of the role of internal control systems as a whole. Second, research that integrates findings across quantitative, qualitative, and experimental methodological approaches is still relatively limited. Third, studies that systematically map the development of themes, methodological trends, and conceptual structures of research related to internal control and fraud detection in the context of modern business are still rare.

Based on these gaps, this study offers novelty through the application of a Systematic Literature Review (SLR) approach with a descriptive qualitative perspective to comprehensively synthesize the literature on the role of internal control in improving the effectiveness of financial fraud detection. This study not only identifies key empirical findings, but also maps the conceptual structure, research trends, and interactions between internal control, audit technology, and the role of auditors. By integrating the COSO framework, cross-sector empirical findings, and developments in audit technology, this study provides a more holistic understanding of fraud detection mechanisms in an increasingly complex and volatile business environment.

Theoretically, this study contributes to the development of accounting and auditing literature by expanding the conceptual understanding of the relationship between internal control, technology, and fraud detection, which have tended to be treated separately. In practical terms, the findings of this study are important for auditors, management, and regulators in designing, evaluating, and strengthening internal control

systems that are more effective, adaptive, and risk-oriented. Thus, this study is expected to make a significant academic contribution as well as have practical relevance in efforts to strengthen internal control as the main mechanism for detecting and preventing financial fraud.

THEORETICAL REVIEW

Internal Control in Preventing Financial Fraud

Effective internal control is a crucial first step in preventing financial fraud. According to COSO (2013), internal control consists of five main components, namely control environment, risk assessment, control activities, information and communication, and monitoring. These five components serve to identify and manage risks that may occur in financial statements, including the risk of fraud. Effective internal control ensures that every transaction and report published by the company complies with applicable standards and is free from material errors. Rezaee (2005) also emphasizes that with strong internal control, organizations can reduce the risk of errors or fraud caused by carelessness or human error in financial management.

Although internal controls can prevent fraud, their effectiveness in detecting financial fraud remains a challenge. Research by Kassem & Omoteso (2023) shows that weak internal controls contribute to a high probability of financial statement manipulation. They state that even though many companies have implemented internal controls, failure to implement adequate controls still opens the door for individuals to abuse their authority. Therefore, it is important to not only rely on existing internal controls, but also to continuously update and strengthen existing systems by incorporating appropriate auditing techniques that are relevant to current developments.

Audit Methods for Detecting Fraud

Auditing is an integral part of detecting financial fraud. Glover et al. (2015) state that audits involving analytical procedures and positive confirmation can help identify discrepancies in financial statements that may indicate fraud. These audit procedures enable auditors to detect anomalies in transactions that may not be consistent with normal or reasonable patterns in financial statements. In addition, Bierstaker et al. (2006)

show that analytical procedures that utilize comparisons between estimates and actual figures, as well as positive confirmation from third parties, are effective tools in detecting deviations that may indicate fraud. However, although these audit techniques have been proven effective, they also emphasize that many organizations have not yet fully utilized these procedures optimally in their daily audit practices.

Several studies also show that although audits can be effective in detecting fraud, current technological developments offer the potential to improve the efficiency of fraud detection in financial statements. Kassem & Omoteso (2023) note that although technologies such as data analytics and artificial intelligence (AI) can accelerate and improve the accuracy of detecting fraud patterns, experienced auditors still play an important role in assessing and providing context to the data generated by technology. This shows that while technology can facilitate the audit process, human experience and knowledge remain key factors in identifying more complex and in depth fraud.

The Role of Technology in Fraud Detection

Technological advances have had a major impact on the world of auditing and fraud detection. Gepp et al. (2020) note that the use of data analytics and artificial intelligence (AI) in the audit process can improve auditors' ability to process large amounts of data quickly and efficiently, identify unusual patterns, and detect suspicious transactions that may not be detected using traditional methods. This technology also enables auditors to perform predictive analysis, which allows fraud to be detected before it develops further. The use of technology enables auditors to conduct more comprehensive and in-depth audits of existing data, as well as minimize the potential for human error in the evaluation process.

Technology offers a lot of potential, but Kassem & Omoteso (2023) argue that it should be used carefully. They note that even though data analytics and AI can speed up and broaden the scope of audits, experienced auditors still need to assess the relevance and interpretation of the data generated by technology. This shows that technology should be used to complement, not replace, human experience in auditing. The combination of technology and the professional skills of auditors can result in a more effective and efficient audit process for detecting fraud.

The Role of Auditor Experience in Detecting Fraud

Auditors' experience plays an important role in detecting fraud, especially in understanding the risks inherent in financial statements. Kassem & Omoteso (2023) show that auditors who have a deep understanding of their clients' businesses and industry characteristics are better able to recognize signs of fraud that are more difficult to detect with technology. This expertise enables auditors to identify unusual transaction patterns and provide a more in-depth interpretation of the data found. This is also emphasized by Glover et al. (2015), who stress that the auditor's experience in understanding the context of the client's business remains a key factor in detecting fraud that may not be detected by automated analytical tools.

Sari (2021) highlight the importance of continuous training for auditors to remain competent in detecting fraud. This training should include the use of the latest technology and a deep understanding of various conventional and technology-based audit techniques. This enables auditors to strengthen their ability to detect more complex fraud and identify risks more quickly in financial statements.

Effective Internal Controls for Detecting Fraud

Effective internal control can reduce the risk of fraud by creating a transparent monitoring system and reducing opportunities for fraud to occur. Albrecht et al. (2008) in the Fraud Triangle theory argue that fraud occurs due to three factors: pressure, opportunity, and rationalization. Good internal control can reduce the opportunity for fraud by eliminating or reducing the chance to act dishonestly. Sari (2021) emphasizes that layered controls, clear separation of duties, and independent verification at every step of the financial process can reduce the risk of financial statement manipulation that leads to fraud.

Kassem et al. (2021) emphasize that the role of management in implementing strict controls and oversight of internal controls is key to preventing financial manipulation that could harm the organization. They also point out that effective internal control requires ongoing audits and consistent monitoring to ensure that all procedures are running in accordance with existing policies, as well as to detect anomalies that could

be signs of fraud in financial statements. A continuous monitoring process enables companies to immediately identify and respond to any inconsistencies or deviations from established procedures. Thus, companies can not only prevent fraud, but also proactively identify risks, improve transparency and accountability in their financial statements. Proper monitoring, if done regularly, can help detect potential fraud before it develops into a bigger problem that could damage the company's credibility and financial stability.

RESEARCH METHOD

The Systematic Literature Review (SLR) method was chosen to identify, evaluate, and interpret all relevant research evidence in the context of accounting information usefulness. SRM is a structured review approach that is widely recognized in various disciplines, including financial accounting and capital market research (Tranfield et al., 2003). The use of this method aims to enable researchers to collect and analyze various literature relevant to the research topic while synthesizing existing research findings. The period from 2016 to 2025 was evaluated during the preparation of this article. The research methodology used in this study follows the guidelines outlined by Denyer and Tranfield (2009) for conducting the TPL process, which consists of five stages or phases.

Figure 1. Steps in the Systematic Review Process
Search Strategies and Formulating Research Questions

The literature search strategy in this study was designed systematically to obtain relevant, high-quality articles that were in line with the main topic, namely the usefulness of accounting information in companies with high volatility. The search process was conducted through several reputable international scientific databases, such as Scopus. The selection of these databases was based on their extensive coverage of academic journals and their ability to provide filtering options based on Quartile categories (Q1–Q4) and year of publication, using two applications:

a. Watase Uake Tools (watase.com)

b. Aplikasi Publish or Perish Application (Scopus Database)

The initial stage of the search began with the identification of keywords. Search keywords were developed through a brainstorming process based on key terminology commonly used in the literature on sustainable reporting disclosure. The main keywords used included: “Internal Control,” “Fraud Detection,” and “Financial Fraud.” The search period was limited to 2016–2025 to ensure the relevance and timeliness of the topic. The entire process followed the guidelines of Wahono (2016) and Tranfield et al. (2003) to maintain the validity and systematic accuracy of the literature review.

The PICOC (Population, Intervention, Comparison, Outcomes, Context) approach was used to design and organize a systematic review to be more organized and relevant to the study entitled "Does Internal Control Strengthen Fraud Detection Effectiveness? A Systematic Literature Review on the Role of Internal Control Measures in Combating Financial Fraud," as recommended by Wahono (2016). Furthermore, this literature review is guided by the main research question, which defines the focus and scope of the study. The research question asked is as follows:

RQ1: How does internal control affect the effectiveness of financial fraud detection in company financial statements?

RQ2: What types of internal controls are most effective in preventing and detecting financial fraud in companies with high volatility?

RQ3: How can technology, such as data analytics and artificial intelligence (AI), improve the effectiveness of fraud detection in internal control systems?

RQ4: What are the main challenges auditors face in implementing effective internal controls for fraud detection, and how can these challenges be overcome?

To answer this research question, we conducted a Systematic Literature Review (SLR) to identify developments in studies covering various approaches to the usefulness of accounting information and the challenges faced in the context of companies with high volatility. After identifying a relevant review sample (n = 79 articles), we then used the SR approach to identify the drivers and outcomes of financial information use for decision-making purposes. The application of SR with a systematic, transparent, and replicable approach helped minimize researcher bias.

Inclusion and Exclusion Criteria

To ensure a systematic literature selection process, this study established the following inclusion and exclusion criteria for research titled "Does Internal Control Strengthen Fraud Detection Effectiveness? A Systematic Literature Review on the Role of Internal Control Measures in Combating Financial Fraud":

Table 1
Inclusion and Exclusion Criteria

Category	Inclusion	Exclusion
Topic	Does the article discuss internal control, fraud detection, or both?	Articles that do not discuss internal control or fraud detection, or that stray too far from the main topic.
Context	Is the research context related to companies or organizations facing high volatility?	Articles that are not relevant to the sector or companies affected by market volatility.
Document Type	Peer-reviewed journal articles, empirical studies, literature reviews, or case studies	Opinion pieces, editorials, conference proceedings that have not undergone peer review, theses, dissertations, or unverified practitioner reports.
Year	Published between 2016 and 2025	Published before 2016.
Language	English language	Articles published in languages other than English.
Indexing and Quality	Indexed in Scopus/Web of Science with a Q1–Q4 quartile ranking	Not indexed in Scopus or categorized as N/A (status unknown).

Document Accessibility	Full text available for download and comprehensive review	Full text is not available or only the abstract is accessible.

Source: Data processed by the researchers

Study Selection and Evaluation

The selection and evaluation of studies is a crucial step in this research to ensure that the literature used is relevant and of high quality. This study adopts the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) approach. As stated, this study complies with the PRISMA guidelines introduced by Moher et al. (2009). PRISMA provides a structured framework for reporting review findings through flowcharts, as illustrated in Figure 2, which has been widely used in various academic studies to identify and select scientific articles from the Scopus database. In this study, an initial data set consisting of 79 articles published between 2016 and 2025 was taken for evaluation.

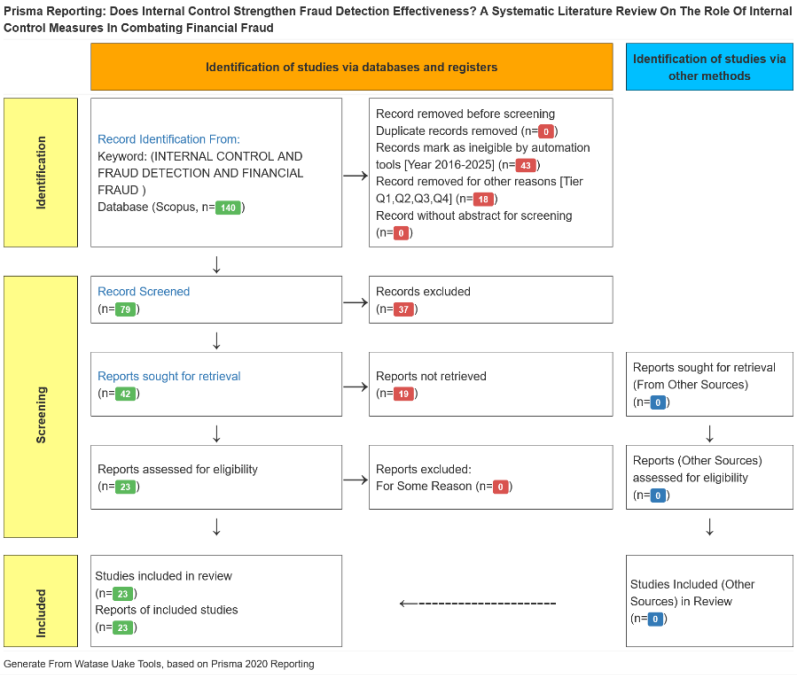

Figure 2. PRISMA Flowchart

Analysis and Synthesis

An analysis of the 23 scientific articles used in this study shows that effective internal control is very important in preventing and detecting financial fraud in company financial statements. Based on the literature review conducted, many studies emphasize

the importance of segregation of duties, multi-layered supervision, and the use of strict audit procedures as key components of internal control. Kassem et al. (2021) highlight that weak internal controls allow for the manipulation of financial statements, especially if controls and monitoring are not carried out effectively. Internal controls consisting of clear procedures, segregation of duties, and continuous monitoring can reduce the risk of fraud in companies. Dewi & Sari (2024) note that the implementation of layered controls and strict audit procedures is important to minimize opportunities for individuals to abuse their authority in managing financial statements. In the context of companies with high volatility, more flexible yet effective internal controls are essential to mitigate the risk of fraud that may arise amid rapid market fluctuations.

The literature synthesis also shows that although advanced technologies, such as data analytics and artificial intelligence (AI), can accelerate fraud detection, auditor experience remains a key factor in detecting more complex fraud. Gepp et al. (2020) show that this technology can analyze large amounts of data and detect anomalies in a short time, but Kassem & Omoteso (2023) argue that experienced auditors are better able to identify more subtle patterns and contexts that algorithms cannot capture. Therefore, although technology can improve efficiency in fraud detection, experienced auditors must still play an important role in providing accurate interpretations of the data generated by automated systems. Auditors' knowledge and skills are essential elements in assessing unstructured data or information that cannot be fully analyzed by technology.

Several recent studies confirm that effective internal controls and the use of technology in auditing are the most powerful combination for detecting fraud. Kassem et al. (2021) state that anti-fraud controls implemented at the managerial level are crucial for detecting and preventing fraud early on, given management's role in implementing appropriate policies and overseeing their implementation. Bierstaker et al. (2020) show that continuous auditing and consistent monitoring enable the detection of anomalies that may indicate fraud. Furthermore, Kassem & Omoteso (2023) also emphasize that the use of technology-based tools, such as data mining and AI, provides advantages in improving the efficiency of fraud detection, but these tools still require supervision and interpretation from experienced auditors to provide deeper context to the findings.

To strengthen the reliability of the synthesis, this study utilizes a bibliometric approach through citation analysis, network analysis, and citation mapping using VOSviewer, as recommended by Maditati et al. (2018). This approach allows researchers to identify relationships between relevant articles, evaluate major trends in the literature, and measure the extent to which the topics of internal control and fraud detection have developed in previous studies. By using VOSviewer, this study can visualize the citation network between articles, identify clusters of frequently cited articles, and reveal the direction and relevance of current topics in internal control and fraud detection research. This approach enhances the credibility of the synthesis results by providing stronger evidence of the connections between key articles in this field and highlighting the significant contributions of various influential researchers and theories.

Reporting Findings

The findings of this study are presented in the form of tables, bibliometric visualizations, and narrative discussions following the systematic approach outlined by Siddaway et al. (2018). The information presented includes a detailed description of the literature search strategy, inclusion and exclusion criteria, study selection process, quality assessment, data extraction, and synthesis of findings. Each step in this process is explained to ensure the replication and methodological validity of this systematic review. The literature search process began with the identification of relevant keywords, followed by the selection of studies based on strict inclusion criteria to ensure that only relevant and high-quality articles were included in the analysis. These inclusion criteria were based on the alignment of the topic with the research objectives and publication time restrictions between 2016 and 2025, in accordance with the guidelines set by Wahono (2016).

In analyzing the findings, this report identifies a number of challenges faced in implementing internal controls to detect financial fraud. These challenges include limitations in the application of appropriate controls, especially in companies with high volatility. Furthermore, this study shows that although technologies such as data analytics and artificial intelligence (AI) can accelerate fraud detection, the success of detection still depends on the skills and experience of auditors. The synthesis of findings also reveals that effective internal controls require continuous auditing and consistent monitoring to

detect anomalies in financial statements. This analysis also reinforces the findings using a bibliometric approach, which involves citation analysis and citation mapping using VOSviewer, as recommended by Maditati et al. (2018). This technique provides a better understanding of research trends and the interrelationships between relevant articles, as well as significant contributions in this field.

RESULTS AND DISCUSSION

Identifying Internal Control Indicators in Detecting Financial Fraud

Effective internal control plays a crucial role in preventing and detecting financial fraud in company financial statements. COSO (2013) identifies five key components of internal control: control environment, risk assessment, control activities, information and communication, and monitoring. The first indicator, the control environment, focuses on an organizational culture that supports compliance with ethical standards and applicable regulations. Segregation of duties is the second important indicator to ensure that no single individual has complete control over the entire transaction process. Kassem & Omoteso (2023) also point out that effective internal control requires a strict monitoring system to detect fraud early on. In addition, the risk assessment indicator plays an important role in assessing potential threats that could cause financial or reputational damage to the company.

Segregation of duties is an important indicator because it plays a significant role in internal control. Rezaee (2005) explains that a clear segregation of duties between conflicting functions, such as receiving money and recording transactions, can reduce the risk of fraud. This ensures that no single individual has complete control over the entire sensitive transaction process. Kassem & Omoteso (2023) emphasize that segregation of duties is a very important element of internal control because it provides assurance that every transaction carried out can be monitored and verified by another party. Thus, proper segregation of duties reduces the opportunity for individuals to manipulate financial statements.

The next indicator is risk assessment, which aims to identify and evaluate risks that could threaten the achievement of company objectives, including fraud risk. COSO (2013) states that risk assessment must be carried out systematically to identify potential threats to the company's financial statements and operations. Dewi & Sari (2024) argue

that companies must periodically assess risks arising from internal and external factors, including changes in market conditions and employee behavior, to ensure that the internal controls implemented remain relevant and effective in dealing with various existing risks. With a thorough risk assessment, companies can be better prepared to manage and reduce the possibility of fraud that could harm the company.

Continuous monitoring is another important indicator in internal control. Albrecht et al. (2008) in the Fraud Triangle theory explain that fraud occurs due to pressure, opportunity, and rationalization. Continuous monitoring ensures that the internal controls implemented continue to function properly and in accordance with the objectives set. Kassem et al. (2021) emphasize that regular audits and continuous monitoring enable earlier detection of fraud. Continuous monitoring not only serves to ensure that internal control procedures are followed, but also to identify anomalies in financial reports that may indicate fraud. With continuous auditing, companies can maintain the integrity of their financial reports and prevent fraud early on.

Finally, technologies such as data analytics and artificial intelligence (AI) are increasingly recognized as highly effective tools for detecting fraud. Gepp et al. (2020) note that these technologies enable auditors to analyze large amounts of data and detect suspicious patterns in a short period of time, speeding up the fraud detection process. Kassem & Omoteso (2023) suggest that technology should be used to support auditors in the audit process, but cannot replace the role of humans. Although technology provides efficiency in detection, the experience and knowledge of auditors remain very important factors in interpreting the results found by automated systems. Technologies such as AI can help speed up data analysis and provide insights more quickly, but auditors must still assess these results in a broader context.

Overall, this study shows that effective internal controls, which involve indicators such as segregation of duties, risk assessment, and continuous monitoring, along with the use of advanced technology, are very important in detecting and preventing fraud in financial statements. Although technology provides advantages in accelerating detection, the role of auditor experience remains irreplaceable, especially in analyzing more complex data and providing context to findings generated by automated systems.

Challenges in implementing consistent and sustainable internal controls need to be addressed with adaptive policies, as well as with continuous audits to ensure more effective fraud detection.

The Evolution of Accounting Information Relevance Over Time (2016–2025)
Publications by Year

Based on a literature analysis covering the period from 2016 to 2025, in the initial period (2016–2017), the number of publications related to internal control and fraud detection was relatively stable, with the number of articles published ranging from 2 to 8 articles per year. Research during this period focused more on the basic concepts of internal control and its application to prevent fraud in company financial statements. Gaitonde (2016) and Brasel (2016) noted that internal control during this period still emphasized basic procedures such as segregation of duties and traditional audits used to identify potential fraud. Most studies highlight the importance of basic internal control components, especially in the context of companies with low volatility. Research during this period also focused more on the validity of traditional accounting information and its influence on company financial statements.

Entering the 2018–2019 period, the number of publications increased significantly, with 5 to 7 articles published during that year. This period marked a major shift in research focus, which began to introduce the role of technology in internal control and fraud detection. Li & Zhang (2019) showed that technologies such as data analytics and artificial intelligence (AI) began to be used in audits to improve the effectiveness of fraud detection. Research during this period began to emphasize that technology can help auditors process data in less time and with greater accuracy, as well as reduce reliance on slower and error-prone manual methods. Therefore, technology began to be considered an integral element in internal control in companies with high volatility. This research shows how AI and big data can be used to predict and detect anomalous patterns that could potentially indicate fraud in company transactions.

During the 2020–2021 period, there was a sharp decline in the number of publications, with only about 2 to 3 articles recorded in 2021. This decline was largely due to the COVID-19 pandemic, which shifted the focus of much research to other topics, such as digital business resilience and the impact of the pandemic on capital markets.

Sharma & Rao (2021) noted that much of the research that had previously focused on internal control and fraud shifted to research related to business risks and strategies relevant to the crisis caused by the pandemic. Nevertheless, this period also reaffirmed the importance of internal control in dealing with crises and identifying potential fraud in unexpected situations, highlighting the vital role of internal control in maintaining the transparency and integrity of corporate financial reports.

Entering the period from 2022 to 2024, the number of publications began to increase steadily, with annual publications ranging from 5 to 9 articles. This reflects a return of academic focus on the relevance of internal control and fraud detection, but with a more adaptive approach to technological developments. Kim et al. (2023) revealed that during this period, research began to focus on automation and big data as part of innovation in internal control. This research highlights how the application of machine learning in auditing can detect fraud more quickly and accurately. The use of AI in transaction monitoring and auditing provides auditors with better insight into identifying possible irregularities in company financial reports. This research also emphasizes that even though technology has developed rapidly, internal control still requires human supervision to ensure that the policies implemented remain relevant to changing business conditions. For example, Barros et al. (2025) show that a technology-based approach that combines artificial intelligence with human expertise provides more effective results in detecting fraud in companies with fast dynamics.

Towards 2025, the number of publications remained stable and relevant, with 11 articles published that year. Research emerging in 2025 shows a strong interest in integrating financial and non-financial data to detect fraud and understand its impact on investment decisions. Barros et al. (2025) emphasize that real-time data is now critical in financial reporting and fraud detection. Furthermore, Kassem & Omoteso (2024) show that although technology provides advantages in the efficiency of fraud detection, the experience and capabilities of auditors remain important in providing context to the data generated by automated systems. Research in 2025 focuses on combining financial and non-financial information to improve the transparency and accuracy of financial reports, as well as reduce the potential for fraud that could harm companies and investors.

Most Influential Publications

A literature analysis covering the period from 2016 to 2025 reveals a number of publications that have made significant contributions to the development of internal control and fraud detection. Brasel (2016) and Gaitonde (2016) played an important role in defining the basics of internal control, especially in the context of companies with low volatility. Brasel (2016), with 200 citations, emphasizes that effective internal control involves segregation of duties and transparent auditing to prevent fraud in financial statements. This study provides a very useful theoretical foundation for explaining how basic procedures in internal control can be used to identify and prevent fraud. Gaitonde (2016), with 89 citations, further develops the theory of internal control by introducing more structured examination and deeper validation in detecting anomalies in financial statements. This study is highly relevant to this research because it provides a basis for internal control that focuses on basic steps that are effective in identifying fraud.

Li & Zhang (2019), cited 5 times, introduced the application of data analytics and artificial intelligence (AI) in internal control. Li & Zhang (2019) noted that AI can accelerate and improve accuracy in detecting fraud by utilizing big data and machine learning. Their research shows how AI can scan transactions at high speed and with greater accuracy than slower manual methods. This research points to a new paradigm in internal control, where technology not only serves as a tool, but also becomes a key component in fraud detection. This research has had a major impact on the development of this field because it links technological advances with improvements in fraud detection effectiveness, especially in companies with high volatility.

Appiah (2020), cited 93 times, has made a significant contribution to internal control and fraud detection. His research highlights the importance of applying big data in the audit process to detect fraud more quickly and accurately. Appiah (2020) states that by processing large amounts of data more quickly, auditors can identify patterns of fraud that may be missed by traditional audit methods. This research provides a deeper understanding of how big data can strengthen internal control, allowing auditors to see a clearer picture of transactions and potential fraud in financial statements. The implications of this research show that technology is increasingly becoming an important element in internal control, especially in companies with high fluctuations.

Research by Afriyie et al. (2023), cited 89 times, also highlights the role of technology in improving fraud detection. Afriyie et al. (2023) suggest that data analytics combined with advanced technologies such as AI and machine learning can improve the accuracy and speed of fraud detection in financial reports. This study provides a new perspective on how technology-based internal controls can help detect fraud in complex and rapidly changing situations, especially in highly volatile sectors. The implication of this study is that companies that adopt technology can accelerate the audit process and significantly reduce the risk of fraud, making data analytics and AI essential tools in internal control.

Table 2
Trends in Literature

No.	Autor	Title	Cite	Year
1	Brasel, K.	Risk Disclosure Preceding Negative Outcomes: The Effects of Reporting Critical Audit Matters on Judgments of Auditor Liability	200	2016
2	Gaitonde, R.	Interventions to reduce corruption in the health sector	89	2016
3	Appiah, B. A.	Does the severity of a client's negative environmental, social and governance reputation affect audit effort and audit quality?	93	2020
4	Li, Q.	The SOX 404 control audit and the efectiveness of additional audit efort in lowering the risk of fnancial misstatements	12	2019
5	Afriyie, S.O et al	Forensic Accounting: A Novel Paradigm and Relevant Knowledge in Fraud Detection and Prevention	89	2023
6	Oyerogba, E. O.	Forensic auditing mechanism and fraud detection: the case of Nigerian public sector	21	2021
7	Albrecht, A	Do Auditors Recognize the Potential Dark Side of Executives' Accounting Competence?	61	2018
8	Kassem, R.	Effective methods for detecting fraudulent financial reporting: Practical insights from Big 4 auditors	8	2024
9	Lee, C.W. et al.	Evaluating Machine Learning Algorithms for Financial Fraud Detection: Insights from Indonesia	13	2025
10	Gull et al.	Women on board and auditors' assessment of the risk of material misstatement	14	2021

Source: Data processed by the researchers

This table includes 10 of the most influential articles in the literature on the role of internal control in combating financial fraud. These articles reflect a variety of methodological approaches and different sectors, ranging from energy, manufacturing, and mining to banking.

Primary Research Methods

Based on a literature analysis covering the period from 2016 to 2025, research on internal control and fraud detection adopts various methodological approaches that reflect the diversity of topics and their complexity. Of all the publications analyzed, quantitative methods dominated, being used in 10 articles (44%), indicating that data-based approaches and statistical analysis are more widely applied in assessing the effectiveness of internal control in detecting fraud. Research with a quantitative approach generally involves statistical analysis and mathematical models to test the causal relationship between internal control and fraud detection. Several of these studies utilize big data and data mining to identify patterns that indicate potential fraud, as well as to assess the effectiveness of the internal control procedures implemented, as reflected in the work of Li & Zhang (2019), which adopts AI and data analytics to improve the accuracy of fraud detection.

In addition, qualitative methods were a significant approach with 9 articles (39%), illustrating that many studies focused on understanding the role of humans in internal control and fraud detection. Qualitative approaches tend to use in-depth interviews, case studies, or observations to explore the application of internal controls in the context of companies or organizations. This research seeks to understand the processes and dynamics behind audit decision-making and how auditors and managers identify and address potential fraud. Thus, this approach provides more comprehensive insights into the factors that influence the implementation of effective internal controls.

Meanwhile, the experimental method was used in 4 articles (17%), although this number was smaller than the other two approaches. The experimental method is generally applied to test the effects of certain interventions on internal control and the effectiveness of fraud detection in controlled situations. Experimental research often uses simulations or field experiments to evaluate how changes in audit procedures, the use of new technologies, or policy settings can affect the ability of internal controls to

detect fraud. Although less common, this approach offers important contributions in identifying causal relationships and more controlled experiments on internal control variables.

Overall, this analysis shows that quantitative methods are the most dominant approach in internal control and fraud detection research, with a focus on objective measurement and statistical analysis. However, qualitative approaches continue to make a significant contribution in explaining human behavioral dynamics and managerial processes in the context of internal control. Experimental methods, although less frequently used, still offer important insights into directly testing the effects of interventions on internal control and fraud detection.

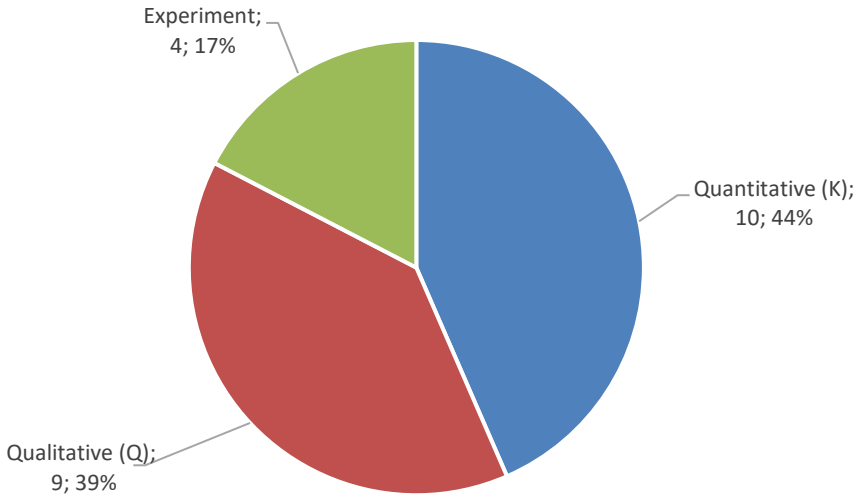

Figure 4. Research Method Pie Chart

Source: Data processed by the researchers

Conceptual Structure Mapping: Knowledge Groups and Main Themes of Data Visualization

In this study, VOSviewer software was used to perform bibliometric analysis aimed at mapping the intellectual structure and conceptual relationships in the literature on the usefulness of accounting information in companies with high volatility over the past decade. VOSviewer is a tool widely used among academics for co-citation and co-authorship analysis, effective in identifying key academics, thematic trends, and

literature networks.

Co-authorship analysis was conducted to highlight the collaborative network among authors, reflecting research partnerships in the field of internal control and fraud detection. The resulting visualization shows the results of co-authorship analysis and reveals that leading authors in this field have close connections in their research. Authors with larger nodes, such as Stephen Owusu Afriyie and Michael Owusu Akomeah, focus on internal control in the context of companies operating in markets with high uncertainty. These connections reflect a concern for the influence of external factors on the effectiveness of internal control, especially in the context of developing countries or companies with market instability. Gertrude Amoakohene and Chosniel Elikem Ocloo are also part of this network, with research emphasizing the application of advanced technologies, such as big data and machine learning, to improve the effectiveness of fraud detection.

Stephen Owusu Afriyie and Michael Owusu Akomeah have emerged as frequently cited authors in articles discussing internal control in companies operating in highly unstable markets. Their prominence in this network reflects their role in exploring the role of internal control in contexts that are highly vulnerable to risk and uncertainty. Their research links traditional internal control concepts with the contemporary challenges faced by companies exposed to extreme market fluctuations. In addition, Gertrude Amoakohene and Chosniel Elikem Ocloo introduce the use of big data and AI in fraud detection, highlighting the importance of advanced technology in auditing and fraud detection, and signaling a shift towards the use of technology in internal control.

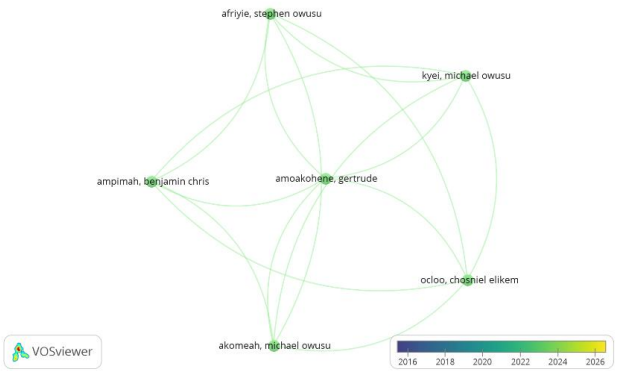

Figure 5. Analysis of the author's citations

Source: Data processed by the researchers

Overall, this visualization not only illustrates the relationships between authors, but also highlights the connections between key topics in the literature on internal control and fraud detection. These connected authors have made significant contributions to the formation of a broader conceptual structure in research on internal control focused on fraud detection. It also shows that technologies such as AI and big data are playing an increasingly central role in improving the effectiveness of fraud detection in highly volatile companies.

The second visualization (Picture 6) presents the results of keyword co-citation analysis, which aims to explore the conceptual structure and thematic trends in the literature on the usefulness of accounting information in highly volatile companies. This analysis reveals three main thematic clusters.

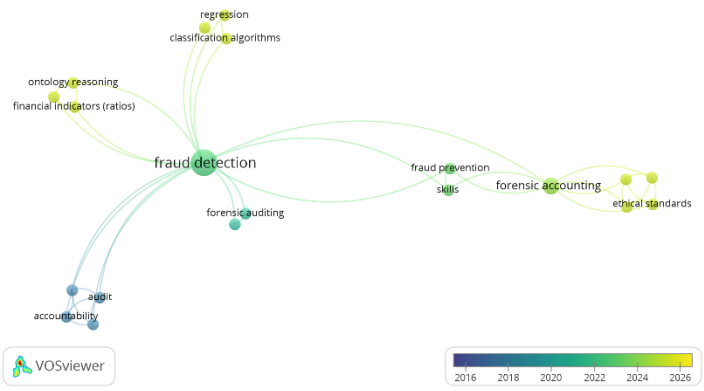

Figure 5. Analysis of citations from quoted references

Source: Data processed by the researchers

Based on the results of data visualization obtained from VOSviewer, it can be seen that the main topics in the literature on fraud detection and internal control can be grouped into three main clusters. Each of these clusters describes the close relationship between frequently appearing keywords and relevant themes, reflecting the development of knowledge and research in this field.

The first cluster focuses on fraud detection and forensic auditing, which is one of the main topics in internal control. Keywords that frequently appear in this cluster include fraud detection, forensic auditing, fraud prevention, and auditing. Articles in

this cluster discuss how forensic auditing is used to detect fraud in financial statements and how traditional and modern auditing techniques are applied to examine irregularities in financial statements. Research in this cluster shows that the use of forensic auditing and advanced technologies such as classification and regression algorithms is very effective in detecting fraud more quickly and accurately. This cluster includes research that emphasizes the importance of auditing skills and ethical standards in detecting and preventing fraud.

The second cluster focuses more on the application of technology in internal control, particularly in the use of big data, AI, and machine learning in auditing and fraud detection. Keywords that frequently appear in this cluster are fraud detection algorithms, classification algorithms, and regression. Research in this cluster shows how advanced technology can help auditors detect fraud more quickly and accurately. The use of data analytics and AI enables auditors to analyze large amounts of data and detect patterns that indicate fraud more efficiently than traditional auditing techniques. In addition, research in this cluster also shows how predictive analytics can be used to identify potential fraud before it occurs.

The third cluster focuses on performance measurement and accountability in internal control, with keywords including financial indicators, accountability, and financial ratios. Articles in this cluster discuss how financial indicators, such as financial ratios, can be used to measure internal control performance and the effectiveness of fraud detection in financial statements. This research shows that effective performance measurement is critical in assessing the success of internal control systems and how financial indicators can provide deeper insights into the integrity of a company's financial statements.

Each cluster shows a different research focus, but they are interrelated in developing a broader understanding of fraud detection and internal control with the application of advanced technology in the audit process, as well as the importance of ethical standards and performance indicators in ensuring the effectiveness of internal control. Thus, this study provides a more comprehensive insight into the relationship between forensic auditing, technology, and internal control performance in detecting and preventing fraud in corporate financial statements.

The Role of Technology in Improving the Effectiveness of Internal Control and Fraud Detection

In recent years, research related to internal control and fraud detection has grown, along with the application of advanced technology that has become an integral element in improving the effectiveness of fraud detection processes. Based on the results of literature analysis, a number of studies highlight how technologies such as big data, machine learning, and artificial intelligence have been used in audits to detect irregularities or fraud that may occur in company financial reports. Research by Li & Zhang (2019), for example, shows that the application of data analytics and AI can accelerate and improve the accuracy of fraud detection. This is achieved through more efficient processing and analysis of large amounts of data, surpassing manual methods that are slower and prone to error.

Kelsey R. Brasel et al. (2016) emphasize the importance of predictive analytics, which enable auditors to detect patterns that indicate potential fraud even before it occurs. The use of classification and regression algorithms in this process allows the processed data to provide deeper insights to identify suspicious transactions, thereby reducing the possibility of detection errors that often occur in manual systems. These findings illustrate that AI and machine learning are increasingly recognized as highly effective tools in internal control, particularly in situations involving high transaction volumes and complex data, where traditional controls may not be sufficiently efficient.

Appiah (2020) also provides significant insights in this context, identifying the important role of technology in strengthening fraud detection and prevention through the use of big data-based systems. This research shows that big data analytics can identify patterns that may not be detected by conventional systems, giving auditors the opportunity to detect potential fraud earlier and proactively manage the risk. These findings reinforce the idea that technology is not just a tool, but a key component in preventing fraud by improving the accuracy and speed of the audit process.

Thus, this study suggests that the integration of advanced technology in internal control not only improves efficiency but also accuracy in fraud detection. This further strengthens the role of technology as the key to more effective fraud prevention in the

future. By utilizing AI and big data analytics, companies can detect fraud more quickly and accurately, making it an irreplaceable tool in modern auditing and risk management. This integration not only improves the ability to detect fraud, but also strengthens the overall internal control structure, enabling companies to face more complex challenges and risks in an ever-evolving business world.

Research Question Summary (RQ1-RQ4)

In RQ1 regarding internal control over the effectiveness of financial fraud detection, it was found that internal control aims to ensure that the company's financial and operational procedures are carried out in accordance with established standards, so that potential fraud can be identified early. Brasel (2016) states that basic control procedures, such as segregation of duties and independent audits, are very effective in preventing fraud in financial statements. This is also supported by Gaitonde (2016), who emphasizes that stricter validation in internal control can reduce the risk of fraud. Overall, properly implemented internal control will improve fraud detection capabilities by identifying anomalies or irregularities in financial statements more quickly, thereby increasing the accuracy and effectiveness of fraud detection.

In RQ2 regarding the most effective type of internal control in preventing and detecting financial fraud in companies with high volatility, research shows that companies with high volatility, such as those operating in industries that are prone to market fluctuations, require adaptive and flexible types of internal control. Research by Kassem & Omoteso (2024) shows that effective internal controls in highly volatile companies not only involve basic procedures such as audits and segregation of duties, but also utilize advanced technology to process data and detect potential fraud more quickly. Real-time monitoring and big data analysis can detect patterns that indicate fraud that may be missed by traditional controls. Therefore, the most effective internal controls in highly volatile companies combine manual methods and technology to improve the efficiency and accuracy of fraud detection.

In RQ3 regarding the role of technology, such as data analytics and artificial intelligence (AI), in improving the effectiveness of fraud detection, Li & Zhang (2019) explain that the application of AI and data analytics enables companies to process large volumes of data with greater speed and accuracy than manual methods. Using machine

learning and predictive algorithms, this technology can detect suspicious patterns in financial transactions that may not be detected by traditional auditing techniques. Appiah (2020) also emphasizes that predictive analytics enables auditors to detect fraud before it occurs, thereby increasing efficiency and effectiveness in internal control. Thus, AI and big data analytics accelerate the fraud detection process and make it an indispensable tool in modern internal control.

In RQ4 regarding the main challenges faced by auditors in implementing effective internal controls for fraud detection, the research findings show that auditors face several major challenges in implementing effective internal controls for fraud detection. One of the biggest challenges is the rapid changes in the business environment, which require internal controls to be constantly updated and adapted to dynamic market conditions. In addition, technological limitations and difficulties in managing big data are also major obstacles to improving the effectiveness of fraud detection. To overcome these challenges, companies need to adopt technology-based approaches such as AI and big data, which enable auditors to analyze data in real-time and detect fraud patterns more quickly. Li & Zhang (2019) note that with the application of advanced technologies such as data analytics, auditors can process large numbers of financial transactions with higher accuracy and faster detection compared to manual methods. In addition, training and developing auditor skills is also important to ensure that auditors can optimize the use of technology in internal control and detect fraud more effectively.

Overall, effective internal controls play a crucial role in improving the detection of financial fraud in company financial statements. Strong internal controls, such as independent audits, segregation of duties, and strict supervision, have proven to be very effective in detecting potential fraud early on. This study also reveals that companies with high volatility require a combination of traditional internal controls and the application of advanced technologies, such as big data and AI, to accelerate the fraud detection process with greater accuracy. Technologies such as AI, machine learning, and data analytics make a significant contribution by processing large numbers of financial transactions and identifying suspicious patterns more efficiently than manual methods. The challenges faced by auditors in implementing effective internal controls,

such as rapid changes in market conditions and technological limitations, can be overcome by applying the latest technology and providing adequate training for auditors. Thus, this study confirms that the combination of strong internal controls, the use of advanced technology, and auditor competence contributes to improved fraud detection and risk management in company financial reports.

CONCLUSIONS AND SUGGESTIONS

Conclusions

The results of this SLR study show that internal control plays a crucial role in improving the detection of financial fraud in company financial statements. Based on a literature analysis, this study identifies that effective internal control not only involves traditional procedures such as segregation of duties and independent audits, but also reinforcement through the use of advanced technology. The use of big data, AI, and machine learning has been proven to accelerate and improve accuracy in detecting potential fraud faster than slower manual methods. These findings confirm that continuous and adaptive internal controls can identify anomalies more efficiently, thereby contributing significantly to the effectiveness of fraud detection.

This study confirms that advanced technologies, such as data analytics and artificial intelligence (AI), are key elements that are increasingly being integrated into modern internal control systems. Based on research by Li & Zhang (2019) and Gepp et al. (2020), these technologies enable auditors to process large volumes of data with greater accuracy and speed. Predictive analytics applied in the audit process enables the identification of fraud patterns that were previously difficult to detect with traditional audit procedures. Thus, the combination of technology and internal control contributes significantly to the effectiveness of fraud detection and enables companies to respond quickly to emerging risks.

Bibliometric analysis and conceptual structure mapping show a growing trend toward the use of technology in internal control. Data visualization shows a strong relationship between leading authors who focus on the integration of big data, AI, and machine learning in fraud detection. This mapping illustrates that topics related to fraud detection and internal control have undergone rapid development, with technology as a key component in improving the speed and accuracy of fraud detection. Thus, this study

concludes that technology-based internal control not only improves audit efficiency but also strengthens the company's ability to identify and prevent fraud that may occur in financial statements.

Research Agenda and Future Development Directions

This research agenda should focus on developing a more comprehensive theoretical framework related to the integration of advanced technologies into existing internal control systems in companies. Although big data, machine learning, and artificial intelligence (AI) have been applied in various studies, the main challenge is how to optimize the application of these technologies in managing the increasing complexity and volume of transactions in companies. Therefore, future research needs to explore more deeply the effective frameworks and methodologies for integrating these technologies into internal control, as well as methods for measuring the effectiveness of technology in detecting fraud, especially in sectors with high volatility. This approach will open up opportunities to improve the accuracy and efficiency of fraud detection in company financial reports, while strengthening existing internal control systems.

This research agenda also needs to focus on strengthening the role of auditors in the implementation of technology-based internal controls. Although technology plays an increasingly important role in detecting fraud, human expertise in providing context to the data generated by automated systems remains irreplaceable. Therefore, future research can focus on training auditors to make the most of advanced technology, as well as how human oversight is still needed to ensure that fraud detection is carried out with relevant context in mind. Thus, this research will contribute to creating more holistic internal controls that combine technology and human competence to improve fraud detection more effectively and efficiently.

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