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Strengthening the effectiveness of accounting information systems: A systematic review of AI integration and internal control practices

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Abstract: This paper examines how the integration of artificial intelligence (AI) and internal control practices contributes to the effectiveness of accounting information systems (AIS) in the context of digital transformation. This study conducts a systematic review of AI integration and internal control practices in strengthening AIS effectiveness. Employing the Systematic Literature Review (SLR) method aligned with PRISMA 2020 guidelines, 97 international scientific articles published between 2019 and 2025 were analyzed from the Scopus database. The review demonstrates that AI adoption consistently enhances efficiency, automation, and analytical capabilities in AIS, while internal controls remain crucial for ensuring reliability, accountability, and mitigation of information risks. The analysis highlights the mediating role of accounting information quality in linking AI, internal controls, and AIS effectiveness; nonetheless, it also raises unresolved challenges. The study emphasizes the importance of balancing technological innovation with robust governance for managers, auditors, and policymakers on investing in digital capabilities, strengthening internal control frameworks, and establishing governance policies that promote the responsible adoption of AI in accounting practices.

Keywords: *Accounting information systems, Artificial intelligence, Digital transformation in accounting, Internal control practices, Systematic literature review.*

1. Introduction

Digital transformation has revolutionized the way organizations manage, process, and report financial information. In an increasingly complex and data-driven business environment, accounting information systems (AIS) are an essential pillar in ensuring the accuracy, reliability, and relevance of financial information. The effectiveness of AIS depends not only on the technical components of the system itself but also on the integration between cutting-edge technology and robust organizational governance. Continuous innovation in AI applications is needed to keep pace with the evolving needs of financial risk management. This includes the development of a new AI-based device for improved risk assessment and control [1]. In addition, the adoption of technologies such as blockchain in accounting information systems further emphasizes the protection of data integrity, as this technology ensures that data remains intact and cannot be manipulated [2].

Many companies have integrated artificial intelligence (AI) into their accounting information systems to improve the efficiency and accuracy of financial reporting. This trend is not only an innovative strategy but also a response to the demand for transparency and accuracy of information in the digital era. In the audit sector, particularly in Saudi Arabia, the adoption of AI presents its challenges for professionals, given the significant changes it brings to audit efficiency and the quality of financial reporting [3]. Various AI applications, including automated transaction processing, fraud detection, and risk assessment, have accelerated the reporting process while enhancing its accuracy [4-6]. In fact, according to Imjai et al. [7], the integration of AI has revolutionized data-driven accounting practices, promising sharper and more reliable financial analysis. Technologies such as Machine

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Learning (ML), Natural Language Processing (NLP), and Robotic Process Automation (RPA) have also been proven to enhance the timeliness and accuracy of financial information disclosure [8-10]. The application of AI also facilitates the management of large amounts of data and complex information, which was previously difficult to handle manually [6, 11]. In other words, AI is not just a tool but has become a catalyst for transformation in the company's financial reporting and control systems.

On the other hand, internal control aspects cannot be ignored, as they form the basis for the reliability of accounting reports. The implementation of security technology, alongside best practices, has been shown to improve an organization's security posture [12]. Research by Draeger and Lohwasser [13] confirms that consistent internal controls can reduce revisions to earnings announcements, thereby strengthening public confidence in the transparency of financial information. Furthermore, the use of machine learning and robotic process automation helps reduce routine work, freeing accountants to focus on strategic analysis [9]. However, technology alone is not enough. The quality of AIS is ultimately determined by the interaction between intelligent innovation and effective internal control mechanisms [14]. The integration of the two produces more reliable and relevant accounting information, supporting informed decision-making and enhancing organizational performance [15, 16].

The integration of artificial intelligence (AI) into accounting information systems (AIS) has been widely studied, revealing various benefits such as increased efficiency, accuracy, and improved decision-making processes [10, 11] and better decision-making capabilities [17, 18]. However, there are still some unknowns and challenges that require further study. The potential of AI in improving accounting processes is widely recognized; however, there is a lack of comprehensive empirical studies that systematically evaluate its impact on supervision, reporting, and error detection in real-world settings [19-23]. AI also shows promise in detecting fraud. The effectiveness and limitations of various AI techniques in different contexts require further exploration [24].

The internal control system is increasingly focused on risk assessment and mitigation to ensure the reliability of financial reporting [25]. Organizational culture plays a crucial role in AIS's success. Companies with supportive cultures tend to have adequate internal controls, which are further strengthened by the adoption of AI [26]. AI can significantly improve the efficiency and accuracy of internal control, shifting governance from "post-event remediation" to "pre-event prevention" [27]. However, the types of internal control weaknesses that most affect the reliability and efficiency of AIS are not well documented. Further research can help in developing appropriate strategies to mitigate these weaknesses.

Aligning AI capabilities with the specific demands of crisis management is far from straightforward, as it requires organizational adaptation and contextual adjustments [25]. Moreover, the opaque nature of AI decision-making, its potential for unpredictable errors, and its growing autonomy introduce additional concerns related to security, safety, and governance [28, 29]. From an ethical perspective, scholars have acknowledged the regulatory and normative challenges of AI in accounting; however, these debates remain relatively underdeveloped. Issues such as data privacy, algorithmic bias, and the need for explainable AI are critical areas that require further empirical investigation [21-23]. At the same time, embedding AI into internal control mechanisms broadens the cybersecurity threat landscape by creating vulnerabilities similar to those in IT [30]. Taken together, the risks, opportunities, and challenges associated with integrating AI and internal controls into AIS highlight the need for more in-depth and sustained scholarly inquiry.

The interaction between AI systems and human accountants, particularly in decision-making and strategic functions, remains a relatively understudied area of research. Clarifying how AI can complement professional judgment and determining the extent to which it is capable of automating surveillance activities are therefore crucial questions [21, 22, 31]. However, continuous auditing and advanced data analysis are widely recognized as promising tools; their specific contribution to enhancing internal audit effectiveness is not yet fully understood. Further inquiry is needed to explore how these technologies can be deployed to generate real-time insights and support the early detection of

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risks [32]. Addressing these unresolved issues calls for a multidisciplinary perspective that integrates knowledge from technology, management, and auditing. By focusing on these areas, future research can significantly improve the effectiveness and efficiency of AI-based internal audit and control mechanisms.

To respond to this research need, the study adopts a Systematic Literature Review (SLR) method guided by the PRISMA 2020 protocol, enabling the identification, synthesis, and classification of the latest research results that discuss the integration of AI and internal control practices in the context of strengthening the effectiveness of accounting information systems. This study is expected to make a conceptual contribution to building a theoretical framework, as well as offer future research directions relevant to technological developments and financial information governance needs in the digital era.

2. Methodology

2.1. Research Design

This study employs a Systematic Literature Review (SLR) approach, following the PRISMA 2020 (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. The SLR approach was chosen to ensure transparency, replication, and rigor in the literature review process [33]. In this study, the review was organized into four stages: identification, screening, eligibility assessment, and final inclusion. A PRISMA flowchart is included to illustrate the systematic process for selecting articles.

2.2. Research Questions

To ensure clarity and focus, this systematic review is guided by the following research questions, which serve as the analytical foundation for the study.

RQ1: How does the integration of artificial intelligence (AI) contribute to increasing the effectiveness of accounting information systems?

RQ2: How do internal control practices play a role in strengthening the reliability and efficiency of accounting information systems?

RQ3: What are the challenges, risks, and opportunities that arise in integrating AI and internal controls into AIS?

RQ4: What are the research gaps that are still open in the development of AI-based AIS effectiveness and internal controls?

These four questions form the basis for filtering, reviewing, and classifying the findings of the selected articles, as well as creating a conceptual basis for the development of theoretical models and future research directions.

2.3. Data Sources and Search Strategies

The literature search was conducted through the Scopus database. It was chosen because it has a wide coverage of international journals, provides complete metadata, and is recognized as one of the leading scientific databases in management and accounting studies. The search was conducted using the keywords: “Artificial Intelligence” OR “AI” AND “Accounting Information System” OR “AIS” AND “Internal Control”.

Query Analysis Search in Scopus Is:

("artificial intelligence" OR "AI" AND "accounting information system" OR "AIS" AND "Internal Control") AND PUBYEAR > 2014 AND PUBYEAR < 2026 AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT TO (SUBJAREA, "COMP") OR LIMIT-TO (SUBJAREA, "ECON") AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE , "re")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (SRCTYPE , "j")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (OA, "all") OR LIMIT-TO (OA , "publisherfullgold") OR LIMIT-TO (OA , "publisherhybridgold"))

Number of initial documents obtained: 878 articles.

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2.4. Inclusion and Exclusion Criteria

2.4.1. Criteria Included

Articles published from 2019 to 2025, focusing primarily on AI, AIS, or internal control topics, peer-reviewed journal articles, available in full text, and written in English.

2.4.2. Exclusion Criteria

Non-journal articles (books, proceedings, working papers), articles that are still in the process of publication (in press), non-English articles, and journals with limited access (green/bronze open access).

2.5. Study Selection Process

Selection of articles according to the stages of PRISMA 2020:

1. Title and abstract filtering**:** 176 articles were filtered from the initial 878 articles based on topic match.
2. Eligibility assessment**:** After a full text review, a total of 97 articles were declared eligible and included in the synthesis stage.
3. Thematic classification**:** The selected articles are classified into six dominant themes, namely Effectiveness of accounting information systems, Integration of AI in AIS, Internal controls, Technology-based audit and assurance, Quality of accounting information, and Digital readiness in accounting.

2.6. Data Extraction and Synthesis Process

Each selected article is analyzed in depth, and the data is extracted into a synthesis table. The information collected includes Title, author, year, and journal publication, as well as Abstract and keywords. Main themes include AI integration in AIS, AIS effectiveness/Performance, Internal Control, Audit & Assurance, Accounting Information Quality, and Organizational Readiness. Furthermore, the research questions are mapped to RQ1 through RQ4. The articles are then categorized into six main themes and further mapped to research questions, ensuring that the analysis of the results aligns with the study's objectives.

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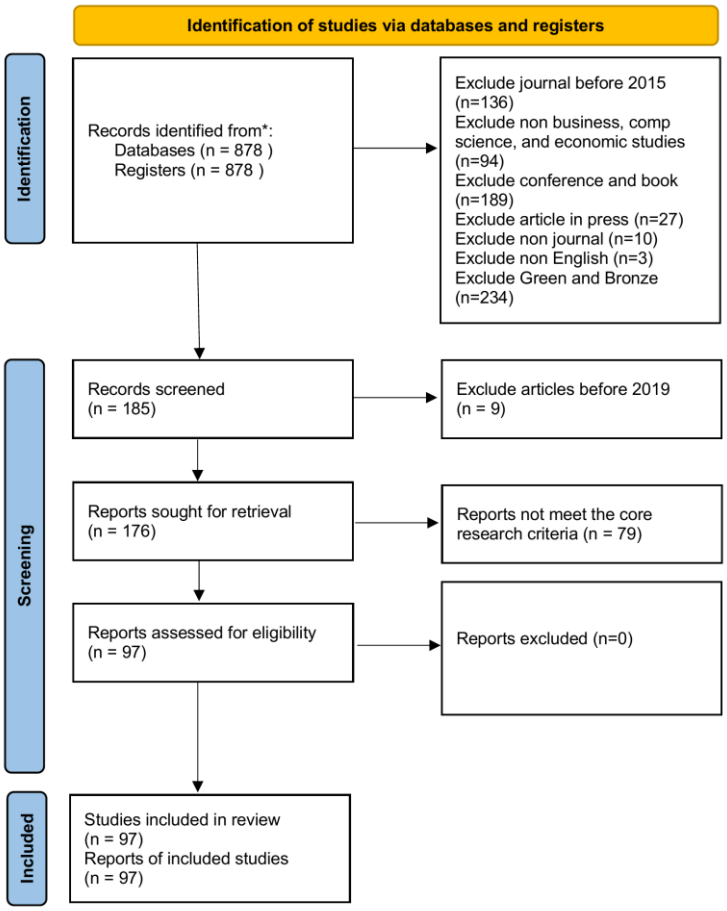

Figure 1.
Flow Diagram PRISMA.

3. Results and Discussion

Based on an analysis of 97 articles identified from 2019 to 2025, publication productivity is dominated by a group of key authors who consistently research topics related to artificial intelligence (AI) integration, accounting information systems (AIS), and internal controls. The most prolific authors are Lutfi and Alqudah [34] with a total of seven publications, followed by Eulerich et al. [35] with five publications each. Furthermore, Ahmad [36] occupies the fourth position with four publications, while Almaiah et al. [37] each have three publications. In addition, authors such as Föhr et al. [38] also made significant contributions with two publications each. These findings indicate that there are key research groups (knowledge hubs) that act as the main drivers in the development of related literature, making them essential references for further research.

The results of the analysis also show that publications on the integration of artificial intelligence (AI), accounting information systems (AIS), and internal controls involve the contributions of authors from various countries, reflecting the increasingly global nature of this research. According to the Scopus database, the top three countries, measured by the frequency of documents, are Jordan with 19 publications, China with 13 publications, and Indonesia with seven publications. The dominance of Jordan and China indicates the centers of focus in the Asian region for the themes of AI, AIS, and internal control. Moreover, Indonesia is starting to show an increasing contribution for the 2019-2025 period. Thus, cross-border research shows the dynamics of academic collaboration that is increasingly

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inclusive and affirms the urgency of this topic in a global context. Meanwhile, the top three countries with the highest total citations are Jordan, with 252 citations from 19 articles (an average of 13.26 citations per article), China, with 168 citations from 13 articles (an average of 12.92 citations per article), and Germany, with 140 citations from 6 articles (an average of 23.33 citations per article). For the average number of citations, the top three countries are Spain (27.67 citations per article), Germany (23.33 citations per article), and the Netherlands (14.40 citations per article).

Overall, this citation pattern shows that there is not always a linear relationship between publication productivity and academic impact. Some countries have a large volume of publications, but their effects in terms of citations remain limited, while other countries with fewer articles have a higher average citation rate. The implications of these findings underscore the importance of prioritizing the quality, international collaboration, and novelty of research, rather than merely focusing on the quantity of publications.

3.1. Distribution of Articles by Central Theme

Of the 97 articles analyzed, it shows that the latest research in the field of Accounting Information Systems (AIS) after 2019 is dominated by the theme of AI Integration in AIS, with 22 articles and AIS Effectiveness/Performance, with 18 articles. This theme indicates that the primary focus of research is on efforts to optimize the accounting system through the adoption of AI technology. The theme of Internal Control, with 11 articles, and Audit and Assurance, with 36 articles, also occupy a significant portion, reflecting attention to strengthening the reliability and transparency of the system through internal control mechanisms and the development of technology-based audits. The theme of Accounting Information Quality appeared consistently throughout the 2015-2019 period, while Organization Readiness was relatively more researched in the early period of digitalization, from 2019 to 2020, and began to decline after 2022. This distribution aligns with the literature, which confirms the dominance of AI as a key driver of AIS effectiveness [3, 5] and the importance of internal control in maintaining system reliability [13].

3.2. Classification of Articles Based on Research Question (RQ)

Articles for the RQ1 category, totaling 49, researching AI integration on the effectiveness of AIS, consistently found that AI contributes positively to the effectiveness of AIS. The articles in this category emphasize AI's contribution to improving information quality, streamlining the reporting process, and enhancing operational efficiency [13, 39].

There are 47 articles in the category RQ2 Internal Control on AIS Reliability. Studies in this category discuss the application of COSO, blockchain, and technology-based auditing frameworks as ways to strengthen internal control [13, 40]

The study, which examines the critical dynamics of technology integration into AIS according to the RQ3 category, comprising 34 articles, highlights algorithmic limitations, privacy risks, and information bias, as well as limitations of AI adoption. However, it also identifies significant opportunities in fraud detection, continuous auditing, and cybersecurity [6, 12, 41]. Overall, the integration of AI in AIS creates a paradox: it can enhance the effectiveness of systems while presenting new risks that necessitate mature governance policies and effective mitigation strategies.

Article for the RQ4 category: 55 articles highlight the research gaps that remain open in the implementation of AI-based AIS effectiveness and internal controls. Existing studies are still limited to specific sectors, such as MSMEs or the public sector, with a focus on technical aspects and minimal exploration of ethical dimensions and social impact. Furthermore, longitudinal empirical studies to assess the long-term effects of AI adoption in AIS are still rare. These findings confirm the need for integrating AI with established internal control frameworks, as well as the development of new conceptual models that combine technological, organizational, and regulatory perspectives. Thus, RQ4 emerged as the dominant theme, opening a vast space for further research and theory development.

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3.3. Research Trends Per Year (2019-2025)

Longitudinal analysis revealed a shift in the study's focus. In the initial period (2019–2020), research focused heavily on Organizational Readiness, which refers to an organization's readiness to adopt digital technology. However, since 2021, the trend has shifted strongly towards AI Integration in AIS, which continues to increase until 2024–2025, showing the dominance of AI topics in academic discourse. The theme of audit and assurance, as well as internal control, has been on the rise since 2021, in line with the development of real-time auditing and the increasing prevalence of cybersecurity issues. Meanwhile, AIS Effectiveness/Performance and Accounting Information Quality remained consistently present, although the portion was relatively decreasing compared to the dominance of the AI theme.

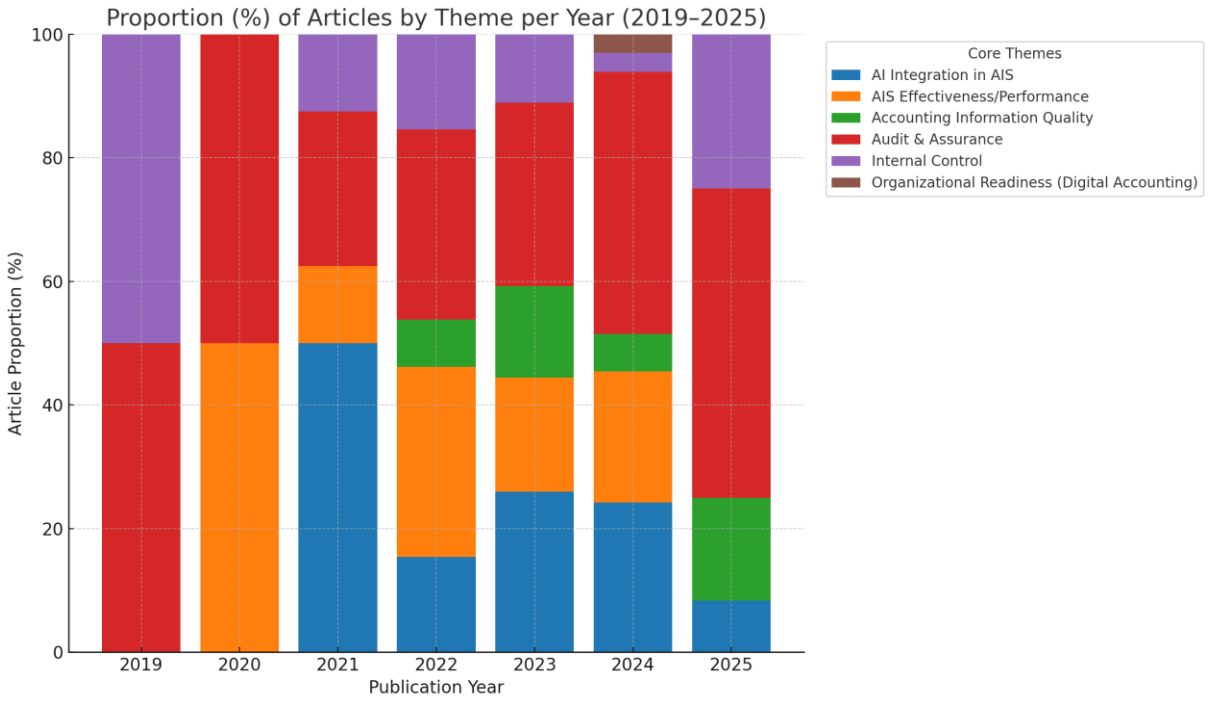

Figure 2.
Proportion (%) of Articles per Theme per Year.

3.4. Discussion

Literature findings indicate that AI plays a significant role in automating processes, enhancing information quality, and improving organizational governance. The contribution of AI to the effectiveness of AIS can be grouped into three main dimensions, namely operational efficiency through automation of accounting processes [42]. Increased transparency, ethics, and reliability of accounting information [36, 43]. In addition to strengthening internal governance and control through the integration of technologists [35, 44]. These findings demonstrate that the integration of AI in AIS serves not only as a technical tool but also plays a strategic role in enhancing the reliability, relevance, and value of accounting information within the context of modern business.

The literature analyzed reveals that robust internal control mechanisms enable organizations to maintain data integrity, minimize the risk of errors, and enhance information accountability. Internal control practices play a fundamental role in improving the reliability and efficiency of accounting information systems (AIS) through several key dimensions, such as ensuring the reliability of accounting data with transparency and accountability [44, 45]. Improve operational efficiency through continuous monitoring, inefficiency prevention, and maintaining compliance [34, 46]. Thus, internal

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control practices not only preserve information integrity but also strengthen AIS's position as a strategic tool in supporting organizational accountability and competitiveness.

The integration of AI into AIS faces several challenges stemming from technological complexity and organizational readiness. Companies are required to invest in employee training and the development of compatible systems so that the benefits of AI can be optimized Wassie and Lakatos [42]. Yang et al. [47] also emphasize that the success of integration is not only determined by technological sophistication but also by managerial readiness and organizational culture. In addition to implementation challenges, integrating AI with internal controls also introduces new risks. The risk of algorithmic bias can lower public trust if it is not anticipated through adequate regulation and governance [36]. The risk of misinformation and weaknesses in the validation of analysis results are challenges for auditors and management in maintaining the quality of internal control [35]. However, the literature also confirms significant opportunities. Nofel et al. [44] mention that when AI is integrated with other technologies, such as blockchain, IoT, and XBRL, the effectiveness of AIS can increase significantly. Georgiou et al. [43] added that AI allows real-time monitoring so that opportunities arise not only in terms of efficiency but also in strengthening governance. Furthermore, Seidenstein et al. [46] show that the integration of AI in the accounting value chain expands the function of internal control beyond simply detecting errors to also preventing inefficiencies. These findings show that while the integration of AI into AIS presents new challenges and risks, the opportunities it offers are much greater when supported by strong internal controls and a mature organizational readiness.

Based on these findings, a gap is identified that highlights the potential for integrating AI and internal control to enhance the effectiveness of AIS. The literature still leaves a vast space for research, particularly in relation to ethical aspects, validity, cross-technology integration, and implementation contexts in various countries. Gaps that are still open include organizational readiness and HR competence in adopting AI-based AIS [42]. Ethical Framework and Transparency in the Application of AI in Accounting [36]. Validity and reliability of automated systems compared to traditional controls [35]. Multi-technology integration (AI–Blockchain–IoT–XBRL) in support of the AIS internal control [44]. As well as the effectiveness of AI-based long-term monitoring to support internal controls [43]. This opens opportunities for future research to make both conceptual and empirical contributions in strengthening the foundation of AIS in the digital era.

4. Conceptual Framework and Theoretical Propositions

Drawing on the findings of the literature review, a conceptual framework is developed to illustrate the relationships among the core variables. The effectiveness of accounting information systems (AIS) is shaped by two main drivers: the integration of artificial intelligence (AI) and the strength of internal control. AI integration supports automation, accelerates data processing, and enhances the quality of financial information [5, 39]. On the other hand, strong internal controls enhance the reliability of the system and reduce the risk of errors or information manipulation [13].

This framework is not intended as a casual empirical model but as a theoretical lens through which the reviewed studies can be organized and interpreted. From this perspective, several propositions are advanced.

P1**:** The adoption of artificial intelligence (AI) technology positively contributes to AIS effectiveness by improving efficiency, automation, and analytical capabilities.

P2: Strong internal controls enhance AIS effectiveness by reinforcing reliability and ensuring compliance with operational standards.

P3: The quality of accounting information mediates the relationship between AI and the effectiveness of AIS, highlighting how technological adoption translates into improved decision-making.

P4: Regulation and governance also mediate the influence of internal controls on the effectiveness of AIS, emphasizing the importance of oversight structures for data accuracy and integrity.

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The framework adopts an integrative approach from information systems theory, organizational control theory, and accounting technology literature to construct conceptually and implicatively relevant propositions. Thus, this framework is expected to serve as a reference for future empirical research to test the interdependencies between variables and develop the latest technology- and governance-based models for evaluating the effectiveness of AIS.

5. Conclusion

The results of a systematic review of 97 scientific articles revealed that the effectiveness of accounting information systems does not depend only on technological aspects or internal control separately, but on the synergy between the two. The integration of artificial intelligence (AI) allows accounting information systems to be more adaptive, responsive, and efficient in the face of transaction complexity and dynamic reporting needs. Meanwhile, the existence of a solid internal control system is a crucial factor in ensuring the reliability of the process and the accuracy of the information produced.

The topical mapping of the literature indicates that research on AIS has become increasingly diverse and multifaceted, multidimensional, reflecting the intersection of digital technologies with contemporary accounting practices. The dominance of the topic of AIS effectiveness indicates that the aspect of system implementation results remains a significant concern. At the same time, the growing emphasis on AI and internal controls points to an emerging shift toward more predictive, intelligent, and integrated forms of accounting systems. Taken together, these developments create a foundation for refining theoretical perspectives and formulating hypotheses for future empirical research.

5.1. Implicasi's Theorem

The findings suggest a theoretical implication that evaluating AIS effectiveness requires a comprehensive perspective, one that acknowledges the interaction between technology and governance. This opens opportunities for the development of conceptual models that integrate AI, internal controls, and information quality as the main determinants of the successful implementation of digital accounting systems. Furthermore, this synthesis expands the scope of thought in the accounting technology literature by placing information quality as a critical mediating variable.

This study contributes to the development of a theoretical understanding of how technology and internal controls interact to strengthen the functionality of AIS. The use of DeLone & McLean models, COSO, and information quality-based approaches suggests that a multidimensional approach is necessary in assessing the effectiveness of modern information systems.

5.2. Practical Implications

From a practical perspective, these findings guide information systems managers and organizational policymakers on how to strategically integrate AI-based solutions into accounting processes while maintaining a reliable internal control framework. Companies need to develop digital capacity, train relevant human resources, and re-evaluate control policies to ensure that the technological advancements implemented truly support the effectiveness and accountability of their accounting information systems.

For organizations, the results of this study serve as a basis for strengthening digital infrastructure and implementing AI-based internal controls. For auditors and regulators, these findings emphasize the importance of technology literacy and algorithmic risk monitoring in the digital accounting process.

Thus, this study makes a significant contribution to both academic understanding and practical application in the digital era, providing the basis for the development of evaluative frameworks and data-driven policies to enhance the effectiveness of accounting information systems in the future.

5.3. Study Limitations

This review is limited to one database (Scopus) and does not include studies in languages other than English. These limitations can affect the diversity of geographical contexts and methodological

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approaches. Further research directions include empirical testing of the proposed conceptual framework, development of an AI-based technology adoption index for AIS, study of specific sectors such as MSMEs or public institutions, and a survey of AI ethics and governance in accounting practice. Furthermore, a mixed-methods approach will be employed to explore user perceptions.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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