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Transforming Audit: A Thematic Review of Recent Digital Developments

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Abstract

The audit profession is experiencing significant changes driven by advancements in digital technologies, transforming traditional practices and reshaping auditors' roles and responsibilities. The study addresses the need for a comprehensive overview of digital transformation's impact on audit practices and competencies, a gap evident in current literature where fragmented studies lack a unified framework to assess these advancements holistically. Using the TreZ framework for thematic analysis, this study systematically examines 24 relevant articles identified through SCOPUS and Web of Science (WoS) databases. The findings highlight five key themes: the digital transformation of audit processes, technological integration and audit automation, the impacts on auditor roles and competencies, challenges and risks of digitalization in auditing, and regulatory compliance and transparency enhancement. This paper's contribution provides a comprehensive understanding of how digital transformation reshapes audit efficiency, accuracy, and transparency. It also emphasizes the need for auditors to develop new competencies in response to evolving technologies. Therefore, future research should focus on standardizing digital auditing frameworks and explore the scalability of digital technologies across various sectors, particularly in highly regulated fields such as healthcare, environmental, and tax auditing. Additionally, examining the long-term impacts of digital tools on auditor roles and the required competencies is crucial. Hence, future studies should also address the challenges faced by smaller auditing firms or public sector entities with limited resources in adopting such technologies, providing targeted strategies to overcome these barriers. Finally, investigating the long-term potential of Artificial Intelligence (AI) and blockchain in enhancing public-sector auditing practices would further enrich this area of research.

Keywords: Auditing, Blockchain, Digital Transformation, AI, Thematic Review

Introduction

The digital transformation era has fundamentally redefined many sectors, including auditing, through adopting data-driven technologies such as Artificial Intelligence (AI), data analytics, and cloud computing. This broader shift towards digitalization has encouraged the adoption of more sophisticated technological tools, aiming to enhance operational efficiency, improve

decision-making capabilities, and increase the overall effectiveness of organizational processes (Bentley, 2020; Gonçalves et al., 2022; Taherizadeh et al., 2023). Notably, this transformation is particularly impactful in sectors requiring high levels of accuracy and accountability, such as auditing (Ferry et al., 2022; Liew et al., 2022a). As organizations increasingly incorporate digital methods, the traditional boundaries of auditing are expanded, reshaping the profession and introducing new levels of transparency and accountability essential for robust auditing practices (Liew et al., 2022a).

However, digital transformation in auditing is not confined to technical tools alone. It requires a shift in both the skill set and mindset of auditors. Yigitbasioglu et al. (2022), noted that modern auditors are now expected to become adept with various software applications, extending their capabilities to include quantitative data mining and text-based analysis tools. With this professional evolution, auditors can navigate the increased complexity and changing demands of audits, enabled by digital tools that allow them to gather more comprehensive and sophisticated evidence. This enhances the quality and credibility of audit findings (Kim & Ha, 2021). Accordingly, this shift highlights a crucial aspect of digital transformation: auditors must pursue continuous learning to remain proficient in an evolving digital landscape.

In public sector auditing, digital transformation takes on additional importance. Public sector auditors face distinct challenges that demand specialized skills and tools to manage resources and maintain public trust. Digitalization in this context helps Supreme Audit Institutions (SAIs) assume more complex oversight roles, leveraging advanced tools for increased transparency and accountability. These are fundamental for ensuring public confidence in resource management (Otia & Bracci, 2022b). Nevertheless, Zhou (2023) suggested that integrating digital technologies within auditing processes impacts the cost structure of audit services, often leading to higher audit fees. Firms may, therefore, need to reevaluate their resource allocation and pricing strategies to meet the financial demands associated with transitioning to digital audits.

The COVID-19 pandemic further highlighted the relevance of digital transformation within the auditing profession, as organizations were forced to adopt remote audit practices. This shift underscored the role of digital tools in maintaining audit standards and quality despite physical constraints, accelerating the adoption of flexible, technology-driven audit methods (Mizdraković et al., 2021). Consequently, auditors have had to adapt to new, dynamic work environments that prioritize digital resilience and flexibility, emphasizing skills in technologies like AI, machine learning, and blockchain. These tools, while offering significant improvements in efficiency and audit quality, also introduce new challenges, requiring auditors to possess a thorough understanding and technical proficiency to apply these technologies effectively (Erişen & Erer, 2023; Santis & D'Onza, 2021).

To summarize, digital transformation has reshaped the auditing field, introducing advanced technologies and redefining the process and purpose of audits. As the auditing profession adapts to these new tools and methodologies, auditors must navigate changing regulatory landscapes and meet evolving stakeholder expectations. The future of auditing hinges on the profession's ability to balance technological integration with traditional auditing principles of integrity, transparency, and accountability. This transformation signals a technical evolution and a strategic and ethical shift, aiming to enhance the reliability and trustworthiness of

financial reporting and resource management through the judicious use of digital tools. Hence, continued research is vital in fully understanding the broader implications of digital auditing. Integrating digital auditing presents challenges and opportunities, making it essential to grasp the complexities of the rapidly evolving digital environment. Therefore, this paper aims to explore the latest trends in digital auditing as documented in the literature from 2020 to 2024, guided by the following Research Question (RQ):

What are the emerging trends in digital auditing across the public and private sectors from 2020 to 2024?

1. Materials and Methods

The term "thematic review" using ATLAS.ti as a tool was introduced by (Zairul, 2020, 2021a, 2021b). This method, which has been protected by copyright under registration number CRLY2023W02032 (Zairul, 2023), involves the application of a thematic analysis approach to conduct a literature review. Clarke and Braun (2013) described thematic analysis as identifying patterns and constructing themes via thoroughly reading the subject matter. The next step is to categorize these patterns and themes to understand trends in the use of AI in architectural practice and education. The core objective of the research is to analyze and interpret the findings to offer recommendations for future research on digital auditing. The literature was selected based on the following criteria: 1) publications from 2020 to 2024, 2) inclusion of keywords related to digital auditing in both the private and public sectors, and 3) a focus on current usage and practices.

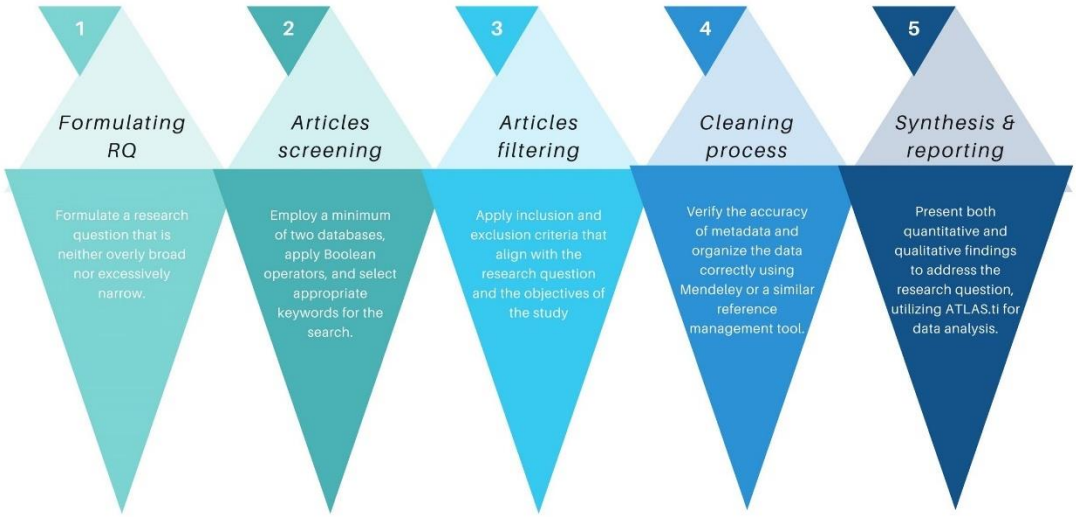

Fig. 1. Thematic review FlowZ (Zairul, 2023)

The TreZ framework for conducting a Thematic Review (TR) in 2024 follows a structured process designed to ensure rigor and clarity in synthesizing research literature (Fig. 1). The process begins with formulating a specific RQ that is neither overly broad nor too narrow. This paper specifically focuses on the recent development of auditing from 2020 to 2024. In the screening phase of the TreZ framework, a combination of databases with a minimum of two databases, such as SCOPUS and Web of Science (WoS), is used to conduct a thorough search. Boolean operators are applied strategically to refine the results, ensuring that only articles meeting specific criteria such as publication year, language, and accessibility are included in the review. This meticulous approach helps identify the most relevant studies for further

analysis and filtering based on the research objectives. In the screening phase of the TreZ framework, a comprehensive search is conducted using a minimum of two scholarly databases, such as SCOPUS and WoS. These databases ensure a broad and thorough identification of relevant literature. As such, Boolean operators (e.g., AND, OR, NOT) are used strategically to refine and focus the search to identify relevant studies based on appropriately selected keywords. Once screened, articles are filtered using inclusion and exclusion criteria that align with the RQ and the study's objectives. Following the filtering stage, a cleaning process ensures the accuracy of metadata and organizes the data using tools like Mendeley for effective reference management. Finally, the synthesis and reporting stage integrates qualitative and quantitative findings to answer the RQ, often using software such as ATLAS.ti for data analysis. This approach ensures in-depth analysis, resulting in a robust synthesis that effectively addresses the RQ while outlining the role and progression of the digital shift in auditing.

Table 1
Keywords used in this Study

SCOPUS	TITLE-ABS-KEY ((("digital transformation") AND (audit* OR "public sector audit*" OR "financial audit*" OR "tax audit*" OR "internal audit*" OR "government audit*") AND (adoption OR implement* OR challenge* OR readiness OR perception OR "technological change"))) AND (LIMIT-TO (PUBYEAR, 2020) OR LIMIT-TO (PUBYEAR, 2021) OR LIMIT-TO (PUBYEAR, 2022) OR LIMIT-TO (PUBYEAR, 2023) OR LIMIT-TO (PUBYEAR, 2024)) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (LANGUAGE, "English"))	50 results
WoS	**("digital transformation") AND (audit* OR "public sector audit*" OR "financial audit*" OR "tax audit*" OR "internal audit*" OR "government audit*") AND (adoption OR implement* OR challenge* OR readiness OR perception OR "technological change")** (Topic) and 2020 or 2021 or 2022 or 2023 or 2024 (Publication Years) and **Article** (Document Types) and **English** (Languages)	51 results

This TR paper utilizes a carefully designed search strategy to comprehensively cover relevant literature. Consequently, keywords were selected based on the research scope, particularly focusing on the digital transformation in auditing within various sectors. The keywords used include terms like "digital transformation," combined with auditing-related terms such as "audit," "public sector audit," "financial audit," "tax audit," "internal audit," and "government audit." To capture the adoption and implementation challenges, additional keywords such as "adoption," "implement*," "challenge*," "readiness," "perception," and "technological change" were included. These keywords were applied across SCOPUS and WoS.

In SCOPUS, a search string was constructed using Boolean operators, combining the keywords in a structured way: TITLE-ABS-KEY ((("digital transformation") AND (audit* OR "public sector

audit*" OR "financial audit*" OR "tax audit*" OR "internal audit*" OR "government audit*") AND (adoption OR implement* OR challenge* OR readiness OR perception OR "technological change"). The search was refined by limiting the results to articles published between 2020 and 2024, filtering by document type to include only articles, restricting to journals, publication at the final stage, and language set to English. Accordingly, this rigorous filtering approach yielded 50 articles in SCOPUS.

In WoS, a similar search strategy was applied, using the keyword "digital transformation" combined with auditing-related terms such as "audit," "public sector audit," "financial audit," and others. The search was refined by applying filters for publication years (2020-2024), document types (restricted to articles), and language (English) to ensure the relevance of the results. This comprehensive keyword selection and filtering approach proved crucial in isolating the most pertinent articles for the TR, resulting in a total of 51 articles identified through WoS.

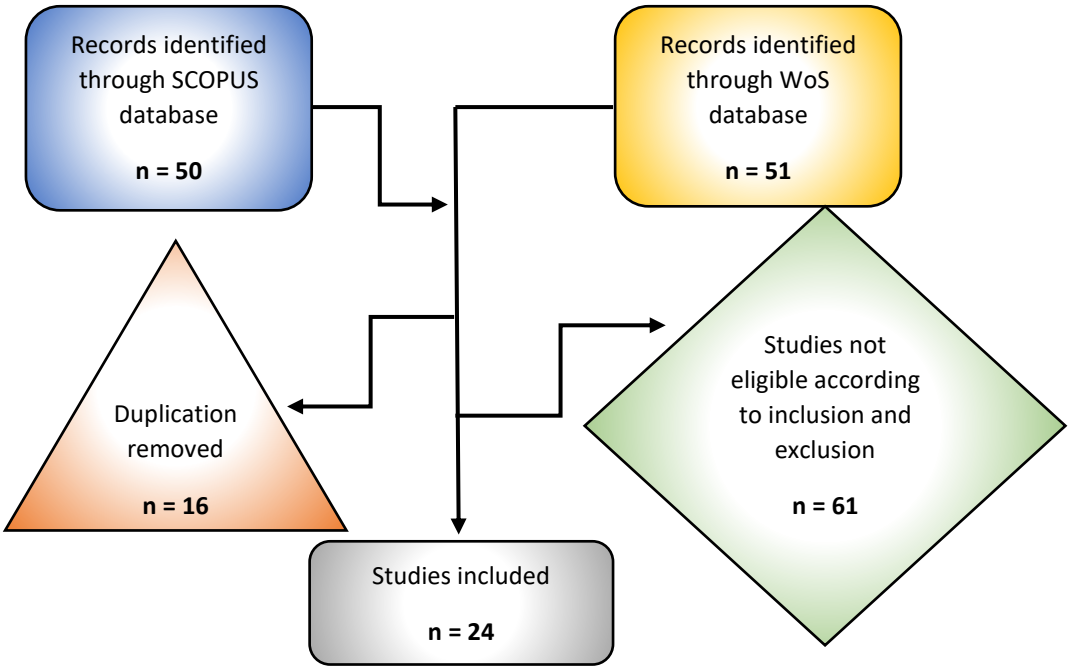

Fig. 2. Inclusion and Exclusion Criteria

In the inclusion and exclusion criteria for this review, a total of 101 articles were initially identified from two databases: SCOPUS (n = 50) and WoS (n = 51). The filtration process followed five systematic steps: Triage, Refinement, Exclusion Criteria, Eligibility, and Zeroing-In. During the process, 61 articles were excluded as they did not meet the predefined inclusion criteria. Specifically, the excluded articles did not directly address digital transformation in auditing, lacked empirical data, or focused on topics irrelevant to the study's objectives.

The review process began with the Triage step, where all articles were screened based on their titles and abstracts to determine relevance to the research focus. This step helped identify studies related to digital transformation in auditing. Following Triage, the Refinement phase applied the inclusion and exclusion criteria more strictly. The inclusion criteria required that articles be peer-reviewed, published between 2020 and 2024, written in English, and

directly related to the impact of digital transformation on auditing practices. Note that articles must provide full-text access and contribute empirical or theoretical insights aligned with the study's objectives.

Exclusion criteria were applied to filter out studies that did not address the RQs or lacked methodological rigor. As a result, 61 studies were excluded, leaving 24 studies for detailed analysis. Furthermore, 16 duplicate studies were removed. The final studies were then subjected to a full-text review during the Eligibility phase to ensure they met all criteria and contributed meaningfully to the TR. Next was the Zeroing-In Step, where the selected studies were grouped into core thematic clusters. These clusters focused on essential topics, such as the impact of digital technologies on auditing practices and their effects on auditors.

The structured application of the TreZ methodology enabled a clear and organized literature review process, leading to the selection of high-quality studies that provide a comprehensive understanding of the impact and evolution of digital technologies. This shapes the future of auditing in both the public and private sectors. Accordingly, the final selection of 24 studies offers a solid foundation for examining the intersection of technology and auditing, highlighting emerging trends, and identifying areas for future research.

Results and Discussions

The digital transformation of auditing has gained significant attention in recent years, reshaping both professional practices and auditing frameworks. As digital technologies continue to evolve, they present new opportunities to enhance audit processes, improve the accuracy and efficiency of financial reporting, and foster greater transparency and accountability in both the public and private sectors. This study examines the recent trends and advancements in digital auditing technologies, as outlined in the literature from 2020 to 2024, highlighting their impact on audit practices and the broader financial landscape.

Quantitative Review

The provided word cloud (Fig. 3) visually represents key terms related to digital transformation in auditing, emphasizing recurring concepts across various discussions and literature. The largest and most prominent words, such as "digital," "audit," "accounting," "transformation," and "data," indicate central themes that dominate the discourse. These terms highlight the growing intersection of auditing with digital technologies and the evolving role of data in driving audit quality and efficiency. Other notable terms such as "management," "financial," "information," "governance," and "public" suggest a broad scope encompassing both private-sector business practices and public-sector reforms. This highlights the significance of digital transformation within organizations and its role as a significant factor in regulatory compliance and governance enhancement. This reflects the increasing reliance on technology to meet transparency and accountability standards.

Fig. 3. Word Cloud

Moreover, words like "artificial intelligence," "blockchain," "automation," and "systems" imply the adoption of advanced technological solutions that are reshaping audit processes. These tools are critical for achieving better performance, automating complex tasks, and ensuring real-time analysis, especially in fraud detection and risk management. Meanwhile, concepts like "compliance," "quality," and "control" further suggest that the digital audit landscape is increasingly focused on improving accuracy and adherence to regulatory requirements.

In conclusion, this word cloud underscores the complexity and depth of digital transformation within auditing, linking technological advancements with improved financial reporting, governance, and data management. Integrating advanced technologies like AI, blockchain, and automation will likely play an even more significant role in shaping future audit practices as the field evolves.

Qualitative Review

The review synthesizes findings from various sources, and five major themes have emerged from the literature: Digital Transformation of the Auditing Process, Technological Integration and Audit Automation, Impacts on Auditor Roles and Competencies, Challenges and Risks of Digitalization in Auditing, and Regulatory Compliance and Transparency Enhancement. The first theme discusses how digital technologies reshape auditing, enhancing efficiency and accuracy. For instance, the shift to cloud services and remote audits has redefined traditional practices. The second theme, Technological Integration, focuses on advancements such as AI, machine learning, and fintech, which have optimized audit functions. This is closely related to the third theme, which explores the impact on auditor competencies, emphasizing the need for continuous skill development and adaptation to digital tools. The fourth theme covers the challenges of digitalization, including cybersecurity risks, regulatory complexities, and the need for robust information technology (IT) infrastructure. Finally, the fifth theme highlights the significance of transparency and compliance, particularly in aligning audit practices with

regulatory demands and improving accountability through digital tools. Each of these themes demonstrates how digitalization presents opportunities and requires careful management of risks and challenges. Fig. 4 illustrates the overall themes above.

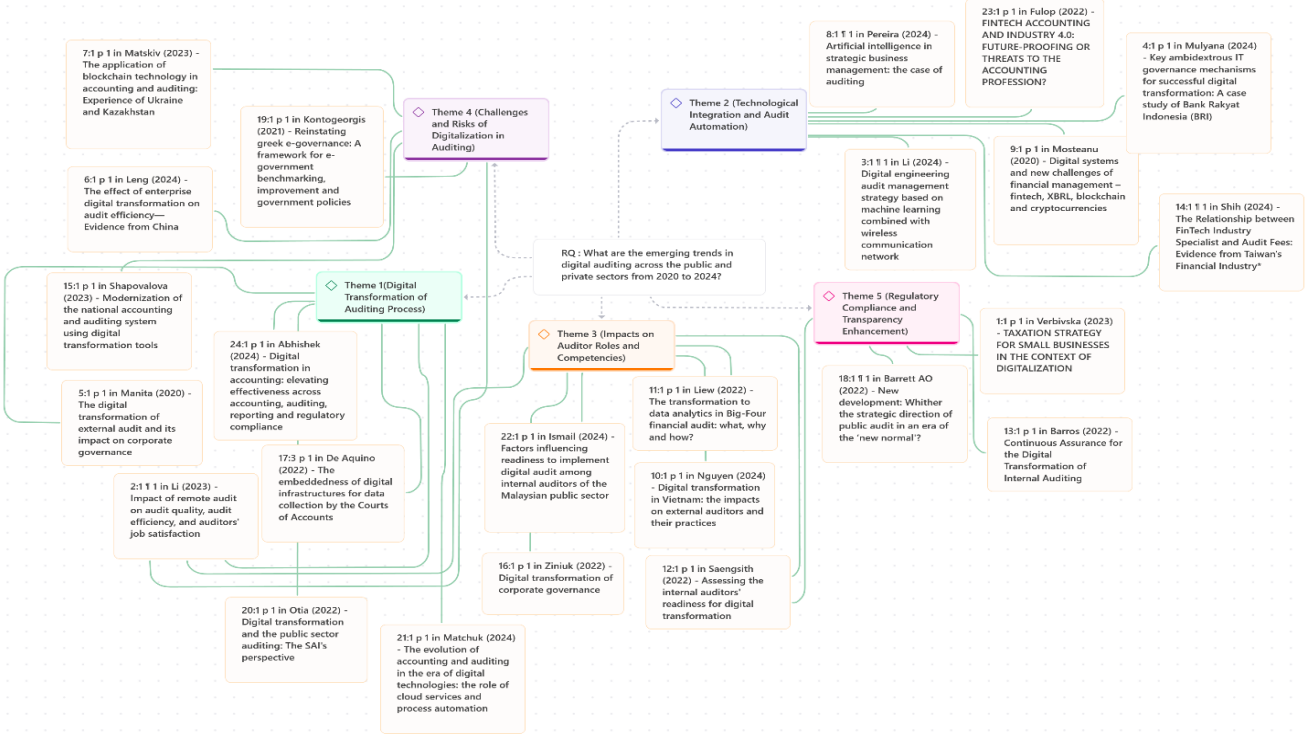

Fig. 4. Overall themes to answer the research question

The digital transformation of auditing is a growing area of research, driven by advancements in technology that reshape traditional audit processes. The first theme, Digital Transformation of the Auditing Process, focuses on how innovations such as AI, data analytics, and automation enhance audit procedures. For instance, studies like those by Y. Li et al. (2023) and Manita et al. (2020), explored how digital tools enable auditors to process large datasets more efficiently, improving accuracy and decision-making. Additionally, Abhishek et al. (2024) highlighted the role of digital transformation in elevating audit effectiveness, particularly in terms of timeliness and risk identification.

Another theme, Technological Integration and Audit Automation, delves into how audit practices evolve by adopting advanced technologies. Pereira et al. (2024), and Mosteanu and Faccia (2020), investigated how automation and blockchain are integrated into audit frameworks, reducing manual workloads and enhancing precision in financial assessments. At the same time, Fulop et al. (2022), further discussed how such innovations can revolutionize audit practices by providing real-time data processing capabilities, ultimately leading to more reliable audit outcomes.

The next theme, the Impacts on Auditor Roles and Competencies, highlights the changing nature of the auditor's role in the digital age. The research by Nguyen et al. (2024), and Liew et al. (2022b), emphasized the need for auditors to acquire new digital skills, such as proficiency in data analysis and familiarity with AI tools. Similarly, Saengsith and Suntraruk (2022), further discussed how these new competencies are critical in adapting to the shifting

demands of modern audit practices as auditors transition from traditional verification roles to more analytical and advisory positions.

Another central theme is the Challenges and Risks of Digitalization in Auditing, which addresses the potential risks associated with adopting new technologies in auditing. On the other hand, Leng and Zhang (2024), and Shapovalova et al. (2023), explored concerns related to cybersecurity, data privacy, and the complexities of integrating digital tools into established auditing frameworks. At the same time, Matskiv et al. (2023), also discussed the operational challenges that audit firms face as they attempt to balance technological advancements with regulatory requirements.

Finally, Regulatory Compliance and Transparency Enhancement examines how digital tools can enhance compliance and transparency in financial reporting. Verbivska et al. (2023), and Barros and Marques (2022), discussed how blockchain and continuous auditing systems can improve the traceability and reliability of financial data, thereby ensuring compliance with regulatory standards. Correspondingly, Barrett AO (2022), highlighted how digital transformation can improve public accountability through enhanced transparency mechanisms. These themes underscore the profound impact of digital transformation on the auditing profession, from improving efficiency and effectiveness to requiring new skills and addressing significant challenges. Table 2 presents the list of articles categorized under each theme.

Table 2
Author vs. Theme

	Theme 1: Digital Transformation of the Auditing Process	**Theme 2:** Technological Integration and Audit Automation	**Theme 3:** Impacts on Auditor Roles and Competencies	**Theme 4:** Challenges and Risks of Digitalization in Auditing	**Theme 5:** Regulatory Compliance and Transparency Enhancement
(Verbivska et al., 2023)	-	-	-	-	/
(Y. Li et al., 2023)	/	-	/	/	-
(J. Li, 2024)	-	/	-	-	-
(Mulyana et al., 2024)	-	/	-	-	-
(Manita et al., 2020)	/	-	-	-	-
(Leng & Zhang, 2024)	-	-	-	/	-
(Matskiv et al., 2023)	-	-	-	/	-
(Pereira et al., 2024)	-	/	-	-	-

(Mosteanu & Faccia, 2020)	-	/	-	-	-
(Nguyen et al., 2024)	-	-	/	-	-
(Liew et al., 2022b)	-	-	/	-	-
(Saengsith & Suntraruk, 2022)	-	-	/	-	/
(Barros & Marques, 2022)	-	-	-	-	/
(Shih & Chu, 2024)	-	/	-	-	-
(Shapovalova et al., 2023)	-	-	-	/	-
(Ziniuk et al., 2022)	-	-	/	-	-
(De Aquino et al., 2022)	/	-	-	-	-
(Barrett AO, 2022)	-	-	-	-	/
(Kontogeorgis & Varotsis, 2021)	-	-	-	/	-
(Otia & Bracci, 2022a)	/	-	-	-	-
(Matchuk et al., 2024)	/	-	-	-	-
(Ismail et al., 2024)	-	-	/	-	-
(Fulop et al., 2022)	-	/	-	-	-
(Abhishek et al., 2024)	/	-	-	-	-

Theme 1: Digital Transformation of Auditing Process

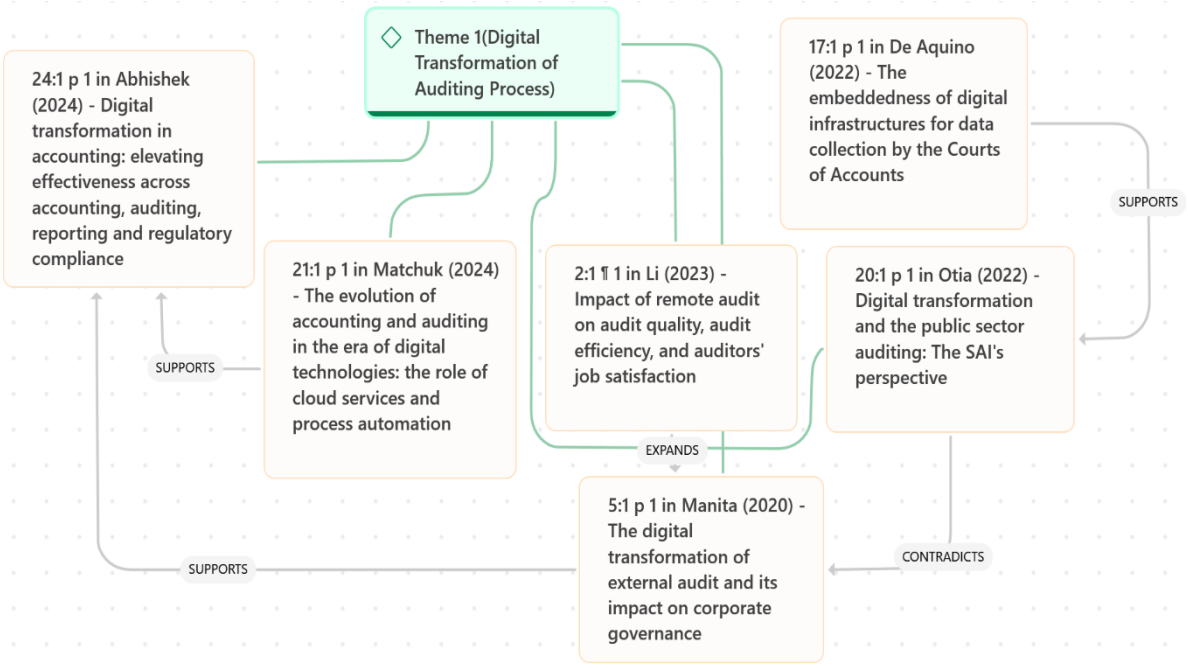

Fig. 5.: Theme 1 (Digital Transformation of Auditing Process)

In the context of digital transformation in auditing, the emerging literature highlights the significant shifts across public and private sectors. As such, Abhishek et al. (2024) discussed how digital transformation is elevating effectiveness across accounting, auditing, and reporting practices, as well as enhancing regulatory compliance. This article supports the findings of Matchuk et al. (2024), who explored the role of cloud services and process automation in the evolution of accounting and auditing, demonstrating how integrating digital tools has streamlined auditing processes. Together, these articles affirm the positive influence of digitalization on audit effectiveness and efficiency.

Further expanding on this theme, Y. Li et al. (2023) emphasized the impact of remote auditing, particularly on audit quality, efficiency, and auditor job satisfaction. This research complements the findings of Abhishek et al. (2024) by demonstrating how digital tools, including remote technologies, have improved the adaptability and reach of audits in a globalized context. In addition, De Aquino et al. (2022) explored the embeddedness of digital infrastructures for data collection in public sector audits, providing evidence that public institutions are also integrating digital systems to enhance transparency and data accuracy. This supports the argument that digital transformation fosters more effective auditing practices across sectors.

However, contrasting views emerge from Otia and Bracci (2022a), who raised concerns about the effectiveness of digital transformation in public sector auditing. This contradicts the largely positive outlook provided by Abhishek et al. (2024), and Matchuk et al. (2024), particularly regarding the long-term impact of digital auditing on governance and accountability. Manita et al. (2020), echoed this concern, noting that while digital transformation offers improvements in corporate governance, it also introduces challenges.

This is especially true concerning the integrity of external audits in the era of rapid technological change.

In summary, the articles collectively present a comprehensive view of the digital transformation of auditing, with several studies reinforcing each other's findings on improved efficiency and transparency, while others critically examine potential risks and limitations. This dynamic interaction between the studies enriches our understanding of how digital tools reshape auditing processes and the challenges arising from their adoption.

Theme 2: Technological Integration and Audit Automation

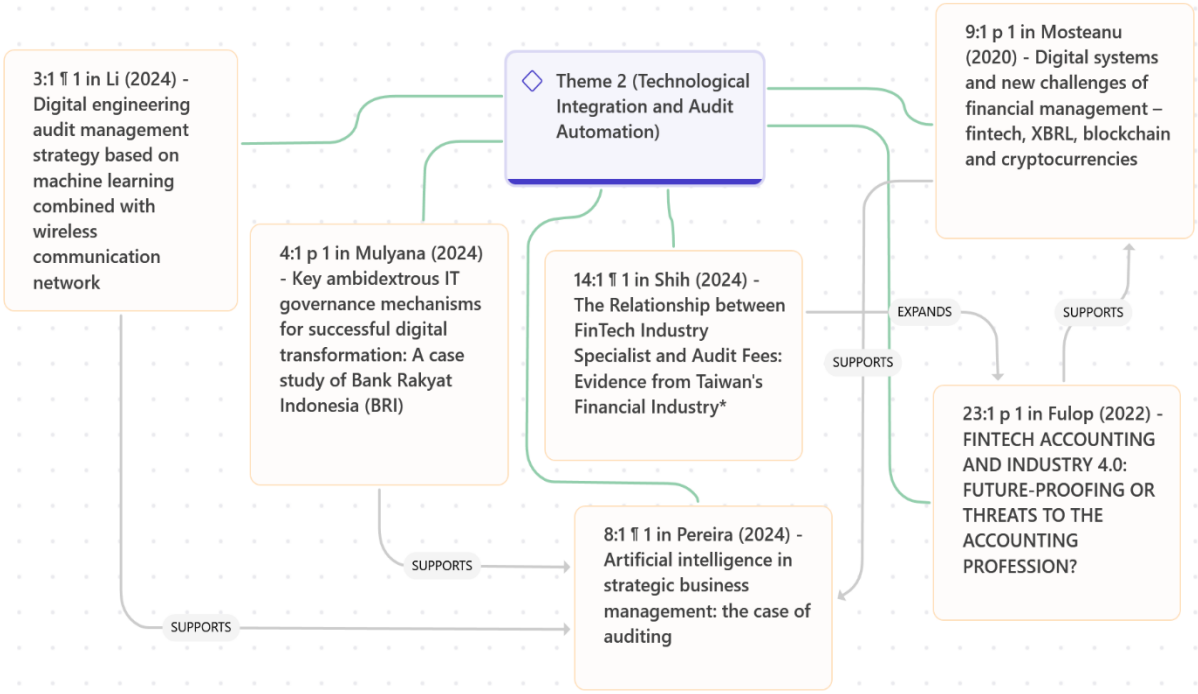

Fig. 6. Theme 2 (Technological Integration and Audit Automation)

The theme of "Technological Integration and Audit Automation" explores how emerging digital technologies are integrated into auditing processes and how these advancements impact audit practices. Li (2024), introduced a digital engineering audit management strategy using machine learning and wireless communication networks. This method highlights the technological innovations that streamline audit processes, aligning with Pereira et al. (2024) study on AI in strategic business management. Pereira expanded on the role of AI in enhancing auditing efficiency by automating routine tasks, thereby reducing human intervention. Meanwhile, Mulyana et al. (2024), complemented this by examining IT governance mechanisms crucial for digital transformation success in auditing, focusing on a case study of Bank Rakyat Indonesia (BRI). This study supports Li's proposition, emphasizing the need for effective digital strategies to ensure seamless integration.

Meanwhile, Shih and Chu (2024), delved into the financial implications of technological adoption, specifically the relationship between FinTech specialists and audit fees in Taiwan's financial industry. This research supports Fulop et al. (2022), analysis of how FinTech and Industry 4.0 impact accounting and auditing. Fulop explored the potential threats and opportunities posed by FinTech advancements, providing a critical lens to Shih's findings by

suggesting that while technology reduces costs, it also brings about significant challenges. On the other hand, Mosteanu and Faccia's (2020), discussion on blockchain, eXtensible Business Reporting Language (XBRL), and cryptocurrencies in financial management further expands on this. This emphasizes the broader challenges auditors face in adapting to these technologies.

Overall, the articles collectively support the notion that technological integration enhances efficiency and necessitates robust governance mechanisms and strategic financial adjustments to fully harness the potential of digital audit automation. The relationships between the papers showcase a complementary exploration of technological impacts, with some papers critically analyzing financial and operational implications. At the same time, others support the need for technological adoption and strategic governance in the auditing profession.

Theme 3: Impacts on Auditor Roles and Competencies

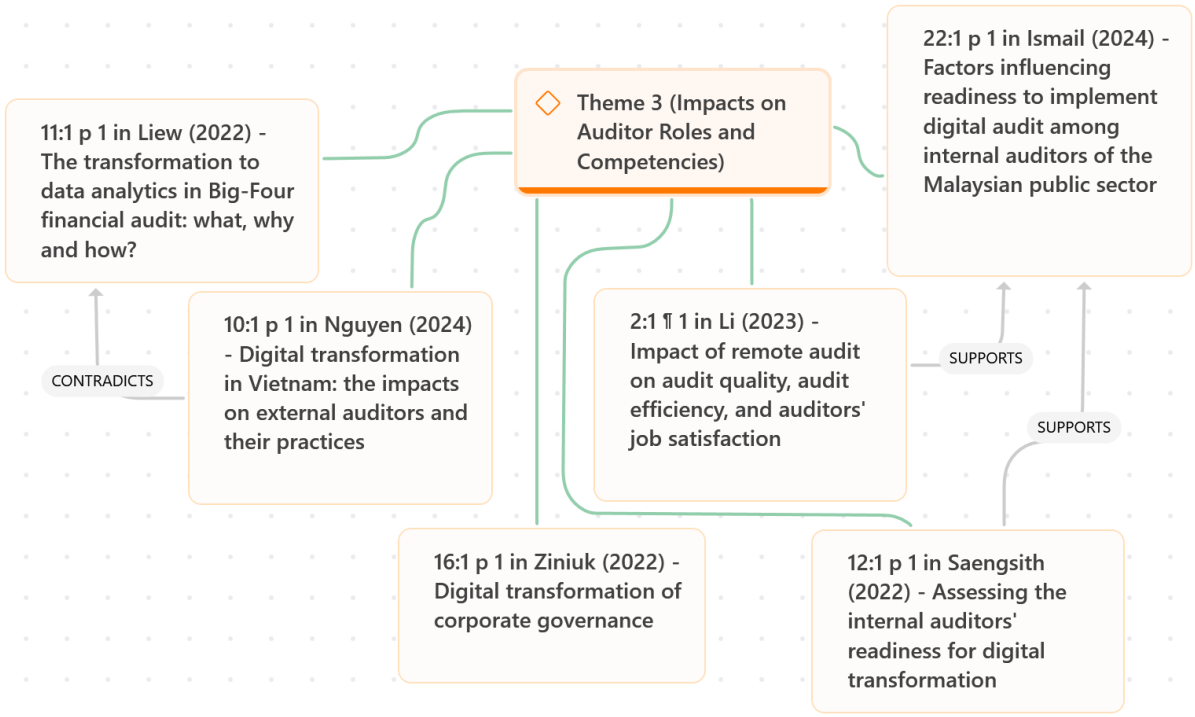

Fig. 7. Theme 3 (Impacts on Auditor Roles and Competencies)

The articles under the theme "Impacts on Auditor Roles and Competencies" collectively explore the transformative effects of digital technology on auditors' roles, skill sets, and organizational practices. Li et al. (2023), examined the positive impacts of remote auditing on audit quality, efficiency, and job satisfaction. This paper highlights how digital tools offer flexibility in audit processes and elevate auditors' work-life balance. Similarly, Ismail et al. (2024), and Saengsith and Suntraruk (2022), delved into internal auditors' readiness to adopt digital auditing, emphasizing the factors that facilitate or hinder successful transformation, particularly in the Malaysian public sector and internal auditing.

However, Liew et al. (2022b), presented a contrasting perspective, particularly concerning data analytics transformation in Big Four financial audits. Liew's findings contradict the smooth adoption narrative by demonstrating that integrating data analytics into audits

introduces challenges in implementation. Nguyen et al. (2024) further supported this by exploring how external auditors in Vietnam face barriers in adopting digital auditing practices, though the paper highlights certain improvements in audit procedures.

These papers contribute nuanced perspectives. While Li et al. (2023), Ismail et al. (2024), and Saengsith and Suntraruk (2022), supported the view that digital tools enhance auditing practices, Liew et al. (2022b), and Nguyen et al. (2024), asserted contradictions. It was suggested that while the potential is significant, the transition involves complexity and challenges. This highlights a broader discourse on balance between efficiency gains and the implementation challenges in the auditing profession's digital transformation.

Theme 4: Challenges and Risks of Digitalization in Auditing

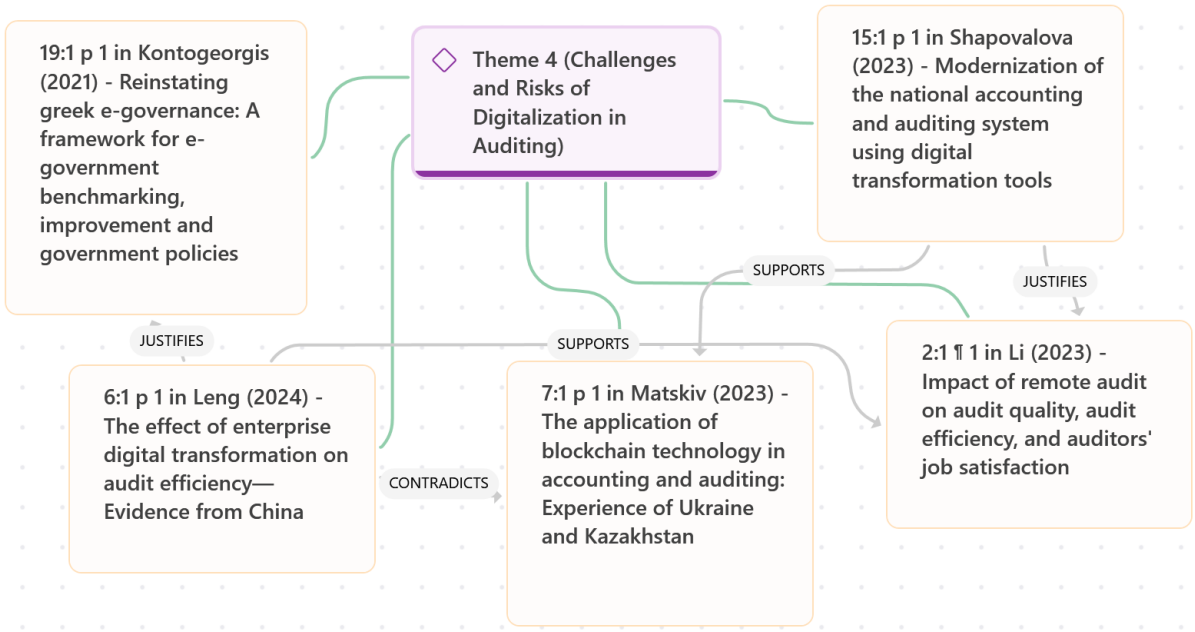

Fig. 8. Theme 4 (Challenges and Risks of Digitalization in Auditing)

In the realm of digitalization in auditing, the presented papers under Theme 4 highlight various challenges and risks associated with the transition towards more technologically integrated audit systems. For instance, the paper by Leng and Zhang (2024), examines how enterprise digital transformation affects audit efficiency, specifically in China. This suggests that while improvements are evident, challenges remain in implementing seamless integration of digital tools into auditing practices. This idea is further supported by Li et al. (2023), who explored the impact of remote auditing on audit quality and efficiency. Li's findings suggested that while remote audits improve certain aspects, they introduce new challenges in ensuring audit integrity and auditor satisfaction. This emphasizes the dual nature of digital transformation in audit processes.

The challenges posed by blockchain technology are examined in Matskiv et al. (2023), highlighting the complexities of applying blockchain in accounting and auditing using experiences from Ukraine and Kazakhstan. This research supported the notion that while blockchain offers transparency and security, its implementation can be complex, contradicting some of the optimism reported in earlier studies like those by Li et al. (2023) and (Leng and Zhang 2024).

On the other hand, Shapovalova et al. (2023), and Kontogeorgis and Varotsis (2021), focused on modernization and the governmental aspects of digitalization, analyzing how policy frameworks can hinder or support digital transformation efforts. Shapovalova's work emphasized the need for modern tools, supporting Li et al. (2023), findings by justifying digital solutions to modernize national auditing systems. Meanwhile, Kontogeorgis and Varotsis (2021), offered insights into governmental frameworks necessary to benchmark and improve e-governance auditing practices.

In conclusion, these papers collectively indicate that while digital transformation presents opportunities for increased audit efficiency and quality, it also brings substantial risks and challenges, particularly in policy adaptation, technology infrastructure, and auditor competencies.

Theme 5: Regulatory Compliance and Transparency Enhancement

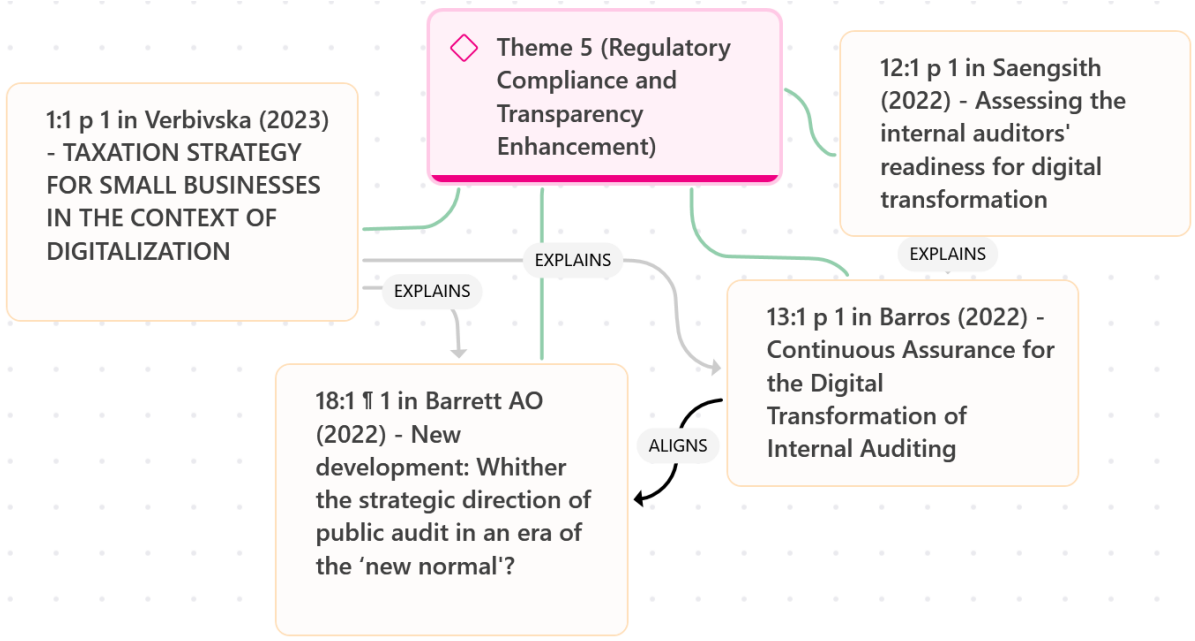

Fig. 9. Theme 5 (Regulatory Compliance and Transparency Enhancement)

The theme of Regulatory Compliance and Transparency Enhancement is explored through multiple articles, each offering unique perspectives on the role of digitalization in improving or adapting audit processes. For example, Verbivska et al. (2023), investigated the taxation strategy for small businesses in digitalization, emphasizing the need for regulatory frameworks that support transparency in a digital-first business environment. This paper explains how tax regulations adapt to the digital era to ensure fair compliance among small enterprises.

Consequently, Saengsith and Suntraruk (2022), assessed internal auditors' readiness for digital transformation, aligning with the theme by highlighting the need for transparency and compliance as organizations increasingly adopt digital tools. This article explains how auditor readiness affects the effectiveness of regulatory compliance efforts, especially in highly digitized environments. Barrett AO (2022), discussed the strategic direction of public audits in the new digital normal, aligning with the theme by suggesting that public audit systems

must be reformed to ensure continuous compliance and transparency in a rapidly evolving technological landscape.

Finally, Barros and Marques (2022), focused on continuous assurance for internal auditing's digital transformation, supporting the argument that digital tools enhance transparency by allowing for ongoing, rather than periodic, compliance checks. This article aligns with the theme by advocating for a shift in audit processes towards real-time monitoring and governance, strengthening regulatory compliance and transparency. These papers emphasize the importance of regulatory frameworks evolving with technological advancements to ensure compliance and enhance transparency. The insights from these works explain and justify how digital transformation improves governance processes while presenting challenges in its implementation across different sectors.

Discussion and Future Studies

The rapid digital transformation within auditing practices, both in the private and public sectors, has significantly reshaped the traditional approaches to audit execution, regulatory compliance, and transparency enhancement. This paper has demonstrated that technological integration, such as AI, machine learning, blockchain, and cloud-based auditing systems, has allowed auditors to increase their efficiency, quality, and governance of audit processes. However, the transition to digital auditing has not been without challenges, particularly in the areas of auditor competency, regulatory compliance, and managing the risks that come with the adoption of new technologies.

One of the primary issues identified is the varying degrees of readiness among auditors to adopt digital tools, especially in public sector settings where regulatory structures are often rigid. Studies like Saengsith and Suntraruk (2022), and Nguyen et al. (2024), highlighted the need for internal and external auditors to upskill and develop the competencies necessary to utilize digital tools effectively. Similarly, Liew et al. (2022b), asserted how integrating data analytics into Big-Four auditing practices has led to a significant transformation in how audits are conducted, although the readiness of smaller firms remains a challenge. The risks associated with digital transformation, as outlined in Matskiv et al. (2023), and Leng and Zhang (2024)**,** also present a crucial area for further exploration. While blockchain and AI promise enhanced transparency and audit efficiency, their use introduces new risks, particularly around cybersecurity and the potential for increased complexity in audit processes. Therefore, auditors and regulatory bodies must balance the advantages of these technologies with the need for robust risk management frameworks.

The regulatory environment has been slow to adapt to technological change, creating a compliance gap that could hinder further progress in the digital transformation of auditing. Barrett AO (2022), suggested that the public sector's audit processes, particularly, must undergo strategic changes to accommodate real-time audit systems and continuous assurance. This shift could significantly improve transparency and compliance, but only if regulatory bodies have the tools and frameworks to oversee these processes effectively. Thus, future research should focus on several key areas to advance the digital transformation of auditing. Firstly, studies should explore the development of standardized frameworks for digital auditing technologies that can be adopted across both the private and public sectors.

These frameworks would provide a common ground for auditors and offer guidance to regulatory bodies on monitoring and managing digital audit processes effectively.

Additionally, there is a need for research on the long-term impacts of AI and machine learning on audit decision-making. As these technologies become more ingrained in auditing processes, it is essential to understand their effects on auditor independence, judgment, and the overall integrity of audit outcomes. This research could help define the role of the human auditor in increasingly automated environments. Furthermore, future studies should investigate the role of blockchain in public-sector auditing. Blockchain technology promises to increase transparency in government audits by creating immutable and accessible audit trails. However, its practical implementation in large-scale public sector audits has yet to be fully explored. Accordingly, this research could identify potential barriers to adoption and develop solutions to facilitate blockchain integration in public-sector auditing.

Lastly, the role of continuous assurance in auditing must be explored further. Continuous auditing and real-time reporting present opportunities for enhancing regulatory compliance, particularly in government. However, studies are required to assess the feasibility of implementing such systems across different types of organizations and industries. This would also involve examining the resource implications for auditors and regulatory bodies in maintaining continuous auditing systems. In conclusion, while the digital transformation of auditing has made significant strides, the road ahead involves overcoming challenges related to auditor readiness, regulatory adaptation, and risk management. Therefore, by addressing these challenges, future research can provide the foundation for more effective, transparent, and compliant auditing practices in the private and public sectors.

Contributions and Benefits of Study

The study significantly contributes to the literature on digital transformation in auditing for private and public sectors. One of the key contributions is its exploration of how digital tools and technologies reshape auditing practices. This research demonstrates that integrating digital technologies enhances audit processes by improving audits' efficiency, accuracy, and quality. Hence, by addressing both the private and public sectors, the study fills a gap in the literature that often focuses on the private sector. Furthermore, this research comprehensively examines how digitalization can be aligned with existing governance frameworks to enhance transparency and accountability, especially in public auditing.

In terms of benefits, the study presents evidence of how digital transformation can enhance audit efficiency. The findings suggest that technologies such as data analytics, automation, and remote auditing significantly reduce the manual workload, leading to quicker and more efficient audit cycles. This is particularly beneficial for public sector auditing, where resource constraints are more prevalent. Additionally, the study highlights how digital technologies contribute to audit quality. Notably, the enhanced ability to analyze large datasets, cross-reference information, and automate mundane tasks ensures that audit reports are more reliable and less prone to human error. As such, this improved accuracy of audit outcomes is critical in fostering trust in public and private sector financial reporting.

Another critical benefit is the role of digital auditing in fostering transparency and regulatory compliance. The study demonstrates how integrating digital tools into auditing frameworks

allows for real-time tracking of financial operations, providing a clearer audit trail. This capability enhances the auditor's capacity to detect anomalies and the overall transparency of financial practices within an organization. Such advancements are pivotal for regulatory compliance, ensuring that public and private entities can effectively meet their statutory obligations. Accordingly, by providing more accurate and timely information, digital audits also support better decision-making processes at the governance level, particularly in the public sector, where accountability and oversight are crucial.

The findings of this study offer substantial implications for future research. Considering the demonstrated positive impacts of digitalization on audit efficiency, quality, and transparency, future research should delve into the scalability of these technologies across various sectors. It is particularly important to those requiring specialized, highly regulated audit processes such as healthcare compliance, environmental sustainability, and tax auditing. Additionally, it is essential to investigate the long-term impacts of digital auditing tools on the evolving roles and competencies expected of auditors. As digital tools continue to advance, a comprehensive understanding of the training and skills development necessary for auditors to leverage these tools effectively is critical. Moreover, future studies could explore smaller auditing firms and public sector entities' unique challenges in adopting digital technologies, offering strategies to address resource constraints and build capacity for digital transformation. Therefore, by contributing to the ongoing discourse on digital auditing, this study enriches academic understanding and provides practical insights for auditors, policymakers, and organizations aiming to modernize their auditing practices. Nevertheless, it addresses critical gaps in current knowledge and lays a foundation for the broader application of digital auditing technologies in similarly regulated and complex fields.

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