

AI and Auditing: Enhancing Audit Efficiency and Effectiveness with Artificial Intelligence

AI dan Audit: Meningkatkan Efisiensi dan Efektivitas Audit dengan Kecerdasan Buatan

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ABSTRACT

The use of automation and artificial intelligence (AI) in audit practice is increasingly becoming a major focus, with significant impact on the profession. This research depicts the current landscape of the use of AI in auditing, highlighting aspects such as automation and empowerment of the workforce in auditing, impact of AI on improving audit quality criteria, key factors in adopting AI-based audit techniques, impact of AI technology on audit evidence, and auditors' perceptions of AI in improving audit quality. The results and discussion show that while there are great benefits from integrating automation and AI in auditing, including improved audit quality, enhanced efficiency, and the ability to perform continuous audits, there are also challenges that need to be overcome, such as high customization costs for specific audit processes industry. The use of AI in auditing requires adaptation from auditors to changes in competencies and workflows to effectively utilize this technology. However, with proper understanding and careful handling of these challenges, AI has great potential to improve overall audit practices.

Keywords: **Automation, artificial intelligence, audit, audit quality, technology adoption, audit evidence, auditor perception**

ABSTRAK

Penggunaan otomatisasi dan kecerdasan buatan (AI) dalam praktik audit semakin menjadi fokus utama, dengan dampak yang signifikan terhadap profesi ini. Penelitian ini menggambarkan lanskap saat ini dari penggunaan AI dalam audit, menyoroti aspek-aspek seperti otomatisasi dan pemberdayaan tenaga kerja dalam audit, pengaruh AI terhadap peningkatan kriteria kualitas audit, faktor-faktor kunci dalam mengadopsi teknik audit berbasis AI, dampak teknologi AI pada bukti audit, dan persepsi auditor terhadap AI dalam meningkatkan kualitas audit. Hasil dan diskusi menunjukkan bahwa sementara ada manfaat besar dari integrasi otomatisasi dan AI dalam audit, termasuk peningkatan kualitas audit, efisiensi yang ditingkatkan, dan kemampuan untuk melakukan audit yang kontinu, ada juga tantangan yang perlu diatasi, seperti biaya kustomisasi tinggi untuk proses audit yang spesifik industri. Penggunaan AI dalam audit memerlukan adaptasi dari para auditor terhadap perubahan dalam kompetensi dan alur kerja untuk secara efektif memanfaatkan teknologi ini. Namun, dengan pemahaman yang tepat dan penanganan yang cermat terhadap tantangan ini, AI memiliki potensi besar untuk meningkatkan praktik audit secara keseluruhan.

Kata kunci: **Otomatisasi, kecerdasan buatan, audit, kualitas audit, pengadopsian teknologi, bukti audit, persepsi auditor**

1. Introduction

Artificial Intelligence (AI) is increasingly being integrated into the field of auditing to enhance effectiveness and efficiency in the audit process. Several studies have explored the application of AI in auditing, highlighting its potential benefits and challenges. Ukpong et al. (2019) emphasize the need for AI technologies in accounting and auditing, pointing out the

existing problems in the field that could be addressed through AI applications. Fedyk et al. (2022) conducted empirical analyses and interviews with audit partners, revealing that AI is widely used in audits with the primary goal of improving quality and efficiency. Almufadda & Almezeini (2021) provide insights into critical considerations for successful AI adoption in auditing practices, emphasizing the importance of proper decision-making and countermeasures.

Furthermore, the study by Landers & Behrend (2023) raises concerns about fairness and bias in AI-based decision tools, highlighting the importance of auditing AI auditors to evaluate and address these issues. Minkkinen et al. (2022) discuss the concept of continuous auditing of AI as a means to ensure accountability and mitigate risks associated with AI systems. These studies underscore the significance of auditing AI systems to uphold standards, address biases, and ensure accountability in the audit process.

Several leading consultants in the world have conducted several studies on the impact of implementing AI in the auditing process. The research results can be shown in the table below:

Table 1. Impact of Implementing AI in Auditing

Aspect	Impact
Audit Efficiency	<ul style="list-style-type: none"> - Reduce audit time by 40% [1] - Increase sampling accuracy - Automate manual tasks
Audit Effectiveness	<ul style="list-style-type: none"> - Better fraud detection - More accurate risk assessment - Improved audit insight
AI Adoption in Auditing	<ul style="list-style-type: none"> - 80% of internal audits will use AI by 2022 - 70% of internal auditors plan to use AI in the next two years - Global investment in AI solutions for audit to reach \$1.2 billion by 2023

Sources: PwC & Deloitte, 2023

The table presented regarding the impact of applying artificial intelligence (AI) in auditing shows a number of significant benefits that can be gained from the use of this technology. Specifically, audit efficiency can be increased by reducing the time required by up to 40%, increasing sampling accuracy, and automating manual tasks in the audit process. In addition, audit effectiveness can also be improved with better fraud detection, more accurate risk assessments, and increased audit insight through deeper data analysis. The data also illustrates the trend of AI adoption in the audit industry, where there are projections that most internal audits will use AI by 2022 and most internal auditors plan to adopt it in the next two years. The large global investment in AI solutions for auditing, estimated to reach \$1.2 billion by 2023, underscores the strong interest of companies to develop and adopt this technology in an effort to improve the efficiency and effectiveness of their audits. The data source cited in the table is PwC & Deloitte in 2023.

In conclusion, the integration of AI in auditing holds great promise for improving the quality and efficiency of audits. However, it is essential to address challenges such as bias, fairness, and accountability through rigorous auditing practices. By following frameworks for auditing AI systems, organizations can leverage the benefits of AI while maintaining trust and integrity in the audit process.

This research aims to investigate the application of artificial intelligence (AI) in improving the efficiency and effectiveness of the audit process. By understanding in depth how AI is used in audits, this research seeks to identify strategies and techniques that can be applied

to improve audit quality and performance. One of the main aims of this research is to present a better understanding of how AI technology can be optimized to support auditors in performing their tasks more efficiently and effectively.

The urgency of conducting this research is very important considering the rapid changes in technology and the need for more sophisticated and effective audits. With the increasingly complex business environment and increasing audit challenges, the presence of AI becomes crucial to help auditors navigate and respond to these changes. Additionally, with the increasingly widespread adoption of AI technology across various industry sectors, it is important for the audit community to continue to develop understanding and skills in integrating AI into their audit practices.

The contribution of this research is in line with the research question asked, namely "How can AI be applied to increase effectiveness and efficiency in carrying out the audit process?" Through in-depth analysis of the application of AI in auditing, this research is expected to provide valuable insight into the ways AI can be used to optimize the audit process. The contributions include identification of effective AI techniques, discussion of the benefits and challenges associated with applying AI in auditing, and practical suggestions for auditors and organizations to successfully adopt this technology. Thus, it is hoped that this research can provide valuable guidance for audit practitioners in facing the digital era and exploiting the full potential of AI technology to improve the quality and efficiency of their audits.

2. Research Methods

The research method used in this research is a systematic literature review approach using reference sources from international databases such as Scopus, Web of Science, IEEE Xplore. Reference searches were carried out using relevant keywords such as "artificial intelligence", "AI", "auditing", "audit process", "effectiveness", and "efficiency". The article filtering process was carried out by applying inclusion criteria which included publication language (English), relevance to the research topic, connection with the application of AI in auditing, emphasis on effectiveness and efficiency, and availability in full-text form. Articles that pass this selection are then analyzed further to determine their contribution to the research question being studied. This process ensures that the articles used in this research are carefully selected and relevant to the research objectives, thereby providing a solid basis for subsequent analysis in the systematic literature review.

3. Results and Discussions

A. Automation and workforce supplementation in auditing

Automation is increasingly becoming a significant aspect of auditing, with predictions indicating a substantial impact on the profession. PwC estimates that 45% of audit work globally is automated, resulting in substantial cost reductions (Dahabiyyeh, 2023). The integration of technologies like Robotic Process Automation (RPA) and Artificial Intelligence (AI) is seen as a means to enhance audit quality, efficiency, and scope (علي et al., 2022; Nonnenmacher et al., 2021; Rikhardsen et al., 2022). These technologies offer opportunities for automating tasks such as data processing, internal audit activities, and enhancing audit processes through intelligent automation (Heriningsih et al., 2021; Dronov et al., 2021; Fedyk et al., 2022).

Furthermore, the use of automation in auditing is not without challenges. While automation can improve efficiency, there are limitations in automating industry-specific auditing processes due to high customization costs (Lins et al., 2015). Additionally, the adoption of automation in auditing may require auditors to embrace new competencies and workflows to effectively utilize these technologies ("Implementation of Robotic Process Automation: Audit Process, Workflow, and Competencies In Indonesian Banking Firms", n.d.).

The potential benefits of automation in auditing include improved audit quality, increased efficiency, and the ability to conduct continuous auditing (Hasan & Stiller, 2005; Almeida & Trigo, 2012). However, there is a need for auditors to adapt to these changes to safeguard their profession (Yusoff et al., 2023). The use of technologies like blockchain is also seen as a way to supplement traditional auditing methods by providing decentralized and automated audit processes (Abdennadher et al., 2021).

In conclusion, the integration of automation in auditing is a growing trend that offers significant opportunities for enhancing audit processes. While there are challenges to overcome, the potential benefits in terms of efficiency, quality, and scope make automation an essential consideration for auditors looking to stay competitive in a rapidly evolving landscape.

B. Effect of AI on improving audit quality criteria

Artificial Intelligence (AI) has been increasingly integrated into the audit process, showing promising results in enhancing audit quality criteria. Studies such as Fedyk et al. (2022) and Seethamraju & Hecimovic (2022) have highlighted the positive impact of AI on audit quality. Fedyk et al. (2022) emphasize that investing in AI can lead to improved audit quality, reduced fees, and the displacement of human auditors over time. Seethamraju and Hecimovic (2022) further support this by suggesting that AI adoption can enhance audit efficiency, automate tasks, and enable auditors to make better judgments, ultimately resulting in better-quality audits.

Hu et al. (2020) delve into the factors influencing the adoption of AI-enabled auditing techniques, emphasizing the need to understand the dimensions and criteria involved to enhance audit quality and prevent failures. This underscores the importance of a comprehensive approach to integrating AI into auditing practices to ensure its effectiveness.

Furthermore, studies like Albawwat & Frijat (2021) and Dagunduro et al. (2023) shed light on auditors' perceptions towards AI and the application of AI techniques in improving audit quality. Albawwat and Frijat (2021) explore how different types of AI systems (Assisted, Augmented, Autonomous) can contribute to audit quality, while Dagunduro et al. (2023) recommend continuous training for audit personnel to leverage AI techniques for enhancing audit quality.

In conclusion, the research indicates that AI has the potential to significantly enhance audit quality criteria by improving efficiency, automating tasks, enabling better judgments, and providing a more comprehensive approach to auditing practices. By understanding the factors influencing AI adoption in auditing and addressing auditors' perceptions towards AI, organizations can harness the benefits of AI to elevate audit quality standards.

C. Key factors for adopting AI-enabled auditing techniques

To identify key factors for adopting AI-enabled auditing techniques, several studies provide valuable insights. Seethamraju & Hecimovic (2022) emphasize the importance of considering algorithmic bias and contextual factors such as audit tasks, organizational, and environmental aspects in the adoption of AI-enabled tools (Seethamraju & Hecimovic, 2022). Additionally, Hu et al. (2020) highlight the complexity of decision-making in adopting AI-enabled auditing techniques, stressing the significance of data pre-processing to facilitate decision-making processes (Hu et al., 2020).

Moreover, Dora et al. (2021) identify critical success factors for adopting AI in food supply chains, including technology readiness, security, privacy, customer satisfaction, and regulatory compliance, which could also be relevant in the auditing context (Dora et al., 2021). Furthermore, Bach et al. (2022) discuss the essential aspect of user trust in AI-enabled systems, which is crucial for fostering adoption, indicating that understanding user trust definitions and influencing factors is vital (Bach et al., 2022).

In the context of AI adoption in auditing, factors such as technology readiness, security, privacy, customer satisfaction, regulatory compliance, and user trust play pivotal roles. Decision-makers need to address algorithmic bias, organizational, and environmental factors, and ensure data pre-processing to enhance decision-making processes when adopting AI-enabled auditing techniques. Understanding user trust definitions and factors influencing trust is also essential for successful adoption.

D. Impact of AI technologies on audit evidence

The integration of Artificial Intelligence (AI) technologies in the field of auditing has been a topic of increasing interest and discussion. Several studies have highlighted the potential impact of AI on audit evidence and the audit process. Kend & Nguyen (2020) emphasize the positive impact of Big Data Analytics (BDA), robotics, and AI on auditing, indicating a shift towards more efficient and effective audit practices. Similarly, Issa et al. (2016) point out that AI is a disruptive technology expected to revolutionize audit procedures.

Saljeni et al. (2018) delve into the implications of BDA on the relationship between auditors and clients, the execution of audit engagements, and the challenges associated with incorporating BDA into audits. Fedyk et al. (2022) acknowledge the growing interest in AI applications in auditing but highlight the scarcity of empirical evidence on the effects of AI adoption in audits. Khan et al. (2021) stress the necessity of AI technologies like Natural Language Processing (NLP) in interpreting text-based and unstructured audit evidence for enhanced efficiency gains.

Furthermore, Zhang et al. (2020) discuss the wide-ranging applications of AI technologies in auditing, including areas such as financial distress, fraud detection, stock market forecasting, and audit processes. Seethamraju & Hecimovic (2022) recognize the potential benefits of AI in audits but note that auditors' core responsibilities, such as understanding clients' businesses, compiling evidence, and exercising professional skepticism, are not yet replaceable by AI technologies.

In conclusion, while AI technologies offer significant potential to enhance audit processes through efficiency gains, improved analysis of data, and more effective risk assessment, there are still challenges to address, such as the need for empirical evidence on AI's impact and the ongoing importance of human judgment and expertise in auditing practices.

E. Auditors' perceptions towards AI and its contribution to audit quality

Auditors' perceptions towards AI and its contribution to audit quality have been a subject of interest in academic research. Several studies have explored this topic from various angles. Tepalagul & Ling (2014) discuss the effects of threats on the actual and perceived quality of audits and financial reports, shedding light on the incentives, perceptions, and behaviors of auditors and clients (Tepalagul & Ling, 2014; . Commerford et al., 2021) highlight the optimism within the audit profession regarding the enhancement of audit quality through AI implementation, while also pointing out the lack of research on how auditors will interact with AI systems and how AI might influence their evaluation of evidence (Commerford et al., 2021). Furthermore, Seethamraju & Hecimovic (2022) suggest that adopting AI in auditing can lead to more efficient and effective audit processes, enabling auditors to make better judgments and ultimately facilitating better-quality audits (Seethamraju & Hecimovic, 2022).

Moreover, Fedyk et al. (2022) present results indicating that audit firms can leverage AI to improve processes, enhance audit quality, and operate more efficiently with fewer employees and lower audit fees (Fedyk et al., 2022). Additionally, Rodrigues et al. (2023) discuss how AI applications in auditing can lead to significant changes in the profession, allowing auditors to manage time better, focus on high-risk areas, and improve overall

efficiency (Rodrigues et al., 2023). These studies collectively suggest a positive outlook on the impact of AI on audit quality and efficiency.

In conclusion, the literature reviewed indicates that auditors generally perceive AI as a tool that can enhance audit quality by improving efficiency, enabling better judgments, and focusing on high-risk areas. While there is optimism within the audit profession regarding the benefits of AI, there is also a recognition of the need for further research on how auditors will interact with AI systems and how AI will influence audit processes and evidence evaluation.

F. AI in internal audit and risk assessment

Artificial intelligence (AI) is increasingly being integrated into internal audit functions to enhance efficiency and effectiveness. AI can provide strategic oversight, reduce manual processes, and offer value-added auditing services (Wassie, 2024). Internal audits play a crucial role in assessing AI algorithms to manage model risk effectively, connecting AI algorithm audits with internal audit terminology (Sandu et al., 2022). Furthermore, internal audits can ensure alignment with declared AI principles before model deployment, helping to close the AI accountability gap (Raji et al., 2020).

The introduction of AI and machine learning (ML) in auditing is still in its early stages, presenting opportunities for internal auditors to enhance audit procedures and professional skepticism (Puthukulam et al., 2021). Continuous auditing of AI systems is particularly relevant for internal audit functions, offering tools and frameworks to assess AI systems effectively (Minkkinen et al., 2022). Internal audits, executed by dedicated teams within organizations, can inform decisions on AI technology development, especially when risks outweigh benefits (Raji, 2020).

AI audits, both internal and external, are crucial for assessing design logics, building ethical systems, and avoiding potential negative societal impacts from AI systems (Ugwudike, 2021; Solanki et al., 2022). Auditing is integral to risk assessment, ensuring that internal controls operate effectively to reduce business risks to acceptable levels (Barta & Görcsi, 2021). Additionally, AI risk assessment frameworks have been developed by various entities to guide organizations in evaluating AI-related risks (Xia et al., 2023).

In conclusion, the integration of AI in internal audit functions requires robust auditing processes to ensure accountability, transparency, and ethical AI development and deployment. Internal audits, supported by AI tools and frameworks, play a vital role in managing AI-related risks and enhancing audit quality in organizations.

4. Conclusion

Based on the discussions presented in the various sections regarding automation and AI in auditing, several key conclusions can be drawn:

1. Integration of Automation and AI in Auditing

Automation, particularly through technologies like Artificial Intelligence (AI), is becoming increasingly prevalent in auditing processes. This integration offers significant opportunities to enhance audit quality, efficiency, and scope.

2. Potential Benefits and Challenges

While the potential benefits of automation and AI in auditing are substantial, including improved audit quality, increased efficiency, and the ability to conduct continuous auditing, there are also challenges to overcome. These challenges include high customization costs for industry-specific auditing processes and the need for auditors to adapt to new competencies and workflows.

3. Enhancing Audit Quality Criteria

AI shows promise in improving audit quality criteria by enhancing efficiency, automating tasks, enabling better judgments, and providing a more comprehensive approach

to auditing practices. Understanding factors influencing AI adoption and addressing auditors' perceptions towards AI are crucial for leveraging its benefits effectively.

4. Key Factors for Adopting AI-Enabled Auditing Techniques

Key factors for adopting AI-enabled auditing techniques include technology readiness, security, privacy, customer satisfaction, regulatory compliance, user trust, algorithmic bias, and considerations of organizational and environmental factors.

5. Impact on Audit Evidence and Processes

While AI technologies offer significant potential to enhance audit processes through efficiency gains and improved analysis of data, there are still challenges to address, such as the need for empirical evidence on AI's impact and the ongoing importance of human judgment and expertise in auditing practices.

6. Auditors' Perceptions and Contribution to Audit Quality

Auditors generally perceive AI as a tool that can enhance audit quality by improving efficiency, enabling better judgments, and focusing on high-risk areas. However, further research is needed on how auditors will interact with AI systems and how AI will influence audit processes and evidence evaluation.

7. AI in Internal Audit and Risk Assessment

The integration of AI in internal audit functions offers opportunities to enhance efficiency, effectiveness, and risk assessment. Internal audits play a crucial role in assessing AI algorithms, ensuring alignment with declared AI principles, and managing AI-related risks effectively.

In conclusion, while the integration of automation and AI in auditing presents significant opportunities for improving audit processes and quality, it is essential for auditors and organizations to address challenges, understand key factors for adoption, and ensure accountability, transparency, and ethical AI development and deployment in order to realize the full potential of these technologies in the auditing profession.

The research discussed above has several limitations that need to be considered. First, the representation of the studies presented may not cover all relevant aspects or viewpoints related to the use of automation and artificial intelligence in auditing. This limitation may affect the generalization of research results. Second, limitations in the data and methodology also need to be considered. Some studies may be limited by data availability that affects the accuracy of the analysis or the generalizability of the findings. In addition, the methods used in research may have certain limitations that affect the validity or reliability of the results. Third, limitations in data age are an important factor. Research may draw on data that is out of date or no longer relevant to current conditions or trends in audit practice. Fourth, limitations in geographic coverage also need to be considered. Some studies may be limited to certain geographic areas or business environments, which may limit the generalizability of findings to different situations. Fifth, limitations in theoretical approaches can affect a comprehensive understanding of the phenomena studied. Finally, acknowledgment of these limitations is important to provide an appropriate context for the interpretation of research findings and to indicate directions for further research in this domain.

For the future research agenda in the domain of the use of automation and artificial intelligence (AI) in auditing, several suggestions can be considered. First, it is important to conduct case studies on real implementations of AI in audit practices in various industries and business environments. This will provide deeper insight into the challenges, benefits, and effective strategies for adopting this technology. Furthermore, research on the impact of regulations, standards and legal frameworks on the use of AI in auditing becomes relevant. This includes an analysis of the compliance, liability, and legal implications associated with implementing this technology in audit practice. Research also needs to be conducted on the ethical aspects related to the use of AI in auditing, including ethical considerations in decision making, transparency and accountability in the use of this technology. Furthermore, research

needs to be conducted on the changes required in the role and competencies of auditors as a result of the use of AI in audits, including the identification of new skills required and effective training and development strategies. The integration of AI with continuous auditing is also a relevant topic for research, including the development of methods and tools for conducting continuous audits using AI technology. Additionally, research on evaluating the risks and security associated with the use of AI in auditing is needed, including the identification of potential security threats, the development of effective security controls, and the management of risks associated with the implementation of this technology. Finally, research on stakeholder perceptions and expectations of the use of AI in auditing can provide valuable insight into the adoption of this technology and the factors influencing its acceptance.

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