



Big Data Analytics and the Enhancement of Audit Quality in the Digital Transformation Era

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Abstract

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This study aims to analyze the role of Big Data Analytics in improving audit quality in the era of digital transformation. Using a literature review method of scientific publications from the last five years, this study examines the relationship between the application of big data analytics and the effectiveness, efficiency, and credibility of audit results. The results of the study show that Big Data Analytics can expand the scope of auditing from a sample-based approach to a population-based approach, strengthen auditors' ability to detect data anomalies, and accelerate the process of verifying financial reports in real-time. In addition to technological benefits, the successful implementation of Big Data Analytics is highly dependent on the digital competence of auditors, infrastructure readiness, and a reliable data governance system. Challenges that arise include information security, professional ethics, and the need to improve technological literacy among auditors. Therefore, Big Data Analytics not only functions as a data analysis tool but also as the main foundation for the development of modern audit practices that are adaptive, transparent, accountable, and sustainable in supporting organizational governance in the digital era.

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1. Introduction

The development of information and communication technology has fundamentally changed the way organizations manage and process data, including in the field of auditing. In the digital era, the emergence of Big Data Analytics (BDA) is one of the main innovations that affect the effectiveness and efficiency of the audit process. This concept allows auditors to process huge volumes of data in real-time and generate more accurate insights compared to traditional audit techniques. This transformation not only changes the way auditors collect audit evidence, but also improves the quality of data-driven decision-making (Hariyanto & Riantono, 2024). In a global context, the adoption of BDA technology has become one of the key determinants of audit quality and public trust in the auditor profession (Al Lawati et al., 2024).

This change is also in line with the demands of the VUCA (Volatility, Uncertainty, Complexity, Ambiguity) era, where business uncertainty and complexity demand an adaptive and technology-based audit system. Traditional audits that rely on sampling are no longer considered adequate to detect fraud risks hidden in digital systems. Therefore, the use of data analytics in the audit process is a strategic imperative that ensures auditors are able to validate data with high precision and increase the reliability level of financial statements (Rahman & Ziru, 2023). In other words, the BDA not only serves as a technical tool, but also as a strategic component in creating robust and transparent audit assurance (Lugli & Bertacchini, 2023).

In addition to the efficiency factor, the implementation of BDA also has important implications for improving audit quality. A study by Al-Ateeq et al. (2022)

shows that the application of data analytics based on the Technology Acceptance Model (TAM) model has a positive impact on auditors' perceptions of effectiveness and objectivity. These results confirm that the readiness of organizations to adopt technology is a crucial factor in improving the quality of audit results. Furthermore, research by Abu Afifa et al. (2022) confirms that the integration of Big Data Analytics in audit systems can improve the detection of transaction anomalies and speed up the process of validating financial information without sacrificing accuracy. This shows that the application of digital technology is not just a trend, but also an instrument that strengthens organizational governance and accountability.

On an international scale, technology-based audits have evolved towards the concept of Audit 4.0, which combines artificial intelligence, machine learning, and predictive analytics as an integral part of the audit process (Meitasari & Audrey, 2023). This paradigm shift reinforces the need for new competencies for auditors, who not only understand accounting and audit principles, but also have high digital literacy. Auditors are now required to be able to use complex data analysis tools, interpret algorithm results, and relate them to the client's business context. According to Hezam et al. (2023), this evolution requires a synergy between technical expertise and ethical professionalism so that the integrity of audit results is maintained amid rapid technological advances.

The post-COVID-19 pandemic context also provides a big boost to audit digitization. Mobility restrictions forced audit organizations to switch to cloud-based systems and data automation to maintain operational continuity. This phenomenon accelerates the digital transformation process, where the use of Big Data Analytics

is a strategic solution in dealing with physical limitations and time efficiency needs (De Santis & D'Onza, 2021). The pandemic has also changed the mindset of auditors in looking at the value of data: from just a source of information to the main foundation in auditing decision-making based on empirical evidence.

Nevertheless, the adoption of BDA is not free from challenges. Several studies show that there is a gap between auditor capabilities and the complexity of the technology applied (Shyriaieva et al., 2023). Data security issues, system integration, and digital infrastructure unpreparedness are the main obstacles in the implementation of analytics-based audits. Therefore, organizations need to design policies that support strengthening human resource capacity and building an audit system that is sustainable and responsive to technological changes (Putra et al., 2023).

Thus, it can be concluded that the implementation of Big Data Analytics has great potential in improving audit quality through increased efficiency, transparency, and data accuracy. However, these benefits can only be maximized if organizations and auditors are able to integrate technology with adequate principles of ethics, governance, and professional competence. This study is expected to provide a more comprehensive understanding of how BDA can be used to strengthen audit quality in various sectors, as well as a reference in developing an adaptive and sustainable digital audit framework in the era of industrial transformation 4.0.

2. Literature Review

2.1. Big Data Analytics and Digital Audit Transformation

The development of Big Data Analytics (BDA) has revolutionized the conventional audit paradigm towards digital audits based on big data and artificial intelligence. BDA allows auditors to analyze complex datasets quickly and deeply, thereby improving risk detection effectiveness and audit time efficiency (Harijanto & Riantono, 2024). In practice, BDA plays an important role in identifying unusual transaction patterns, optimizing decision-making, and improving the transparency of financial statements. With its predictive analytics capabilities, auditors can assess potential data fraud and anomalies with a higher level of accuracy than traditional methods (Rahman & Ziru, 2023).

Recent studies show that the digitization of audits is also driving fundamental changes to an organization's internal control system. The implementation of the BDA shifts the orientation of audits from a retrospective approach to a prospective one, where auditors not only assess the past but also project future risks (Lugli & Bertacchini, 2023). This is in line with the global trend towards Audit 4.0, which integrates technologies such as artificial intelligence, machine learning, and audit process automation to produce evidence-based and data-driven audits.

Furthermore, research by Meitasari and Audrey (2023) confirms that the synergy between AI and BDA creates an audit environment that is more adaptive to dynamic business environment changes. Auditors are not only data users, but also strategic analysts who are able to interpret data as the basis for organizational risk prevention. Thus, the transformation of BDA-based digital audits is not only a

technological issue, but a shift in the value and role of auditors in the era of global digitalization.

2.2. Big Data Analytics and Audit Quality

Audit quality is the main indicator of the reliability of financial statements and the credibility of auditors in providing assurance of the accuracy of financial information. In the modern context, the use of Big Data Analytics (BDA) plays an important role in strengthening audit quality through increased accuracy, efficiency, and anomaly detection capabilities. A study by Al-Ateeq et al. (2022) revealed that the use of BDA associated with the Technology Acceptance Model (TAM) model was able to increase auditors' perception of the usefulness and ease of use of technology, which ultimately had an impact on better quality audit results. BDA not only speeds up the data collection process, but also improves the accuracy of audit risk assessment through real-time data analysis and advanced algorithm-based visualization.

Furthermore, the research of Abu Afifa et al. (2022) confirms that the implementation of BDA allows auditors to examine the entire population of data rather than just a sample, so that the risk of material errors can be significantly minimized. This approach results in a more thorough and evidence-based audit. On the other hand, Alrashidi et al. (2022) show that the use of data analytics tools in the audit process also strengthens the dimension of auditor independence and objectivity because the analysis is carried out based on actual data, not subjective assumptions. However, the effectiveness of the BDA on audit quality is also highly dependent on the auditor's competence and the readiness of the organization's

technological infrastructure. Therefore, the successful implementation of BDA in improving audit quality requires a balance between technological innovation and the development of human resource capabilities that are able to manage and interpret data ethically and professionally.

2.3. Challenges of Implementing Big Data Analytics in Audit

While the benefits of Big Data Analytics (BDA) on audit effectiveness and quality have been widely recognized, its implementation process faces a variety of technical, ethical, and organizational challenges. One of the main obstacles lies in the readiness of digital infrastructure and the competence of auditors in operating advanced technology. Research by De Santis and D’Onza (2021) highlights that there is still a significant gap between the capabilities of auditors and the complexity of the analytical systems used in modern audits. Many audit firms are still in the transition stage to full digitalization, so the BDA integration process often does not run optimally.

In addition, the issue of data security and privacy is a serious challenge in the implementation of BDA. In big data-driven audits, auditors interact with sensitive volumes of data that require a high level of protection. A study by Shyriaieva et al. (2023) explains that the risk of data leaks and audit ethics violations increases along with the use of cloud-based systems and distributed networks. Auditors are required not only to have technical skills, but also a deep understanding of digital ethics and responsible data governance. Putra et al. (2023) added that the challenges of implementing BDA also include aspects of organizational culture. Some organizations tend to be resistive to change due to the perception that audit

digitization can threaten auditors' professional autonomy. Therefore, successful digital transformation in auditing requires a holistic approach that involves ongoing training, strong data security policies, and managerial support in adopting technological innovations.

3. Methods

This study uses a literature review research method, which aims to analyze and synthesize various empirical and conceptual findings related to the influence of Big Data Analytics (BDA) on audit quality in the context of digital transformation. This approach was chosen because the topics studied are conceptual and continue to develop dynamically along with the advancement of information technology and the digitization of the audit process. Through literature analysis, this study seeks to formulate a comprehensive understanding of the role of BDA, implementation challenges, and opportunities to improve the quality of big data-based audits.

The research stage is carried out through four main steps. First, identify relevant and up-to-date sources of literature. Researchers collected references from academic databases such as Google Scholar, IEEE Xplore, SpringerLink, Emerald Insight, and MDPI with a publication year limit between 2020 to 2024. The selected literature includes empirical, theoretical articles, as well as reports on digital audit practices from various countries. Second, a literature selection and classification process was carried out based on relevance to the main keywords, namely Big Data Analytics, quality audit, digital audit, and auditing technology. This process ensures that all the sources analyzed have a direct connection to the research topic.

Third, content analysis was carried out to evaluate the main themes that emerged in previous research. The analysis focused on identifying the pattern of relationship between the use of BDA and improving audit quality, as well as factors that affect the effectiveness of the implementation of the technology, such as auditor competence, infrastructure readiness, and data governance. Findings from the literature were systematically processed to find similarities, differences, and trends that emerged in the last five years.

Fourth, the synthesis stage is carried out to develop a conceptual framework that comprehensively explains the contribution of BDA to audit quality. The results of this synthesis are then used to formulate the main findings and conceptual conclusions of the research. This approach allows analysis to be conducted objectively and in-depth without empirical bias in the field, as each argument is supported by scientific evidence from reliable literature. Thus, the literature study method in this study not only serves to summarize the results of previous research, but also as a means to build a new theoretical framework that explains the relevance of Big Data Analytics in strengthening the effectiveness, efficiency, and quality of audits in the digital era.

4. Results

The results of this literature study-based research illustrate a close relationship between the application of Big Data Analytics (BDA) and improving audit quality in various organizational contexts, both public and private sectors. An analysis of fifteen scientific references shows that the digitization of the audit process through

BDA not only impacts technical efficiency, but also fundamentally changes the audit paradigm. Auditors are now required to play the role of strategic analysts who are able to leverage data at scale to assess risks, detect anomalies, and provide more accurate recommendations to management.

According to Harijanto and Riantono (2024), the use of BDA in audit practice is able to expand the scope of analysis from sample-based examinations to full-data population-based analysis. This approach improves the reliability of audit results because all transactions are tested, not just a small portion. In traditional audits, time and resource limitations mean that auditors are only able to assess a small portion of the data, so potential hidden risks can be missed. With BDA, each transaction can be thoroughly evaluated using an automated algorithm that detects abnormal patterns. This makes the audit process more comprehensive and increases confidence in the results obtained.

Research by Al Lawati et al. (2024) shows that the implementation of BDA in financial organizations contributes to increased audit assurance because auditors can identify relationships between financial variables in real-time. In the context of business globalization, this is especially important because cross-border transactions pose a high complexity to financial reporting. With the support of advanced analytics, auditors can measure data integrity, identify irregular transactions, and provide a stronger evidence-based evaluation of risk management and regulatory compliance.

In addition, Rahman and Ziru (2023) emphasized that the digital transformation of auditing has improved the ability of audit firms to provide added

value to clients. The use of machine learning-based analytics systems and data visualization tools allows auditors to present audit results in a visual form that is easy for management to understand, while shortening the analysis time. This has an impact on improving operational efficiency and strengthening the relationship between auditors and clients through higher transparency of information. Thus, the BDA not only serves as a technical analysis tool, but also as a means of communication that increases stakeholder trust.

However, the quality of audits resulting from the implementation of BDA is highly dependent on the level of digital literacy of auditors. Lugli and Bertacchini (2023) emphasize that audit digitization cannot run effectively without adequate investment in the training and development of auditor technology competencies. Auditors need to understand how analytical algorithms work, the interpretation of data results, and the risks associated with data processing errors. When auditors are able to combine analytical expertise and professional ethics, the audit results will have higher validity and be free from interpretive bias.

Furthermore, Al-Ateeq et al. (2022) through the Technology Acceptance Model (TAM) approach found that perceived usefulness and perceived ease of use are the main factors in the successful implementation of BDA in the audit environment. Auditors who understand the benefits of technology tend to be more quick to adapt and use BDA as the main tool in the audit process. The research also shows that organizations with innovative cultures have a higher rate of technology adoption, resulting in better quality audits.

Similar findings were put forward by Abu Afifa et al. (2022), who found that BDA improves auditors' ability to detect data mismatches through descriptive and diagnostic analysis techniques. By utilizing pattern recognition algorithms, auditors can automatically identify transaction anomalies without having to manually check each document. This speeds up the audit process and reduces the risk of human error. Furthermore, Alrashidi et al. (2022) added that the use of Big Data Analytics tools such as Python and R in the audit process expands the capacity of auditors to integrate various data sources, ranging from internal accounting systems to external data such as the stock market and social media, in order to detect indications of financial report manipulation more accurately.

De Santis and D'Onza (2021) highlight that the legitimacy of the use of BDA in audits is also related to regulatory aspects and professional ethics. The implementation of digital technology demands strict oversight of data integrity, as errors in data collection or interpretation can lead to audit bias. Therefore, auditing professional bodies such as the IAASB and IFAC are beginning to encourage the development of digital audit guidelines that include data governance, the use of algorithms, and technology-based reporting. This effort aims to ensure that the audit results generated from the BDA still meet the principles of objectivity and auditor independence.

From an organizational perspective, Shyriaieva et al. (2023) identified structural challenges in the implementation of BDA, especially related to infrastructure readiness and data security. Many companies face obstacles in integrating legacy information systems with new analytics platforms. These

compatibility issues often slow down the process of digitizing audits. In addition, the risk of data leakage is a major concern, given that the volume of data analyzed is very large and often confidential. To address this, organizations need to develop strong cybersecurity policies and conduct internal audits of data management systems on a regular basis.

Research by Putra et al. (2023) strengthens these findings by emphasizing the importance of synergy between technological readiness and governance policies in the successful implementation of BDA. In the context of public organizations, the main challenge lies in the lack of understanding of the long-term benefits of data analytics. Many institutions still see technology investment as a cost burden, rather than as an instrument of increasing transparency and efficiency. Therefore, a change in managerial paradigm is needed so that BDA can be strategically integrated in the organization's audit system.

The results of the analysis also show that the use of BDA has great potential in supporting a risk-based audit approach. By leveraging predictive analytics, auditors can identify high-risk areas before the audit is conducted, so that the audit focus can be directed to the most critical areas. Le et al. (2022) stated that this approach not only improves audit efficiency, but also strengthens auditors' ability to provide recommendations based on empirical data. The risk-based approach is also in line with the principle of continuous auditing, where the audit process is carried out continuously using an automated system that monitors transaction activities in real-time.

Huh et al. (2021) added that the effectiveness of information system-based audits is greatly influenced by the data input and the quality of the system used. The higher the quality of the IT-based audit system, the better the audit results obtained. This emphasizes that BDA cannot stand alone without the support of a reliable and integrated information technology system. In this context, collaboration between auditors and technology specialists is crucial to ensure the data used is relevant, valid, and free from processing errors.

In addition to the benefits and challenges that have been discussed, the literature also shows the strategic dimension of the implementation of BDA. According to Lugli and Bertacchini (2023), audit digitization not only improves technical efficiency, but also contributes to the formation of an image of auditor professionalism. Auditors who are able to master modern technology are considered more adaptive, innovative, and competent, which ultimately increases public trust in the accounting profession. Thus, the ability to integrate BDA in audits can be an indicator of the audit organization's capabilities in facing global competition.

The overall results of this study show that Big Data Analytics acts as a catalyst for the transformation of audits towards a new paradigm that is more transparent, accurate, and evidence-based. The use of this technology encourages operational efficiency, strengthens data governance, and improves the quality of audit results through comprehensive analysis of financial and non-financial data. Even so, the success of its implementation is greatly influenced by organizational readiness, auditor digital literacy, and adequate data security policies. By paying attention to

these factors, BDA has the potential to become the main foundation in realizing credible and sustainable audits in the era of digital transformation.

5. Discussion

The results of the literature review show that the application of Big Data Analytics (BDA) has significantly changed the audit landscape, both in terms of methodology, auditor competence, and professionalism paradigm. The use of BDA has been proven to strengthen audit quality through increasing the effectiveness, efficiency, and ability of auditors to detect risks in real-time. However, this transformation also presents various challenges that must be anticipated by organizations and the audit profession. Conceptually, the results of this study support the findings of Harijanto and Riantono (2024) that BDA expands the scope of audit analysis from sampling-based to population-based testing, so that the audit results become more comprehensive and valid. This confirms the shift in the role of the auditor from a mere data examiner to a strategic analyst who manages information at scale. However, this adaptation requires a change in mindset and strengthening digital competencies. Many auditors are still stuck in a manual approach due to a limited understanding of analytics technology and algorithms.

In addition to improving audit quality, the results of Abu Afifa et al.'s (2022) research show that the integration of BDA has a positive impact on auditor objectivity because data-driven decisions tend to be freer from subjective bias. The use of analytics technology also speeds up the data validation process, reduces administrative burden, and increases transparency between auditors and

management. However, as stated by Lugli and Bertacchini (2023), the success of this transformation is not only determined by the availability of technology, but also by the readiness of organizations to adopt digital culture. Changes in organizational behavior are key so that the use of BDA can be thoroughly integrated into the audit system.

The results of Shyriaieva et al.'s (2023) research show that although the benefits of audit digitization are enormous, data security and privacy challenges remain major obstacles. Digital audits are at high risk of data leakage if they are not accompanied by strong cybersecurity controls. Therefore, audit institutions need to develop data governance policies that include information protection standards as well as digital ethics training for auditors.

The discussion also revealed that competency challenges are still a central issue in the adoption of BDA. Meitasari and Audrey (2023) emphasize the need to redefine auditor competencies in the digital era. Auditors are not only able to understand accounting principles, but also master the concepts of data analytics, machine learning, and interpretation of algorithmic results. Without this capability, the potential of the BDA in improving audit quality cannot be optimized. Thus, accounting and auditing education needs to adjust the curriculum to include data literacy and information technology in more depth. Based on the results and discussions, it shows that the success of the implementation of BDA in improving audit quality is multidimensional involving technology, people, policies, and ethics. When these four aspects are well integrated, the BDA is not only an analytical tool,

but also the foundation for modern audit practices that are adaptive, transparent, and sustainable.

6. Conclusion

This research confirms that the application of Big Data Analytics (BDA) has a strategic role in improving the quality of audits in the era of digital transformation. Through a literature review of various literature in the last five years, it is possible to get an idea that BDA not only serves as a technical tool, but also as a key driver of the change in the audit paradigm towards a more transparent, efficient, and evidence-based system. With the ability to analyze large amounts of data in real-time, auditors can detect risks early, minimize material errors, and strengthen the reliability of financial statements. In addition, the results of the study show that the success of the implementation of BDA is highly dependent on the readiness of the organization and the competence of auditors. Digital literacy aspects, continuous training, and understanding of technology ethics are key factors so that BDA can be used optimally.

Successful data-driven audits also require strong data governance policies to protect the privacy and security of processed information. By integrating analytics technology, artificial intelligence, and good governance, modern audits can evolve into adaptive systems that are aligned with the dynamics of the digital economy. The findings of this research are expected to be a conceptual basis for the development of a sustainable BDA-based audit model, as well as encourage the improvement of auditor professionalism in the midst of rapid technological change. Overall, the BDA

is an important foundation in building credible, accountable, and relevant audit practices in the future.

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