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Article

Theoretical and Practical Aspects of Using Artificial Intelligence and Big Data Technologies in the Audit Process

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Abstract: In the context of digital transformation, the audit profession is undergoing significant changes driven by the rapid development of Artificial Intelligence (AI) and Big Data technologies. This article examines the theoretical foundations and practical applications of AI and Big Data in the audit process. The study highlights how advanced data analytics, machine learning algorithms, and automated audit tools enhance audit quality, improve risk assessment, and increase the efficiency of detecting errors and fraud. Special attention is given to the transformation of traditional audit methods into continuous and real-time auditing models. The article also analyzes international best practices and identifies key challenges related to data security, professional judgment, and regulatory adaptation. Based on the analysis, recommendations are proposed for the effective integration of AI and Big Data technologies into modern audit systems, particularly in emerging economies.

Keywords: audit, artificial intelligence, big data, digital audit, audit risk assessment, financial data analytics, automation.

1. Introduction

The rapid development of digital technologies has significantly transformed the auditing profession, creating new opportunities and challenges for auditors worldwide. Traditional audit methods, based on sampling and manual verification of financial statements, often face limitations in dealing with large volumes of data and complex transactions. In this context, the integration of Artificial Intelligence (AI) and Big Data technologies into audit processes has emerged as a crucial tool for enhancing efficiency, accuracy, and reliability of audit results [1].

Artificial Intelligence enables auditors to automate routine procedures, analyze vast amounts of financial and operational data, and detect anomalies that may indicate errors or fraudulent activities. Machine learning algorithms, natural language processing, and predictive analytics allow auditors to move beyond conventional post-event verification and adopt continuous and real-time audit models.

Big Data, on the other hand, provides access to structured and unstructured data from various internal and external sources. By leveraging advanced analytical tools, auditors can identify patterns,

correlations, and trends that would be impossible to detect manually. This capability not only improves risk assessment but also supports more informed decision-making and strengthens the overall governance framework of organizations.

Despite these advantages, the adoption of AI and Big Data in auditing presents several challenges, including data security, regulatory compliance, and the need for specialized skills among audit professionals. Therefore, a careful and systematic approach to the implementation of these technologies is essential to maximize their benefits while minimizing potential risks [2].

The aim of this article is to explore both theoretical foundations and practical applications of AI and Big Data in auditing, analyze international experiences, and provide recommendations for effective integration of these technologies into modern audit systems, particularly in emerging economies.

2. Literature Review

According to Kokina and Davenport, the introduction of Artificial Intelligence in auditing fundamentally changes the way auditors perform risk assessments and detect anomalies. The authors argue that AI-driven algorithms allow for continuous monitoring of transactions, thereby significantly increasing the accuracy and reliability of audit findings. They emphasize that AI tools can handle vast amounts of structured and unstructured data, which traditional audit procedures are unable to process efficiently [3].

Appelbaum, Kogan, and Vasarhelyi note that Big Data analytics provides auditors with the capability to identify patterns and correlations in financial data that were previously undetectable. Their research highlights that the integration of Big Data into audit practices not only improves error detection but also enhances the auditor's ability to provide strategic recommendations for decision-making. The authors argue that the combination of AI and Big Data can transform audits from periodic evaluations into continuous and predictive processes [4].

Alles stresses the importance of continuous auditing frameworks and claims that the implementation of digital technologies in audit procedures enables real-time verification of transactions. According to his analysis, auditors can proactively identify discrepancies and potential fraud, which reduces financial risk for organizations. He also points out that continuous auditing models demand higher levels of technological competency and specialized knowledge among audit professionals [5].

Rezaee and Riley argue that despite the clear benefits of AI and Big Data, challenges remain regarding data security, ethical considerations, and regulatory compliance. They suggest that organizations should establish robust frameworks for data governance and auditor training to ensure that the technologies are applied effectively and responsibly. Furthermore, the authors emphasize that adapting international best practices to local contexts is crucial for maximizing the effectiveness of digital audit tools [6].

Overall, the literature shows a consensus that AI and Big Data technologies significantly enhance audit efficiency, accuracy, and predictive capability. However, successful implementation requires addressing technical, regulatory, and professional challenges.

3. Materials and Methods

This study employs a qualitative and analytical research approach to examine the theoretical and practical aspects of using Artificial Intelligence and Big Data in auditing. Secondary data sources, including academic journals, industry reports, and case studies of international audit practices, were analyzed to identify key trends, challenges, and best practices. Comparative analysis was used to evaluate the effectiveness of AI-driven audit tools versus traditional audit methods. Additionally, practical applications and real-world examples were examined to illustrate how these

technologies improve audit accuracy, risk assessment, and efficiency. The findings aim to provide actionable recommendations for integrating AI and Big Data into modern auditing processes.

4. Analysis and Results

The integration of Artificial Intelligence (AI) and Big Data technologies into the audit process has demonstrated significant improvements in both efficiency and accuracy of audit procedures. According to Kokina and Davenport, AI-powered algorithms enhance anomaly detection by analyzing large volumes of financial transactions in real-time, which allows auditors to focus on high-risk areas rather than routine checks. This shift from sample-based verification to comprehensive data analysis reduces the probability of undetected errors and fraud.

Big Data analytics complements AI by providing auditors with access to structured and unstructured datasets from various internal and external sources. Appelbaum, Kogan, and Vasarhelyi emphasize that combining these technologies allows auditors to identify hidden patterns, correlations, and trends that are otherwise difficult to detect through traditional auditing methods. For example, continuous monitoring of transactional data can reveal repetitive anomalies or unusual patterns that may indicate fraudulent activities.

The following table illustrates a comparative analysis of audit effectiveness using traditional methods versus AI and Big Data-assisted approaches:

Table 1. Performance Comparison of Traditional and AI-Based Audit Methods

Audit Method	Detection Accuracy (%)	Time Efficiency (hours per 1000 transactions)	Risk Assessment Capability
Traditional Audit	78	25	Moderate
AI-assisted Audit	92	10	High
Big Data & AI Integrated Audit	96	7	Very High

As seen in the table, the integration of AI and Big Data leads to a substantial increase in detection accuracy, from 78% with traditional auditing to 96% with an integrated approach, while simultaneously reducing the time required for transaction review. Moreover, risk assessment capabilities are enhanced, allowing auditors to not only detect errors but also predict potential vulnerabilities within financial systems [7].

Alles highlights that continuous auditing frameworks enabled by these technologies facilitate real-time verification, which transforms audit from a periodic activity into a dynamic and predictive process. This approach allows organizations to address risks proactively rather than reactively, improving overall financial governance. Rezaee and Riley also note that, despite technical advantages, successful implementation requires careful consideration of data privacy, regulatory compliance, and auditors' digital competencies.

Furthermore, international case studies indicate that firms utilizing AI and Big Data in auditing have observed not only operational efficiency but also strategic benefits, including enhanced decision-making, improved stakeholder confidence, and reduction in financial misstatements. The results demonstrate that integrating AI and Big Data technologies into auditing processes is not merely a technical upgrade but a transformative approach that fundamentally reshapes audit methodology, aligning it with the demands of modern, data-driven financial environments [8].

5. Conclusion

The analysis demonstrates that the integration of Artificial Intelligence and Big Data technologies into the audit process significantly enhances audit quality, efficiency, and risk

management capabilities. AI algorithms enable auditors to automate routine procedures, detect anomalies, and focus on high-risk areas, while Big Data provides access to large-scale structured and unstructured datasets, allowing for deeper insights and predictive analysis. Combined, these technologies transform traditional auditing from a periodic, sample-based process into a continuous, real-time, and data-driven activity.

The study also highlights that successful implementation requires not only technological infrastructure but also skilled auditors capable of interpreting complex data and applying professional judgment in a digital environment. Moreover, challenges related to data security, regulatory compliance, and ethical considerations must be addressed to ensure reliable and responsible use of AI and Big Data in auditing.

Overall, the adoption of AI and Big Data represents a transformative shift in audit methodology, offering both operational and strategic benefits. By leveraging these technologies, organizations can enhance financial transparency, reduce risks, and improve decision-making processes, ultimately contributing to stronger corporate governance and stakeholder confidence.

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