

Innovative Approaches to Data Analysis in Accounting and Auditing (From Big Data to Data-Driven Solutions)

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Abstract

In the world of accounting and auditing, there are challenges such as unreliable information, repeated accounting tasks, mistakes, and incorrect calculations. To tackle these problems, it is important to look into how modern data analysis technologies, particularly big data, can improve audit processes. This study aims to find opportunities for using innovative data analysis methods in accounting and auditing, with a focus on big data and data-driven decision-making. It explores how new technologies are being used in these fields, emphasizing their role in ensuring high-quality audits. The research also looks at different ways in which information technologies and big data can be used effectively in auditing. Ultimately, the study concludes that auditors need to be skilled not only in accounting and finance, but also in data analysis in order to produce thorough and reliable results.

Keywords: Accounting, Audit, Data Analysis, Big Data, Procedures, Business Development.

Introduction

The integration of information systems and technologies is rapidly becoming a crucial driving force in the global economy. These tools empower organizations to effectively tackle economic and social obstacles in a timely and productive manner.

The advancements in technology have not only expanded production capabilities and global reach but have also presented challenges in the field of accounting. However, the introduction of digitalization in the business landscape has provided a solution to these challenges. Thanks to advancements in information technology, it is now possible to automate and streamline various aspects of society, including accounting, through the implementation of electronic systems.

The implementation of electronic tools and technologies is transforming traditional management structures within enterprises, particularly in the realm of accounting. The digitalization of accounting processes greatly enhances the efficiency and accuracy of accounting information processing. As a result, the role of a skilled accountant is increasingly

focused on enhancing accounting organization and practices (Prokopenko, 2021; Salehi et al., 2020; Sun & Shen, 2020).

An audit of financial statements involves an independent professional auditor reviewing an organization's financial reports through the gathering of evidence, performing analytical procedures, and preparing working papers, much of which is still done manually.

Recent studies by Al-Sai et al. (2022) and Barbaglia et al. (2022) propose that incorporating big data techniques has the potential to transform traditional audit methodologies. Big data tools offer advanced learning capabilities and process automation, leading to faster and more accurate results. The use of big data methods provides a comprehensive and multidimensional perspective on financial issues.

Implementing new systems and techniques for internal and external analysis in the operations of large corporations and those involved in auditing and analysis can be done quickly.

In traditional practices, analysts and auditors used manual methods to categorize and analyze data for specific tasks (Aleksieienko et al., 2020; Holwerda, 2021; Milojevi et al., 2020). Recent advancements have demonstrated that data can now be categorized and analyzed without human involvement, breaking down barriers between companies. In today's data-centric environment, businesses are adept at gathering information, yet many still face challenges in converting data into practical insights and grasping the true worth of their enterprises.

The study by Sanetra-Pógrabi (2022) presents groundbreaking research on traditional versus innovative management strategies in the socio-political and socio-economic context of Poland, offering valuable insights for the fields of accounting and auditing. The findings suggest that incorporating technological advancements, such as big data analysis necessitates a re-examination of conventional approaches and the development of new strategies that align with present-day challenges and opportunities.

Moreover, Kolinets (2023) provides a comprehensive discussion on future trends in technological innovations, offering a framework for anticipating the evolution of data analysis in accounting and auditing. Auditors are tasked

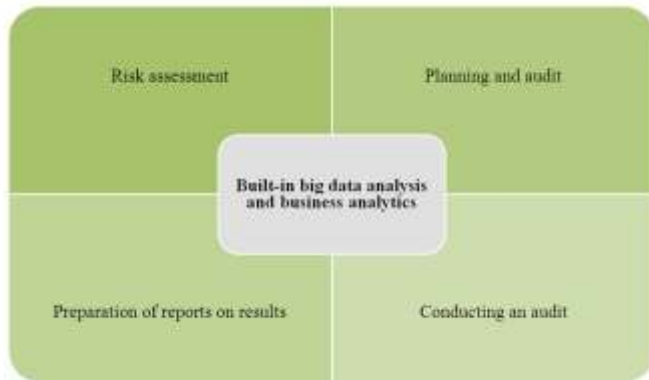
with navigating an ever-growing pool of data, necessitating a vigilant eye on emerging technologies and their impact on the worldwide financial landscape. Both present unique opportunities and challenges for auditors to consider. This correlation underscores the significance of integrating advanced data analysis tools and methodologies to remain competitive and efficient in the fast-paced financial landscape. This connection enhances scholarly dialogue on the topic and offers practical guidance for professionals seeking to navigate the complexities introduced by big data and data-driven solutions in the audit industry.

Leading companies with mature strategies focused on continuous information and data analytics (D&A) Sapotnitska et al. (2023) use a variety of internal and external sources to create customised databases designed to solve specific problems. They use sophisticated methods to obtain accurate information and improve the quality and repeatability of the analytical solutions they implement.

Managing data effectively requires a robust system to collect, process, integrate, and activate it to generate valuable information. Developing a data management platform and implementing a management policy are essential components of this process. Big data technology plays a crucial role in simplifying and streamlining analytical procedures, making it a necessary tool for maintaining business competitiveness. Leading global companies, such as Amazon, Twitter, Macy's, and Netflix, have recognized the importance of incorporating big data technology into their operations and are heavily investing in this area (Abou-Foul et al., 2021; AlNuaimi et al., 2021; Bowen & Grosskopf, 2023; Marshalok et al., 2021).

Due to the current unpredictable economic environment, there is a growing demand for improved and efficient analysis among both internal and external users. Analysts have long acknowledged the significance of data analysis in enhancing audit quality and compliance. However, challenges such as inadequate technological resources, data collection issues, and privacy constraints have hindered the widespread adoption of this strategy. Nonetheless, recent advancements in data science and analytics present an opportunity to rethink the traditional audit methods. By fully incorporating Big Data Analytics techniques into audit practices, the audit process can be revolutionized and expedited (Figure 1).

Figure 1. Components of big data analytics and business intelligence processes



Compiled by the author based on (Afonasova et al., 2019; Bamel&Bamel, 2021; Bluhm & Cutura, 2022; Kashchena et al., 2022; Otonne et al., 2023).

Integrating big data analysis into company audits can significantly improve the quality and relevance of the assessments. Nonetheless, its adoption in our country is hindered by security risks related to sensitive data. The importance of protecting sensitive data, safeguarding private information, and ensuring data accuracy is crucial, regardless of the size of the data sets (Rezvorovych, 2021; Goldstein et al., 2019).

The unique characteristics of big data pose new risks that necessitate a comprehensive strategy for companies to effectively utilize analytics while mitigating uncertainties and achieving consistent results. Audit procedures entail collecting, reviewing, analysing, and reporting information from diverse sources at various levels of granularity. Current audit practices lack standardized data, leading to substantial manual effort in obtaining, reviewing, and analysing information.

Implementing data analytics in the internal audit process necessitates a revision of the current methodology. It's crucial for data analytics to not just complement but fundamentally enhance the audit process. Central to this transformation is the standardization of financial data across companies. By establishing uniform data requirements for auditors, both internal and external, organizations can streamline the information retrieval process, resulting in significant time and resource savings.

Additionally, stakeholders like lenders stand to gain from companies utilizing cutting-edge analytical tools on standardized data.

Methodology

The focus of this study is to explore potential areas for advancing modern audit practices through the use of data analysis tools, specifically big data. By reviewing existing scientific literature, the goal is to identify ways in which modern data tools can enhance the effectiveness of auditors and improve financial and accounting information analysis. This study seeks to provide a thorough and up-to-date examination of the changing landscape of the field by referring to both recent and traditional literature by scholars from the early 21st century. It also focuses on examining the fundamental principles of data analysis and its application in accounting and auditing.

Findings

The latest global data metrics reveal a steady rise in data volume for analysis and a booming market for Big Data analytics, as depicted in Figure 2. Moreover, Figure 2 showcases the emergence of the Internet of Things, which aids in the aggregation and management of data for deeper insights. Furthermore, Figure 3 highlights the swift expansion of data storage capacities worldwide, driven by the digitalization of numerous sectors and the ubiquitous collection of user data by online platforms like social networks and search engines.

Fig. 2. Statistics on the prevalence and utilization of Big Data globally along with projections up to 2029 (in billion US dollars) (Big data - statistics & facts, 2023)

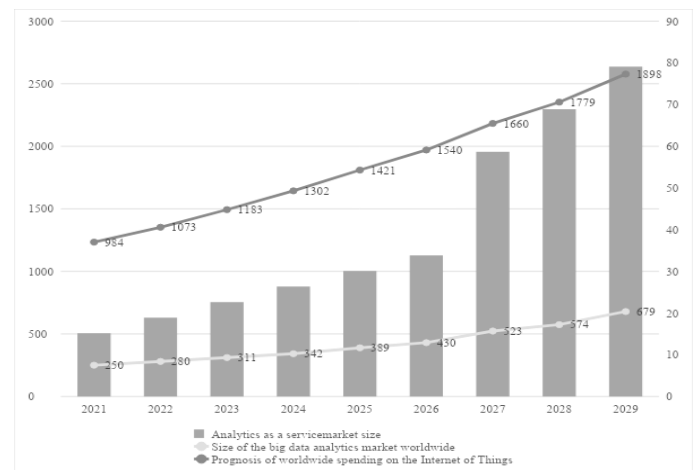
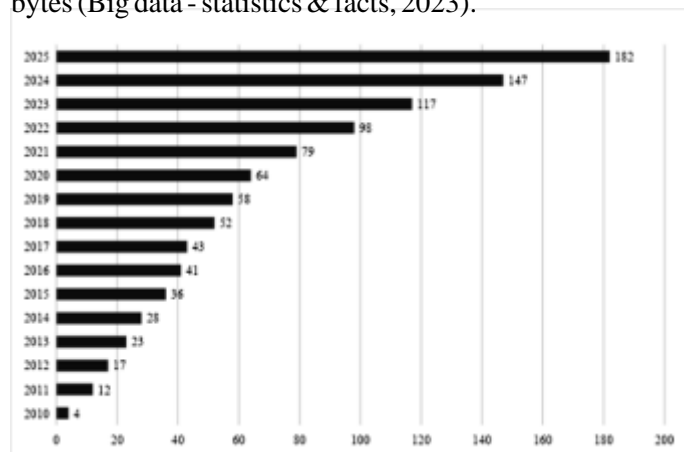


Fig. 3. The volume of data produced, gathered, duplicated, and harnessed worldwide has seen a substantial rise between 2010 and 2020, with forecasts suggesting a continued expansion from 2021 to 2025, quantified in zetta bytes (Big data - statistics & facts, 2023).



Like businesses utilising data analytics to enhance standardized data, auditors can leverage audit data analytics to improve their work. Integrating data-driven solutions in auditing is crucial for enhancing the effectiveness and precision of audit procedures. By adopting cutting-edge technology, auditors can explore further possibilities - as shown in Table 1.

Table 1 : Applications of big data in auditing

Field of application	Characteristics
Analysing substantial volumes of data	Utilising big data analytics technologies to analyse vast quantities of financial data requires implementing machine learning algorithms to detect anomalies and assess potential risks.
Electronic auditing	Use of electronic audit tools to automate data collection and processing, with the use of electronic signatures and authentication to ensure data reliability
Smart analytical tools	Use of analytics to assess risks and identify anomalies in financial statements, followed by the development of predictive models to prevent potential issues.
Security audit and data protection	Utilisation of technology to safeguard the confidentiality and integrity of audit data by implementing unauthorized access prevention mechanisms.

The author compiled the information from various sources (Akhter et al., 2022; Andersson et al., 2022; Hrynychshyn, 2021; M khalchenko&Tytarenko, 2023; Oneshko&Pashchuk, 2021; Yaotian et al., 2022) to emphasize the possible advantages of using audit data analytics.

Utilising audit data analytics allows auditors to integrate data from different sources, visualize financial and non-financial information, and detect patterns and irregular transactions. These capabilities make audit data analytics applicable to a variety of areas, as outlined in Table 2.

Table 2 Areas of application for audit data analytics

Field of application	Characteristics
Financial audit	<ol style="list-style-type: none"> 1. Detection of financial inconsistencies and fraud. 2. Assessment of the effectiveness of financial operations and internal control systems. 3. Analyse financial statements to identify risks and opportunities for improvement
Operational audit	<ol style="list-style-type: none"> 1. Monitoring the efficiency of operational processes. 2. Identify opportunities to optimise business processes and reduce costs. 3. Monitoring compliance with internal standards and procedures

Field of application	Characteristics
Information security	<ol style="list-style-type: none"> 1. Identify potential threats to data and information system security. 2. Monitoring access to confidential information and detecting unauthorised access
Tax audit	<ol style="list-style-type: none"> 1. Determining the correctness of tax calculation and compliance with tax legislation. 2. Identifying opportunities to optimise tax liabilities
Risk analysis	<ol style="list-style-type: none"> 1. Identification of potential risks for the company and development of strategies for their management. 2. Analysis of external and internal factors that may affect business success
Logistics and supply chain	<ol style="list-style-type: none"> 1. Identify opportunities to optimise logistics and supply chains. 2. Monitoring the effectiveness of inventory management processes
Quality control	<ol style="list-style-type: none"> 1. Monitoring the quality of products and services. 2. Identify problems in production processes that may affect quality

Created by the author using (Ardito et al., 2021; Arslanalp et al., 2019; Doroshenko et al., 2023; Vdovichena et al., 2022; Woloszko, 2020; Deng et al., 2022).

Enhanced analytical procedures using big data techniques have surpassed traditional analyst tools, involving the examination of all pertinent data such as company transactions and key business process master data. In today's era, investigators must harness vast amounts of data to delve deeper into analytics. These methods can assist them in better understanding their clients' situations and using data to enhance audit quality and detect fraud. Every auditor should have access to more robust audit tools than just spreadsheets. Leveraging big data can improve the efficiency of data analytics across various stages such as descriptive, diagnostic, predictive, and prescriptive analytics. It can also offer extensive audit evidence, facilitating the linkage between financial statements and concrete business transactions, while pinpointing potential risks. In addition, internal audit can utilize big data to incorporate unstructured and non-financial data for risk monitoring purposes. Despite these obstacles, audit firms are actively exploring ways to overcome these challenges and incorporate big data into their audit processes in order to enhance the efficiency and effectiveness of their services.

It is essential for auditors to utilize both traditional accounting data and big data in order to obtain a comprehensive understanding of a company's financial transactions. While traditional data provides quantitative and structured information, big data offers more detailed and nuanced insights through unstructured and semi-

structured data. In today's business landscape, auditors often need multiple sources of evidence to validate information. For instance, when cross-checking shipment data, traditional shipping documents are used as the main source of confirmation, complemented by GPS data from large-scale data sources for further validation. The combination of both traditional and big data is crucial for effective auditing techniques in analysing complex business transactions (Mian & Rosenthal, 2016; Malsch & O'Dwyer, 2021).

Inspectors should start by identifying potentially significant and valuable large amounts of information before gathering and consolidating the data. However, the process of collecting information at this stage is often challenging due to discrepancies in the data. Large data sets are frequently unorganized and lack a common identifier, making it difficult to merge different sources of data. For instance, an auditor tasked with verifying the revenue of an energy company would need to combine data on phone calls from each business unit with sales figures. In large data integration, a thorough comprehension of the data sets and skilled data programming are essential. This highlights the critical role of both human expertise and technology in successfully executing this process.

Furthermore, there are concerns regarding the protection and security of such vast amounts of data. Due to the presence of sensitive information in large data sets, it is important to prioritize the protection of confidentiality for clients and inspectors. Additionally, concerns arise regarding transparency when external auditors are granted access to extensive client data, leading to inquiries about privacy and independence.

Furthermore, the significance of extensive data integration lies in the competency of those managing it. The implementation of automated systems may not necessarily reduce manual labor significantly, as big data integration requires a higher skill level. For instance, an auditor who used to rely on traditional inventory audit evidence must now collect and analyse data from big data sources. This shift requires audit professionals to develop expertise in both auditing and information technology. Moreover, attracting and training auditors who are proficient in big data poses a challenge. Universities should revamp their accounting programs to emphasize data skills and encourage partnerships between accounting and software development departments.

Additionally, there is a significant learning curve for experienced IT professionals when adapting to new large data systems, especially for a full-time auditor. Introducing a big data program that necessitates specific data skills may result in substantial expenses if the auditing firm experiences a high turnover rate, leading to recurring costs for training fresh hires.

Additionally, audit firms may be discouraged from investing in big data tools due to the high costs associated with software that can handle both large data sets and intricate analyses (Bannikov et al., 2022; Chirişescu & Dumitru, 2019; Yu et al., 2023).

The sixth challenge hindering the dissemination of significant advancements in big data lies in the lack of adequate administrative and legal oversight in its utilization. As practices evolve in a particular field, regulations often need to be adjusted accordingly. Therefore, if the assessment is adapting to big numbers, audit criteria must also be updated in tandem. Thus, it is crucial to enhance current audit processes in order to address these challenges effectively.

As the aptitude to collect and combine big information becomes more accessible and easier to do, there is a need to update review standards and guidelines to accommodate the use of data analytics techniques. Professionals in this field often rely on established auditing methods that include the use of big data. Therefore, today, auditors using analytical methods based on big data must not only be

experts in working with financial statements but also have the skills to work with advanced data technologies.

Conclusion

To close the divide between theory and practice, a complete comprehension of the presentation and influence of big records and modern analytical tools in auditing is crucial. Research indicates that many audit firms are still struggling to harness the full potential of big data for enhancing the accuracy, reliability, and cost-effectiveness of their audits. The integration of big data analytics into audit firms and financial management processes requires active involvement of both senior management and internal audit staff in decision-making, from goal-setting to the development of algorithms or statistical models for data analysis. Building a team with the necessary resources and technical expertise to analyse data in real-time, manage extensive data repositories, automate routine tasks, and utilize artificial intelligence for informed decision-making is key to successfully implementing big data analytics in the audit industry.

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Conflicts of Interest: The authors wish to confirm that there are no conflicts of interest to disclose in relation to the current study.

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