SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2025
ORGANIZATION AND MANAGEMENT SERIES NO. 240

EXPLORING THE POTENTIAL: A SWOT ANALYSIS OF BLOCKCHAIN ADOPTION IN THE AUDITING PROFESSION

Katarzyna RENIK

University of Economics in Katowice; katarzyna.renik@uekat.pl, ORCID: 0000-0002-1313-6594

Purpose: The article aims to systematize the main benefits, drawbacks, opportunities, and risks of Blockchain Technology (BT) adoption in the auditing profession.
Design/methodology/approach: The research uses the SWOT analysis method, a critical literature review, and a bibliometric analysis of selected articles from the Scopus database.
Findings: Results show that researchers are aware of the pros and cons of BT adoption in audit, indicating real-time auditing, reducing the time and cost of audit, improving efficiency, ensuring transparency and immutability, but on the other side, a lack of regulations, changing auditors' role, requirement of training, implementation costs, risks regarding cybersecurity, and security of data. However, despite many challenges and threats, scientists argue that this technology will not replace auditors. Furthermore, BT can supplement auditors' analytical audit processes and enhance their professional judgment.
Practical implications: The significant value of this research enables practitioners to carefully consider and support decision-making regarding the implementation of BT in their audit companies.
Originality/value: Considering these conclusions, this article presents the current state of knowledge in this area. Also, it indicates a future research agenda for researchers and outlines implications for practitioners, teachers, and students. The bibliometric analysis and literature review identify a potential research area encompassing auditors' acceptance, the ethical aspects of BT use, and regulations.
Keywords: auditing, blockchain, adoption, SWOT analysis.
Category of the paper: Scientific research.

1. Introduction

In recent times, numerous innovations and technologies have emerged in the field of finance, including Artificial Intelligence (AI), Generative AI (such as ChatGPT), blockchain, and many others. In today's ever-evolving world, change is inevitable, including in the finance, accounting, and auditing professions.

The literature indicates that blockchain technology (BT), the Internet of Things, smart contracts, and artificial intelligence solutions serve distinct functions and can effectively address various financial reporting and auditing issues. Taken together, they have great potential to enhance the reliability of financial statement information and alter how companies typically operate (Roszkowska, 2021). Researchers and accounting professionals, in general, are trying to understand how BT can affect accounting and auditing, and what changes this technology can bring.

In the literature, the impact of BT on the future of auditing and potential risks (McGregor, 2020), its effect on audit risk (Dyball, 2021), and the challenges and resistance of auditors to BT (Pimentel et al., 2021) can be identified. The potential impact of BT was indicated by Brender et al. (2019). Firstly, the potential disruptive impact of technology on the audit profession has not been fully anticipated, and smaller audit firms are not prepared for the coming changes. Secondly, the auditing profession will undergo a paradigm shift in two ways: it will become more IT-oriented than accounting-oriented, and more forward-looking than backward-looking. Finally, the profile of auditors will change. The potential and implications of BT are also presented by Bonson and Bednarova (2019) in the context of challenges, i.e., scalability, flexibility, appropriate architecture, and cybersecurity.

The scientists also focus on current trends and future opportunities for use in accounting (Pimentel, Boulianne, 2020), as well as the benefits and challenges (Han et al., 2023), and new risks, changes in procedures, and additional opportunities (Bonyuet, 2020).

Nowadays, research is primarily focused on AI and BT issues from an accounting and auditing perspective, among others, using a wide range of research methods.

On the one hand, scientists have explored BT in accounting using the literature review method (Zemankova, 2019). Zhang et al. (2020) examined the impact of AI and BT on the accounting profession, identifying challenges and opportunities through a comprehensive review. Through a systematic literature review (SLR), Atik and Kelten (2021) identify the potential impact of BT on accounting and its possible effects. The literature review conducted by Han et al. (2023) highlights the benefits of BT and AI, as well as the challenges that await accountants and auditors. Garanina et al. (2022) provided a structured literature review of BT in accounting and identified main topics and trends. They claim that the four most commonly discussed areas of BT include the changing role of accountants, new challenges for auditors, the opportunities and challenges of BT application, and the regulation of cryptoassets.

Apart from SLR, Silva et al. (2022) conducted a bibliometric analysis to identify implications for the auditing environment, highlighting several new challenges related to the skills and knowledge required of audit professionals. Many studies employ bibliometric analysis, for example, to describe research trends and future directions in Big Data and AI within the accounting and auditing field (Agustí, Orta-Pérez, 2022; Pizzi et al., 2021).

On the other hand, Ziemba et al. (2025) noted that most researchers conduct empirical or conceptual studies using diverse approaches, methods, and tools. For instance, studies have used semi-structured interviews to explore the adoption of BT in accounting (Akter et al., 2024), including interviews with practitioners from both Big Four and non-Big Four firms (Parmoodeh, 2023). Other researchers have focused on statistical analysis (Huang et al., 2024) and conducted surveys exploring the influence of BT on accounting and auditing in various countries (Alkhwaldi et al., 2024; Elmaasrawy et al., 2024; Majeed, Taha, 2024; Qader, Kemal, 2024). Conceptual articles identified theoretical frameworks (Liu et al., 2022) or modeling understood as proposing a triple-entry accounting protocol (Pan, 2023).

As shown, opinions among researchers and practitioners are divided. In previous literature, scientists have employed various research methods. Furthermore, despite the growing number of empirical studies, Lombardi et al. (2022) emphasized the need for further empirical research and practitioner involvement, while also highlighting the importance of training requirements and education to bridge the gap between theory and practice. Bellucci et al. (2022), who conducted a systematic literature review (SLR) in accounting practice, highlighted an opportunity to perform future in-depth analyses to test new methods, including empirical and quantitative methods. Regarding the research area, Ziemba et al. (2025) highlighted issues related to impact, changes, challenges, opportunities, and auditors' perceptions of BT adoption as a future research direction. Additionally, Hakami et al. (2023) suggested that another area of future research could examine the potential benefits and challenges of using BT in these areas, as well as its implications for auditing standards and regulations. This article aims to address both identified research gaps.

In addition, the literature lacks a comprehensive, in-depth comparison of the primary features of BT adoption in the auditing area, using two research methods: a combination of SWOT and bibliometric analyses. Using SWOT analysis is valuable for both education (Keban, 2019) and management of technology (Nazarko, 2017). Therefore, it is necessary to compile the existing research and summarize the information in this area in order to point out to practitioners and researchers the wide range of features of BT and the possibilities of its application in auditing, so that they will have a better picture of the benefits and risks they have to face or will face and what challenges to expect. The overview should support auditors in the decision-making process and increase awareness of the opportunities and threats associated with adopting this technology in auditing companies. It also provides a comprehensive summary of BT's advantages and disadvantages in audits for academic societies, including students, teachers, and researchers. Therefore, academics, who are also educators, should focus on how best to train new and practicing auditors for this brave new world (Pimentel, Boulianne, 2020). Furthermore, it indicates potential research areas to examine in the future.

This article aims to systematize the benefits, drawbacks, opportunities, and risks of BT adoption in the auditing profession by categorizing them into four categories: strengths, weaknesses, opportunities, and threats (SWOT). To achieve the above objective, the following research questions were:

1. What are the strengths and weaknesses of BT in auditing that can be identified in the literature?
2. What opportunities and threats to BT in the auditing profession are identified in the literature?
3. What are the current trends and potential research directions of BT in the auditing area?

The remaining research is structured as follows. Section 2 presents the methodology. Section 3 provides the theoretical background, while Section 4 presents the findings and discussion. The conclusions and future research agenda are contained in Section 5.

2. Methodology

This study is based on a critical review of the current literature on BT adoption in the auditing field and a synthesis of the findings. The literature review identifies the main topics in the SWOT analysis framework: strengths, weaknesses, opportunities, and threats. The literature review included publications in English and articles published between 2017 and 2024 as of the end of September. Data for the bibliographic analysis were obtained from the Scopus database via a keyword search. An initial analysis of the search results for the keywords "blockchain" AND "audit*" in the Scopus database yielded 2,610 documents. Then, the search results were limited to financial fields directly related to the two subject areas: „Business, Management, and Accounting" and "Economics, Econometrics, and Finance". Additionally, the search was limited to English. The final research search was conducted using the following query: TITLE-ABS-KEY (blockchain AND audit*) AND (LIMIT-TO (SUBJAREA , "ECON") OR LIMIT-TO (SUBJAREA , "BUSI")) AND LIMIT-TO (LANGUAGE , "English")). The search results yielded 377 results. After that, the author provided a selection of articles on the relevance and importance of the analysis. The final number of selected articles is 34. The study selection process is detailed in Fig. 1. The PRISMA flow diagram identifies studies by searching with the refined research string and reporting the number of results obtained.

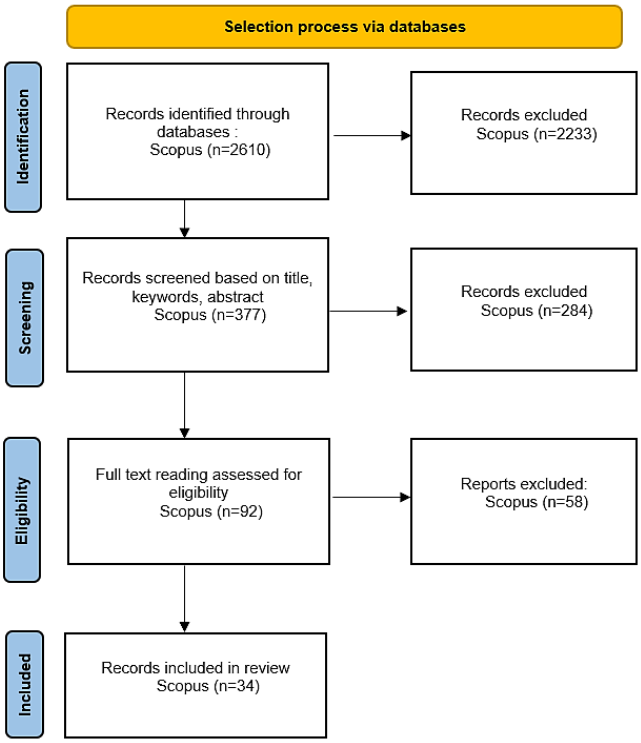

Figure 1. Diagram PRISMA.

Source: own elaboration.

This article also provides an in-depth examination of BT adoption in auditing across various methods and perspectives, helping readers understand its practical applications within the auditing profession. It narrows down to BT adoption exclusively from an auditing perspective, making it worthwhile for both interested parties - auditors and accountants. In the current literature, only a few articles using the SWOT analysis method have examined the influence of BT on the accounting profession, as provided by Lardo et al. (2022), Pramono (2020), and Tiron-Tudor et al. (2021). However, this research focuses solely on auditing and is based on the methodology employed by many authors (Farrokhnia, 2023; Tiron-Tudor et al., 2021; Pramono, 2020; Shevchuk, Radelytskyy, 2024).

A SWOT analysis enables the classification of the leading research areas related to the implementation and adoption of BT in the auditing profession. This classification includes four categories, namely strengths, weaknesses, opportunities, and threats, that can support a decision to implement BT in audit firms. The SWOT analysis is mainly based on selected articles from the Scopus database.

In addition to providing a more comprehensive summary of these four areas of BT adoption and identifying potential research areas, a bibliometric analysis was employed. Bibliometric analysis is based on the VOS viewer application for mapping science, which enriches literature analysis with a graphical presentation of keywords (Lardo, 2022; Mugwira, 2022). This method was also applied in systematic or critical literature reviews (Ziemba et al., 2025; Hakami et al., 2024).

A combination of critical literature analysis and planned qualitative research, using bibliometric analysis and SWOT analysis, can contribute to the development of science in the field of new technologies, notably BT in the auditing profession, to minimize undesirable effects in their professional practice.

3. Critical literature review

3.1. Strengths

Undeniably, BT can bring significant benefits and changes to the current auditing (Dai, Vasarhelyi, 2017). The major strength of BT implementation in auditing, indicated by many authors, is associated with improving efficiency (Elommal, Manita, 2022; Garanina et al., 2022; Han et al., 2023; Zemánková, 2019; Tan, Low, 2019), especially efficiency of recording, reconciling, and auditing of accounting data (Schmitz, Leoni, 2019). BT technology, by providing a distributed ledger (CPA, AICPA, 2017), ensures transparency and immutability of audit records. This strengthens the credibility of audit processes and enhances trust between auditors and their clients. Other benefits of BT include capacity, reliability, and data integrity (Han et al., 2023), as well as improved audit quality, operational efficiency, and the maximization of AI technology's capability to collect comprehensive information and data for rapid and accurate analysis (Zhang, 2020). Qader and Cek's (2024) research on BT and AI found a positive impact of their use on audit quality, aiding in the audit process and even facilitating fraud detection.

Many of these benefits are related to BT's real-time features. Changing the traditional approach to real-time auditing can ensure real-time inventory and transaction verification (Parmoodeh, 2023). As a result, BT streamlines time-consuming tasks, such as replacing current sampling practices (Han et al., 2023), the traditional method of gathering evidence, and confirming outstanding receivables and payables, by providing real-time verification (Zemánková, 2019). As a consequence, it results in lower auditing costs (Schmitz, Leoni, 2019; White et al., 2020) and frees up time for conducting more comprehensive and timely analyses.

Some results indicated a positive relationship between audit clients' use of BT and both inherent risk and control risk when auditing accounting estimates. The results also showed that BT enhances the collection of sufficient and appropriate audit evidence during the audit of accounting estimates (Elmaasrawy et al., 2024).

Additionally, BT employs advanced cryptographic techniques to protect data, making it highly immutable, tamper-proof, and resistant to manipulation or fraud (Parmoodeh, 2023). Audit firms can use this technology to securely store and transmit sensitive financial information, safeguarding it from unauthorized access. The transaction parties that execute

transactions accurately and securely depend on centralized processors that maintain their separate ledgers (CPA, AICPA, 2017).

3.2. Weaknesses

BT, like any other new technology, also has drawbacks and poses an obstacle to the auditors' profession. To gain a broader understanding of the BT implementation issue, which will be beneficial to practitioners in their decision-making, it is worth considering the other side of the coin. Challenges presented in the literature include investing in new technologies, addressing training needs for managers, employees, and auditors, and meeting the requirements of new regulations and accounting and auditing standards (Dai, Vasarhelyi, 2017).

Regulations serve as the primary procedural guidance for auditors and their firms. Currently, auditors lack regulatory certainty regarding new technologies. Given the novelty of this technology, there is a lack of regulations that cause barriers to BT adoption (Brender et al., 2019). The timing mismatch between the rapidly changing IT environment and the regulators' slow pace of releasing new or updated standards works against auditors. It is undeniable that more guidance is required to utilize BT as an audit tool (Gauthier, Brender, 2021), and auditors should familiarize themselves with the technology they will be using. Elommal and Manita (2022) emphasized the need for a clear, coherent legislative framework, along with new audit standards, to enable audit firms to implement BT and enhance auditing practices. However, it is unclear how audit standards should be updated or changed (Rozario, Thomas, 2019). Parmoodeh et al. (2023) also highlighted several challenges, including a lack of training and guidelines, as well as a need for improved understanding and awareness of procedures. In their research, one participant identified unfamiliarity with the technology as the most significant risk. Auditors primarily face a lack of knowledge and skills. This new challenge requires them to understand this technology and its implications in order to stay abreast of developments in the new BT ecosystem (Schmitz, Leoni, 2019; Silva et al., 2021; Tan, Low, 2019). Standards, guidelines, and training are needed to address the challenge BT will pose to the audit (Lombardi et al., 2022).

The subsequent weakness is related to the costs associated with implementing, integrating, and maintaining a BT (Fuller, Markelevich, 2020; Han et al., 2023; Liu, 2019). According to Cao et al. (2019), while the implementation of BT by auditors offers the benefit of cost savings through improved audit efficiency, it also entails indirect costs, such as the potential loss of clients who prefer traditional methods.

Some authors not only carefully highlight the potential benefits of BT but also identify challenges such as scalability, storage, flexibility, cybersecurity, and organizational complexity. Weaknesses in BT adoption are also apparent in the BT structure itself. First, BT cannot guarantee complete reliability and cannot store all data. Unfortunately, auditors must adjust their practices to BT, as there is no universal solution for each auditing firm's specific problems (Han et al., 2023). Other BT risks mentioned by Rozario and Thomas (2019)

include the potential theft or loss of digital wallets' private keys, errors in smart contract code, increased audit demands in a BT environment, higher computing power requirements, cybersecurity threats, litigation risks, and vulnerabilities in smart contracts.

Other studies (Akter et al., 2024) based on structured interviews highlight potential benefits, such as triple-entry accounting and real-time reporting, but also emphasize the challenges and lack of understanding regarding the use and advantages of BT in accounting, its complex integration with existing systems, and the higher costs linked to adopting it.

Most of the authors' considerations pertain to the application of BT in auditing, specifically from the perspective of implementing it within an audit firm. Dyball (2021, 2022) examines the application of BT during the audit of financial statements when used by an audited client. Results showed that clients using BT are seen as riskier than other customers (Dyball, 2021). In this case, both inherent and control risks are increased.

3.3. Opportunities

BT can also create numerous opportunities to enhance the auditors' profession in the future. It can be viewed as a reliable source of data for auditing, thereby enhancing the authenticity of audit data, providing a stable audit trail, and facilitating responses to audit data requests (Zhang et al., 2020).

Firstly, the excellent potential of BT lies in enhancing automated auditing processes, i.e., verification and automating audit activities continuously to test controls, analyze risks, identify exceptions or anomalies, analyze patterns, and review trends (Han et al., 2023). Through automation, auditors will no longer need to request many documents, which currently serve as the primary foundation for their controls. For this reason, the audit budget time could be reduced, and costs associated with fraud detection could be lowered (Parmoodeh, 2023). Likewise, BT can reduce costs by increasing audit efficiency, which can simultaneously increase transaction speed (Parmoodeh, 2023; Secinaro et al., 2021; Tan, Low, 2019) and enable more thorough scrutiny of clients' financial reports for data accuracy and regulatory compliance.

Automatization can not only save costs and time but also decrease or even eliminate human errors as well (Rozario, Vasarhelyi, 2018; Schmitz, Leoni, 2019; Zemánková, 2019) through the tests of controls (Šindelář, Dlask, 2021), automation of reconciliation of balancing items (Maffei et al., 2021), and transactions processes which reduce errors from maintaining a nonbiased record (Bonsón, Bednárová, 2019). Automation in the external confirmation process of accounting records facilitates inventory and data analysis (Maffei et al., 2021; Parmoodeh, 2023). Instead of verifying amounts or balances, auditors can reduce their efforts in testing financial information (Dai, Vasarhelyi, 2017) and focus on judgment, analytical procedures, complex transactions, testing controls, play a more strategic audit role, or develop new advisory services (Elommal, Manita, 2022; Parmoodeh, 2023). Thus, auditors can fully leverage BT's potential to simultaneously incorporate other analytical tools, thereby facilitating

analytical procedures (Parmoodeh, 2023). Moreover, Tan and Low (2019) expected that audit quality could be enhanced by reducing data recording errors and by strengthening fraud deterrence. Singhvi et al. (2021) highlight the potential of BT, expert systems, and machine learning to transform audit industry processes and emphasize the importance of new auditors understanding these emerging technologies.

Many of the opportunities associated with the adoption of BT are seen in the change of traditional auditing into continuous and comprehensive systems of control (Schmitz, Leoni, 2019), replacing manual and periodic reconciliation with automatic and real-time reconciliation, manual based on sampling with automatic confirmation of the entire population, manual sampling-based with an automatic inventory of the entire population, and manual sampling-based with an automatic data analysis of the entire population (Maffei et al., 2021). Current audit processes, such as recording transactions, processing data, storing information, and verifying the accuracy of recorded data (Maffei et al., 2021), will also transform. From the auditor's perspective, their role and profession will change due to BT (Schmitz, Leoni, 2019), and the scope of the decision will be different. Auditors will need to determine whether the corresponding contra-account has been correctly classified after payment is recorded (ICAEW, 2018) or verify that external parties providing online services for BT have ensured the reliability of these services in accordance with all applicable laws and regulations. They will mainly verify aspects that cannot be automated.

Some authors also indicate potential related to minimizing fraud risk (Liu et al., 2019; Tan, Low, 2019; Bonsón, Bednárová, 2019), enhancing fraud detection capabilities by providing a tamper-proof, immutable audit trail (Parmoodeh, 2023), or even preventing fraud by improving business information systems (Lombardi et al., 2022). This is because the reduction of the risk of attacks is ensured by distributing ledgers providing authenticity and reliability of audit data and various audit-related documents (Bonsón, Bednárová, 2019; Dai, Vasarhelyi, 2017; Zhang et al., 2020), as well as integrity and validation of data on BT platforms (Dyball, Seethamraju, 2021). Additionally, the timestamping of information in the BT reduces the cost of verifying false financial information (Zhang et al., 2020).

The last opportunity to evolve auditing practices concerns smart contracts, which are computer code stored on a blockchain. They allow counterparties to automate tasks manually through a third-party intermediary. Besides, smart contracts can accelerate business processes, reduce operational errors, and improve cost efficiency (CPA, AICPA, 2017; Rozario, Thomas, 2019; Schmitz, Leoni, 2019). According to Lombardi et al. (2022), smart contracts might also enable Audit 4.0 efficiency, reporting, disclosure, and transparency.

Therefore, it can be concluded that BT has excellent potential to supplement traditional auditing (Abdennadher et al., 2022). BT could offer a more comprehensive approach and alter the current audit paradigm. It would reduce audit costs, errors, and frauds, increase audit budget time, and, eventually, the efforts of auditors (Parmoodeh, 2023).

3.4. Threats

While BT can be perceived as a promising, emerging technology with great potential, it also poses threats to the auditors' profession, leading to significant changes. To understand the consequences and limitations of BT adoption, it is essential to examine the threats it poses, enabling users to manage them better and minimize as many risks and challenges as possible.

On the one hand, there are considerations that BT changes auditing, mainly through disruptions to the audit profession's status quo and the potential obsolescence of auditing standards (McGregor, Carpenter, 2020). Traditional audit practices are shifting toward IT audits, disrupting current audit practices by increasing the use of third-party confirmations rather than reducing the need for physical observation (Parmoodeh, 2023). Furthermore, small and medium-sized companies may be left behind by the large firms from The Big 4, which can take advantage of all audit firms in the market, resulting in an unequal gap between these two (Han et al., 2023).

On the other hand, some threats posed by the implementation of new technologies, including BT, are unmanageable and impossible to eliminate. They can be classified by type of risk. A few authors recognize security, operational, and other risks associated with, i.e., data confidentiality, private key management, business continuity and disaster recovery, information security, integration, scalability, regulatory, reputational, and IT compliance (Maffei et al., 2021), technological, data security, interoperability, and third-party vendor risks (White et al., 2020). For Šindelář (2021), the most significant risk from BT is the risk to integrity. Other risks are associated with permissionless blockchain (BT) platforms, arising from security vulnerabilities stemming from collaboration with numerous external parties (Dyball, Seethamraju, 2022). Dyball and Seethamraju (2021) identify the reasons for the impact on risk in their previous research. Firstly, it lacks technical, data, and governance standards. Secondly, there are negative implications for both inherent and control risks arising from uncertainty about the integrity of BT platforms. A lack of information about the impact of inherent risk can increase the uncertainty for the auditing clients BT uses. Thirdly, auditors appear to lack the ability to ensure the accuracy of information on BT platforms. Maffei et al. (2021) focus more on the risks and hazards of adopting BT in accounting and auditing practices, pointing out the following risks: underestimating possible manipulative and fraudulent practices, underestimating the risks of misclassifying and valuing accounts, lack of expertise when assessing business performance, and risks posed by inexperienced IT staff when adopting and operationalizing BT.

Furthermore, the adoption and implementation of BT can introduce new threats, including risks related to high energy consumption demand (Garanina et al., 2022), as well as the underestimation of potential risks or the incorrect use of BT tools (Maffei et al., 2021). Additionally, an accounting system based on BT, which provides financial data for auditing, may not yield sufficient and appropriate audit evidence (Maffei et al., 2021). Another challenge

for audit firms is the cost of BT implementation, which can create a barrier to BT adoption (McGregor, Carpenter, 2020).

BT poses a significant threat to the auditors' approach. On the one hand, trust in BT has led many practitioners and researchers to believe that auditors will become obsolete (Schmitz, Leoni, 2019). It may be related to auditors' expressed concerns about their technological competence in evaluating BTs (Pimentel, Boulianne, 2020). On the other hand, 45 percent of respondents believe that the lack of trust in this technology could delay BT adoption (PwC, 2018). The reason for the lack of trust in BT may be that auditors lack sufficient skills to utilize technology effectively, placing too much reliance on it rather than developing and practicing their professional judgment (McGregor, Carpenter, 2020).

Different auditors' approaches to BT technology lead to the next threat. The emergence of BT technology will require auditors to adapt their professional skepticism and critical thinking to new methods. BT adoption will require auditors to enhance their skills in qualitative and subjective areas, transitioning from quantitative processes to more qualitative, strategic, and process-oriented roles while still evaluating various aspects, such as classifications, recognitions, and management valuations (Parmoodeh, 2023). For instance, in case of the lack of a master copy of the database, auditors must be prepared for access responsibilities, timing, and speed of data availability, ensure completeness, integrity, and nonrepudiation of data, adequacy of validation controls and audit trail, and the existence of data backup and disaster recovery processes (Bonyuet, 2020). Therefore, Lombardi et al. (2022) suggest that there may be a potential need to reconsider or modify audit procedures accordingly, particularly in light of digitalization and BT adoption. Professional audit standards are not yet prepared to incorporate new trends into traditional audits (Zemánková, 2019).

Due to these threats, auditors are also exposed to technostress. It negatively affects auditors' perceptions of use, and the perceived usefulness of BT can be influenced by technostress (Shbail, 2023). Moreover, the success of BT adoption in auditing depends, among other factors, on auditors' perceived usefulness and ease of use (Alshurafat et al., 2022; Majeed, Taha, 2024; Shbail et al., 2023). Furthermore, according to Ferri et al. (2021), auditors' intentions and acceptance of the technology are also important issues. The results show that the main predictors of auditors' intention to use BT are performance expectations and social impact. Moreover, auditors' expected effort to implement and use the technology seems to be a reasonably reliable predictor. Auditors' knowledge about BT is positively associated with their use intention, indicating their optimism about this technology; their professional skepticism does not affect their intention. However, the perceived adequacy of accounting standards has an adverse effect, thereby weakening the effect of BT knowledge on intention, revealing a status quo bias in BT use (Juma'h, 2023). Acceptance is also related to technostress, which, according to Shbail et al. (2023), influences auditors' plans to adopt BT technology. The impact of technostress during technology use is also not overlooked in the research (Alshurafat et al., 2023). The results show that technostress affects the perceived usefulness and

ease of use of BT technology. The study found that perceived ease of use and perceived usefulness are significant predictors of attitudes toward the decision to use.

In connection with the above, auditors must consider the subsequent security implications. BT has limited ability to provide security and resistance to tampering and fraud, particularly in detecting fraudulent transactions (Schmitz, Leoni, 2019). After BT adoption, issues related to underestimation of fraudulent operations, hidden manipulation behind related-party transactions, classification errors, or evaluation issues were not a concern before BT implementation due to the use of ad hoc controls (Maffei et al., 2021). Although advantages include increased efficiency, lower costs, greater transparency, and a consistent audit history of all transactions, according to White et al. (2019), they are not without significant risks. These risks include technology, data security, interoperability, and third-party vendor risks. Due to the inherent advantages of BTs, auditors are required to provide assurance services to clients that use BTs and to offer guidance on BT technology. As such, auditors must be equipped with knowledge and experience in BT and assessing the risks associated with BT.

If auditors and their firms decide to implement BT, they will also face a dilemma about which type of BT to adopt for their company - private or public. There is a significant difference between these two blockchains. On the one hand, a public, or "permissionless" blockchain is accessible to any user on the Internet. Due to the lack of access controls, any unauthorized user can read or modify the data. On the other hand, BT, based on a private key, also known as "permissioned", is shared only with certain participants, but it poses a danger that firms can modify or control transactions (Bonyuet, 2020). Given the 51% attack rule, data auditing can be compromised when a group of miners controls the absolute majority of power (Liu et al., 2019; Silva et al., 2021). It would influence the reliability of BT as a financial reporting tool, as any group with 51 percent of the computing power could modify the transaction history (Bonyuet, 2020). Han (2023) claimed that the risk of hacking is greater for private blockchains managed by administrators because hackers can infiltrate their networks or modify the content of the blockchains and the operating roles. For this reason, this decision has significant implications for safety and capacity.

4. Findings and Discussion

4.1. SWOT analysis

The biggest objection from professionals concerns the widespread claim that consensus verification can replace financial statements or the audits required for them. Understanding the audit community's concerns can help guide future BT development and inform customized implementation (Sargent, 2022).

The above literature examples represent only a part of the issues planned for study and most often relate to BT and AI, or to audit and accounting issues. Due to differences arising from the definitions of these concepts, they should be considered separately. Therefore, this article provides a comprehensive, synthetic overview of the strengths, weaknesses, opportunities, and threats of BT adoption in auditing, thereby addressing the research gap in this area. Table 1 summarizes the considerations described in Section 3.

Table 1.
SWOT Analysis

Strenghts	**Weaknesses**
• Improving the efficiency of recording, reconciling, and auditing accounting data. • Transparency and immutability of audited data. • Immutable, tamper-proof. • Resistant to manipulation or fraud. • Capacity, reliability, and data integrity. • Real-time audit, inventory, and verification. • Improving sufficient and appropriate collection during estimating. • Lower costs. • Time saving.	• Lack of regulations or standards. • Changes in audit role. • Required training and guidance for auditors. • Costs of implementation and maintenance of BT. • Scalability, storage, flexibility, cybersecurity, and organizational complexity. • Potential loss of clients. • Theft or loss of digital wallets' private keys. • Increasing clients' inherent and control risks.
Oportunities	**Threats**
• Improving the authenticity of audit data. • Enhancing automation auditing processes, i.e., verification, analysis of risks, and analysis of patterns. • Automatization in gathering data or documents. • Fraud detection and minimizing fraud risk. • Eliminating human errors (non-biased records). • Changing and supporting the traditional role of auditors. • Focusing on professional judgment and analytical procedures. • Developing new advisory services. • Manual based on sampling with automatic confirmation of the entire population. • Integrity and validation of data on blockchain platforms. • Smart contracts. • Audit 4.0.	• Obsolescence of auditing standards. • Shift to IT audit. • Ensuring the integrity. • Disruptions to the status quo of the audit profession and potential obsolescence of auditing standards. • Transitioning from quantitative processes to more qualitative. • Risks associated with, e.g., data confidentiality, private key management, business continuity, disaster recovery, information security, integration, scalability, etc. • Underestimating the risks of misclassifying and valuing accounts. • A high demand for energy consumption. • Adapting skepticism and critical thinking to new methods. • Technostress, lack of acceptance, and the impact of auditors' attitudes. • Necessity of database copy. • Risk of hacking for private blockchains.

Source: Own elaboration based on the critical literature review presented in Section 3.

Regarding the table above, the SWOT analysis results indicate that BT has strengths and opportunities in auditing, as well as weaknesses and threats. The SWOT analysis of BT adoption in the auditing profession reveals an area indicating potential alongside challenges that must be carefully navigated.

The adoption of BT in the auditing profession presents significant benefits and opportunities, namely automation and real-time audit, which lead to increased efficiency, transparency, immutability, and the integrity and reliability of data. It is immutable, tamper-

proof, and resistant to manipulation or fraud while also supporting numerous processes, resulting in reduced time and costs that revolutionize traditional practices and pave the way for a more trustworthy industry. The BT application offers several advantages, including enabling auditors to use a shared, synchronized ledger, thereby enhancing the credibility of audit processes. The robust security capabilities of BT avoid unauthorized access or manipulation of financial data. Its real-time auditing capability also allows auditors immediate access to data, making audits more efficient and providing a more comprehensive view of financial reports.

However, it is essential to note the weaknesses, challenges, and threats associated with blockchain adoption in auditing. The complexity of the technology requires auditors to invest in acquiring the necessary knowledge and skills. Furthermore, audit firms should pay more attention to various threats, including cybersecurity, scalability, and inherent and control risks. They must be aware of the current changes in auditors' roles and auditing processes, which are shifting towards more qualitative and IT audits. It is essential to be aware of the risks that may hinder the adoption of BT. The resistance to change within the auditing profession, as well as the inherent resistance to change in conventional practices, tends to inhibit the adoption of this transformative technology. In addition, scalability and performance limits, as well as interoperability among different BT platforms, require close attention to ensure there are no integration or compatibility issues. Audit firms should also consider gains and costs. They can achieve numerous benefits and high revenues as a result of cooperation with high-tech companies they audit. The use of modern technology and auditors' expertise in this field can elevate audit firms' service levels and result in more audit engagements. However, auditors' high knowledge and specialized skills can deter smaller companies from engaging them, due to the risk of high audit costs. Furthermore, audit firms also face higher costs, including the implementation of technology, appropriate IT systems, employee training, and the salaries of specialists they must hire.

Nevertheless, the opportunities presented by blockchain adoption in the auditing profession are significant. Blockchain's automated reconciliation and efficient data analysis can reduce errors and inconsistencies in financial reports, enhancing the reliability and accuracy of audits. Blockchain's transparency and auditability also enhance auditors' fraud-detection capabilities, providing a powerful tool for identifying and preventing fraudulent transactions.

For this reason, auditing firms should be aware of BT's features and recognize its revolutionary capabilities before implementing this technology. They must carefully navigate the weaknesses and threats associated with BT implementation to leverage its potential benefits fully. By focusing on strengths, overcoming weaknesses, seizing opportunities, and turning threats into strengths, auditors can leverage blockchain's implementation as a force for good, ushering in a new era of transparency, efficiency, and credibility in auditing.

4.2. Bibliometric analysis

Bibliometrics, a quantitative method for analyzing scientific literature, enables researchers to understand trends and patterns within their field. It is a helpful tool for researchers to assess the state of BT research in an audit (Hakami et al., 2023).

The bibliometric analysis used 34 articles selected from the Scopus database. After setting the frequency of occurrence to 3, VOSviewer proposed 90 keywords. Most of them were not related to the research area. Thus, 47 items were rejected. Finally, the VOS viewer map contains 43 items (keywords) related to BT and auditing. The selected keywords are divided into four clusters: Blue #1, Yellow #2, Red #3, and Green #4, as presented in Table 2.

Table 2.
Keywords in four clusters

No.	Colors	Authors' keywords	Occurrences	Total link strength
Cluster #1	blue	**accounting**	**17**	**169**
		benefit	5	49
		future	3	26
		need	6	68
		opportunity	7	85
		practice	10	101
		profession	11	121
		real-time	3	23
		role	5	56
		transaction	9	91
Cluster #2	yellow	challenge	9	101
		change	5	52
		client	4	42
		design methodology approach	11	139
		development	7	81
		impact	**14**	**145**
		originality value	11	139
		perception	4	52
		regulator	3	27
		risk	9	96
Cluster #3	red	analysis	7	79
		auditing	14	144
		audit quality	4	33
		audit procedure	7	67
		blockchain	32	305
		efficiency	6	59
		fraud	5	54
		implementation	5	67
		implication	**13**	**147**
		process	9	83
		reporting	6	53
		smart contracts	6	52
		transparency	7	76
Cluster #4	green	acceptance	4	43
		adoption	6	69
		auditor	19	184
		cost	7	85
		data	**10**	**106**
		effect	7	76
		evidence	9	105
		intention|	5	49
		knowledge	6	69
		use	9	89

Source: Own elaboration based on the VOSviewer (van Eck, Waltman, 2010) and Renik et al. (2025).

To identify current trends in literature and future research gaps for scientists, the SWOT analysis was enhanced by utilizing the VOSviewer map and conducting a bibliometric analysis of the Scopus database. The data selected for the bibliometric analysis were obtained from Scopus articles based on the search described in section 2. As a result, selected articles for the SWOT analysis were included in the bibliometric analysis using the VOS viewer application. The results are presented in Figure 2 below.

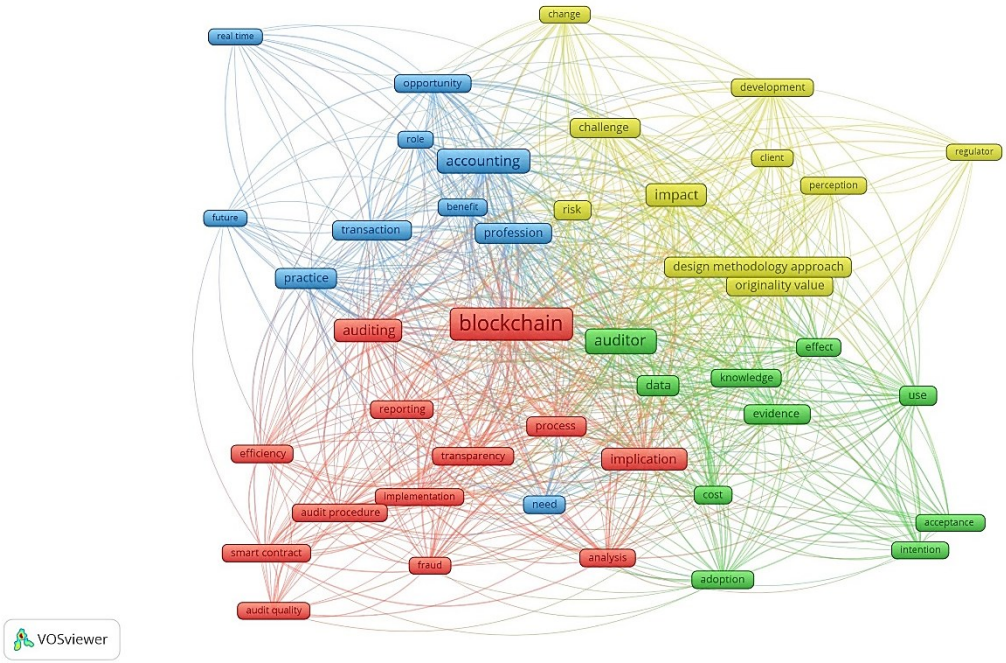

Figure 2. Bibliometric map from the VOS viewer application.

Source: own elaboration.

Based on the VOSviewer map analysis presented in Figure 2 and the keywords presented in Table 2, four main conclusions can be drawn.

Firstly, the blue cluster contains words related to the most positive aspects of SWOT analysis, namely strengths and opportunities in audit practice. It defines the future role of auditing practice and its benefits in the accounting and auditing profession. This cluster is based on 10 keywords contained in 21 articles used in the SWOT analysis. The furthest words from keywords in the middle of the map indicate a potential research gap. In this cluster, it is undeniably real-time.

The second (yellow) cluster represents the second part of the SWOT analysis: weaknesses and threats. It illustrates a connection between the impact of challenges and development, which can depend on risks and regulatory factors. It raises issues related to auditors' perception of changes and client perspectives. In this cluster, a future research direction is the changes and issues surrounding regulation. To analyze this cluster, 25 articles used in the SWOT analysis are reflected by 10 keywords.

The third (red) cluster focuses on practical issues related to procedures and processes, i.e., on the implementation stage. BT implementation in auditing can affect audit quality, transparency, and efficiency. The proposed solution for these features is seen in analysis, reporting, and smart contracts. In this case, the potential research gap may relate to audit quality. 13 keywords were used to analyze this cluster.

The fourth (green) cluster is more closely related to science, as it examines auditors' knowledge of BT's effects on adoption and use. The outermost keywords, least frequently explored in the research, are intention and acceptance, reflecting the research gap. This cluster is based on 10 keywords. In general, the keywords are most closely linked to the main keywords: blockchain, auditing, and auditor, which are related to practice, profession, design methodology, approach, knowledge, data, process, and reporting. They may reflect the most widely explored topics in current scientific research. On the other hand, the outermost keywords are real-time, change, regulator, acceptance, intention, and audit quality. They represent a potentially rare topic in the existing literature and offer potential future research directions.

As illustrated by the VOSviewer map, the bibliometric analysis highlights current trends in the BT area. Except for "blockchain", "auditor", and "auditing", the most common keywords in the VOSviewer map from each cluster are accounting, impact, implication, and data. It shows that areas have been thoroughly explored, aligning with the literature presented in the critical literature review and SWOT analysis sections.

Furthermore, this VOSviewer map helps scientists find future research directions by indicating gaps. Therefore, scientists should focus on different uninvestigated areas, such as future issues related to client perception, real-time auditing, regulators and regulations, audit quality, and auditors' acceptance. To fill this gap, these topics should impact efficiency and improve the knowledge required to make informed decisions about BT implementation for audit firms, as well as prepare auditors for changes.

4.3. Contribution to practice, science, and education

Sometimes the scientific and practical worlds differ, so, naturally, researchers and practitioners are not always in agreement about the potential of BT.

On the one hand, some scientists argue that the role of auditors and the traditional audit paradigm will change in the coming years or are already being changed by BT or other technologies (Abdennadher et al., 2022; Parmoodeh, 2023). Some practitioners believe they will not change, while others claim that they have already changed and will continue to change (Parmoodeh, 2023). Some authors even claim that auditors are becoming redundant or are forced to fundamentally alter their current roles and professional auditing standards, as these standards do not provide adequate guidance for auditors to use new technologies (McGregor, Carpenter, 2020). The ongoing digitization of the economy presents both challenges and opportunities for the auditing profession, requiring auditors and their clients to adapt (Tiberius,

Hirth, 2019). Moreover, the results show that the annual audit is increasingly evolving toward a continuous audit approach.

On the other hand, BT can be interpreted as both an opportunity and a threat or as benefits and limits (Abdennadher et al., 2022; Schmitz, Leoni, 2019). Some authors have a more positive attitude toward BT adoption, emphasizing opportunities rather than threats or limitations (Parmoodeh, 2023; Pizzi et al., 2021). Despite prevailing uncertainty, experts believe that new technologies will not replace auditors (Han et al., 2023; Maffei et al., 2021) but rather support them, and that auditors and their professional judgment will still be needed (Dai, Vasarhelyi, 2017; Garanina et al., 2022). It is speculated that the auditor role will be needed, for example, to verify judgments made in financial statements using blockchain-based Accounting Information Systems (Tan, Low, 2019), or they will be called upon ex-ante to verify transactions and even entire ecosystems using BT (Garanina et al., 2022). Additionally, there is a low probability of replacing professional skepticism auditors with an impersonal and mechanical control system based on BT in the future (CPA, AICPA, 2017; Schmitz, Leoni, 2019) if they can adjust their practices to this technology accordingly (Parmoodeh, 2023) and change or improve old methods and practices (Maffei et al., 2021).

BT auditing has been considered from two perspectives: enthusiasm about the potential and the risks associated with implementation (Lombardi et al., 2022). For this reason, auditors should not fear losing their jobs or being replaced by new technologies. They should be prepared for change and challenges, and perceive BT as an evolving tool that facilitates professional judgment and expedites auditing across many processes.

On the other hand, scientists present suggestions for professionals and educators, as well as the desired capabilities of job candidates (Zhang et al., 2020). The author believes that this study's implications are also helpful to researchers and individuals in education, including educators who teach students and students who may become future practitioners (accountants or auditors).

These groups should also be prepared for the changes that BT brings to science and education, because whether they will familiarize themselves with the benefits and drawbacks of BT implementation will depend on their pursuit of degrees or jobs and on potential future success in the profession. However, teachers should be open-minded to innovations and new technologies, not only to secure a promotion, but primarily to develop knowledge and practical skills to pass on to their students. They should serve as a guide and motivator for exploring technology in audit. Changes are unavoidable. For this reason, students and teachers should learn about BT, AI, and other new technologies as soon as possible.

This study can be used for educational purposes as a comprehensive guide to the benefits, drawbacks, opportunities, and risks of implementing and using BT in audit practice.

The article also outlines potential research directions and areas to be examined in the future. It provides examples of research questions and avenues for further research for both scientists and young researchers (students). Based on the literature review and bibliometric analysis, future research questions can be posed:

1. How has BT changed the auditor's profession and auditing procedures so far?
2. How do auditors respond to emerging technologies?
3. How will auditors' perceptions affect their decision about BT implementation and usage?
4. What are the possibilities for managing the disadvantages (challenges, weaknesses, and threats) associated with the use of BT in auditing?
5. What are the ethical dilemmas and moral aspects of BT implementation in the audit profession?
6. How did regulations change, and should they change in the future for the practical usage of BT in audit?

The presented areas should be investigated and studied using an empirical approach (Ziemba et al., 2025), drawing on empirical evidence, quantitative methods, and statistical tools to address research gaps from practitioners' perspectives.

Future research should focus on analyzing the benefits and challenges of using BT in audit firms, as well as the ethical issues auditors face. This analysis should also examine how auditors perceive the changes of the last few years and how they would improve the implementation and usage of BT in auditing.

These questions may provide valuable insights for scientists to further research, improve audit practices, streamline procedures, and change auditors' attitudes toward this innovation. This research is the first step in involving auditors in research, as understanding the limitations of BT adoption enables subsequent research to identify potential changes and improvements for more effective implementation. With that, auditors could change their perception and more willingly utilize this technology in their profession.

To summarize, continuous real-time auditing and automated observation may certainly facilitate auditors' work but also pose a risk, rendering the auditor's role irrelevant (Appelbaum, Nehmer, 2017). Auditing based on real-time BT effectively minimizes the need for physical observation and monitoring of business processes. Rather than traditional verification, auditors can observe which transaction timestamps were added and whether the blocks are hashed (Appelbaum, Nehmer, 2017).

In conclusion, the primary drawback of this technology is that it has not been thoroughly explored. With its implementation, there are many unknown factors, including inadequate regulations. Audit firms considering BT implementation also must consider whether they can afford the cost and effort of transformation. Additionally, auditors may experience uncertainty due to a lack of knowledge, skills, or clear guidelines. They will not be replaced by technology. Instead, BT will support their work so that they can focus on the more analytical tasks.

However, they should continually deepen and broaden their knowledge to complement their work.

5. Conclusion

BT, like most new technologies, can evoke a range of opinions depending on users' knowledge, experience, approach, or cultural background. Apart from the auditors' resources, BT has already changed its current audit tools (Zemánková, 2019).

Content analysis and bibliometric analysis of the literature allowed us to identify the main areas in terms of SWOT (strengths, weaknesses, opportunities, and threats). Regarding the SWOT analysis based on the literature, the main advantages of BT implementation include real-time audit and automated audit processes, which reduce time and costs and eliminate human errors. BT has excellent potential to innovate in auditing and enhance auditors' roles in control through automation, including data gathering, real-time record confirmation, risk analysis, and reconciliation. However, it could pose weaknesses and threats in data security, a lack of regulations, potential client loss, inherent and control risks, and the risk of hacking. It might pose challenges for auditors, including changes to the auditors' role, technostress, a lack of trust, and required training.

Scientists believe that it is rare for BT or other technology to replace auditors. It will be used in auditing. It would rather change its role and tasks during audits by using more IT tools, allowing it to focus on analytical tasks, make informed ethical decisions, and provide professional judgments. However, the authors' lack of unanimity encourages consideration of the actual advantages and disadvantages of BT adoption for auditing, as well as the opportunities and risks that might arise in the near future for the auditors' profession. Therefore, practitioners must be prepared and possess the necessary knowledge about the benefits and risks that the implementation and use of BT in auditing can entail.

Based on a bibliometric analysis, it can be concluded that current trends in the BT area have been thoroughly explored, encompassing accounting, impact, implication, and data, aligning with the literature presented in the critical literature review and SWOT analysis sections. Furthermore, the VOSviewer map showed that future research directions should focus on client perception, real-time auditing, regulators and regulations, audit quality, and auditors' acceptance.

This study can serve as a guide for researchers to develop this research area, as it categorizes the current state of the literature, highlights research gaps, and outlines potential future research directions. Additionally, it provides insights for students and teachers at universities to familiarize themselves with the benefits and current challenges of new technologies in auditing,

as well as for policymakers to provide appropriate guidance and adjust current laws to reflect the changing audit profession.

This article also provides valuable insights for auditors and management bodies, serving as a guide to decision-making on the pros and cons of BT adoption. Specifically, it explores whether audit firms should implement BT technology within their own companies or partner with clients to use BT. Audit firms consider BT implementation if they can afford the venture and expand their offer. For this reason, each audit firm must take an individual approach and adjust solutions to its specific profession.

This study is not devoid of limitations resulting from the author's subjective selection of articles for analysis. The analyzed publication was selected from the Scopus database, one of the largest databases, and other databases potentially containing different bibliographies were excluded. The literature provides numerous examples of research on new technologies, including blockchain, artificial intelligence, smart contracts, machine learning, and others, in the field of auditing and accounting. However, this study focused exclusively on blockchain technology in the auditing profession, excluding accounting from the investigation.

Acknowledgements

The author wishes to express sincere acknowledgments to Professor Ewa Wanda Ziemba and Professor Ewa Wanda Maruszewska for their valuable guidance, constructive comments, and kind support during the preparation of the data used in this study. Their expertise and encouragement greatly contributed to the quality and completion of this research.

References

1. Abdennadher, S., Grassa, R., Abdulla, H., Alfalasi, A. (2022). The effects of blockchain technology on the accounting and assurance profession in the UAE: an exploratory study. *Journal of Financial Reporting and Accounting*, *20*(1), 53-71. https://doi.org/10.1108/JFRA-05-2020-0151
2. Agustí, M., Orta-Pérez, M. (2022). Big data and artificial intelligence in the fields of accounting. *Spanish Journal of Finance and Accounting,* 1-36.
3. Akter, M., Kummer, T.-P., Yigitbasioglu, O. (2024). Looking beyond the hype: The challenges of blockchain adoption in accounting. *International Journal of Accounting Information Systems, 53*, 1-20. https://doi.org/10.1016/j.accinf.2024.100681

4. Alkhwaldi, A.F., Alidarous, M.M., Alharasis, E.E. (2024). Antecedents and outcomes of innovative blockchain usage in accounting and auditing profession: An extended UTAUT model. *Journal of Organizational Change Management, 37(5),* 1102-1132. https://doi.org/10.1108/JOCM-03-2023-0070
5. Alshurafat, H., Al-Mawali, H., Obeid, M., Shbail, A. (2022). The influence of technostress on the intention to use blockchain technology : the perspectives of Jordanian auditors. *Development and Learning in Organizations: An International Journal*. https://doi.org/10.1108/DLO-06-2022-0103
6. Appelbaum, D., Nehmer, R.A. (2017). Designing and Auditing Accounting Systems Based on Blockchain and Distributed Ledger Principles. *Feliciano School of Business*, 1-19.
7. Atik, A., Kelten, G. (2021). Blockchain Technology and Its Potential Effects on Accounting: A Systematic Literature Review. *Istanbul Business Research*, https://doi.org/10.26650/ibr.2021.51.806870
8. Bellucci, M., Bianchi, D.C., Manetti, G. (2022). Blockchain in accounting practice and research: systematic literature review. *Meditari Accountancy Research*, *30*(7), 121-146. https://doi.org/10.1108/MEDAR-10-2021-1477
9. Bonsón, E., Bednárová, M. (2019). Blockchain and its implications for accounting and auditing. *Meditari Accountancy Research*, *27*(5), 725-740. https://doi.org/10.1108/MEDAR-11-2018-0406
10. Bonyuet, D. (2020). Overview and impact of blockchain on auditing. *International Journal of Digital Accounting Research*, *20*, 31-43. https://doi.org/10.4192/1577-8517-v20_2
11. Cao, S., Cong, L., Yang, B. (2019). A Distributed Ledgers and Secure Multi-Party Computation for Financial Reporting and Auditing. *Management Science forthcoming.* George State University. https://dx.doi.org/10.2139/ssrn.3248002
12. CPA (2017). *Blockchain technology and its potential impact on the audit and assurance profession.* Retrieved from: https://www.cpacanada.ca/business-and-accounting-resources/audit-and-assurance/canadian-auditing-standards-cas/publications/impact-of-blockchain-on-audit
13. Dai, J., Vasarhelyi, M. (2017). Toward blockchain-based accounting and assurance. *Journal of Information Systems*, *31*(3), 5-21. https://doi.org/10.2308/isys-51804
14. Dyball, M.C., Seethamraju, R. (2021). The impact of client use of blockchain technology on audit risk and audit approach—An exploratory study. *International Journal of Auditing*, *25*(2), 602-615. https://doi.org/10.1111/ijau.12238
15. Dyball, M.C., Seethamraju, R. (2022). Client use of blockchain technology: exploring its (potential) impact on financial statement audits of Australian accounting firms. *Accounting, Auditing and Accountability Journal*, *35*(7), 1656-1684. https://doi.org/10.1108/AAAJ-07-2020-4681
16. Elmaasrawy, H.E., Tawfik, O.I., Abdul-Rahaman, A.-R. (2024). Effect of audit client's use of blockchain technology on auditing accounting estimates: Evidence from the Middle East.

Journal of Financial Reporting and Accounting, https://doi.org/10.1108/JFRA-08-2023-0499

17. Elommal, N., Manita, R. (2022). How Blockchain Innovation could affect the Audit Profession: A Qualitative Study. *Journal of Innovation Economics & Management*, *37*(1), 37-63. https://doi.org/10.3917/jie.pr1.0103
18. Farrokhnia, M., Banihashem, S.K., Noroozi, O., Wals, A. (2023). A SWOT analysis of ChatGPT: Implications for educational practice and research. *Innovations in Education and Teaching International.* https://doi.org/10.1080/14703297.2023.2195846
19. Ferri, L., Spanò, R., Ginesti, G., Theodosopoulos, G. (2021). Ascertaining auditors' intentions to use blockchain technology: evidence from the Big 4 accountancy firms in Italy. *Meditari Accountancy Research*, *29*(5), 1063-1087. https://doi.org/10.1108/MEDAR-03-2020-0829
20. Fuller, S.H., Markelevich, A. (2020). Should accountants care about blockchain? *Journal of Corporate Accounting and Finance*, *31*(2), 34-46. https://doi.org/10.1002/jcaf.22424
21. Garanina, T., Ranta, M., Dumay, J. (2022). Blockchain in accounting research: current trends and emerging topics. *Accounting, Auditing and Accountability Journal*, *35*(7), 1507-1533. https://doi.org/10.1108/AAAJ-10-2020-4991
22. Gauthier, M.P., Brender, N. (2021). How do the current auditing standards fit the emergent use of blockchain? *Managerial Auditing Journal*, *36*(3), 365-385. https://doi.org/10.1108/MAJ-12-2019-2513
23. Hakami, T., Sabri, O., Al-Shargabi, B., Rahmat, M.M., Nashat Attia, O. (2023). A critical review of auditing at the time of blockchain technology – a bibliometric analysis. *EuroMed Journal of Business,* https://doi.org/10.1108/EMJB-01-2023-0010
24. Han, H., Shiwakoti, R.K., Jarvis, R., Mordi, C., Botchie, D. (2023). Accounting and auditing with blockchain technology and artificial Intelligence : A literature review. *International Journal of Accounting Information Systems*, *48*, 100598. https://doi.org/10.1016/j.accinf.2022.100598
25. Huang, F., Wang, T., Yen, J.-Ch. (2024). Opportunities or challenges? Audit risk and blockchain disclosures in 10-k filings. *Auditing. A Journal of Practice & Theory*, *43(2),* 131-158. https://doi.org/10.2308/AJPT-2021-045
26. ICAEW (2018). *Blockchain and the future of accountancy.* Retrieved from: https://www.icaew.com/technical/technology/blockchain-and-cryptoassets/blockchain-articles/blockchain-and-the-accounting-perspective
27. Juma'h, A., Li, Y. (2023). The effects of auditors' knowledge, professional skepticism, and perceived adequacy of accounting standards on their intention to use blockchain. *International Journal of Accounting Information Systems, 51,* 100650. https://doi.org/10.1016/j.accinf.2023.100650

28. Keban, Y.B., Arifin, S., Wahyono, R. (2019). SWOT Analysis and Its Implementation Strategies in Educational Management. *Journal of Education and Practice, 10*(12), 86-92. https://doi.org/10.7176/JEP/10-12-10
29. Lardo, A., Corsi, K., Varma, A., Mancini, D. (2022). Exploring blockchain in the accounting domain: a bibliometric analysis. *Accounting, Auditing & Accountability Journal*, *35*(9), 204-233. https://doi.org/10.1108/aaaj-10-2020-4995
30. Liu, M., Robin, A., Wu, K., Xu, J. (2022). Blockchain's Impact on Accounting and Auditing: A Use Case on Supply Chain Traceability*. *Journal of Emerging Technologies in Accounting*. https://doi.org/10.2308/jeta-2021-002
31. Liu, M., Wu, K., Xu, J.J. (2019). How Will Blockchain Technology Impact Auditing and Accounting: Permissionless versus Permissioned Blockchain. *Current Issues in Auditing*, *13*(2), A19-A29. https://doi.org/10.2308/ciia-52540
32. Lombardi, R., De Villiers, C., Moscariello, N., Pizzo, M. (2022). The disruption of Blockchain in auditing - A Systematic Literature Review and an Agenda for Future Research. *Accounting, Auditing & Accountability Journal*, *35*(7), 1534-1565. https://doi.org/10.1108/AAAJ-10-2020-4992
33. Maffei, M., Casciello, R., Meucci, F. (2021). Blockchain technology: uninvestigated issues emerging from an integrated view within accounting and auditing practices. *Journal of Organizational Change Management*, *34*(2), 462-476. https://doi.org/10.1108/JOCM-09-2020-0264
34. Majeed, R.H., Taha, A.A.D. (2024). A survey study of Iraqi auditors' adoption of blockchain technology. *Asian Review of Accounting*, *32(3)*, 521-546. https://doi.org/10.1108/ARA-01-2023-0015
35. McGregor, D., Carpenter, R. (2020). Potential threats for the auditing profession, audit firms, and audit processes inherent in using emerging technology. *The Business and Management Review*, *11*(02), 45-54. https://doi.org/10.24052/bmr/v11nu02/art-06
36. Mugwira, T. (2022). Internet Related Technologies in the auditing profession: A WOS bibliometric review of the past three decades and conceptual structure mapping. *Spanish Accounting Review*, *25*(2), 201-216. https://doi.org/10.6018/rcsar.428041
37. Nazarko, J., Ejdys, J., Halicka, K., Magruk, A., Nazarko, Ł., Skorek, A. (2017). Application of Enhanced SWOT Analysis in the Future-oriented Public Management of Technology. *Procedia Engineering, 182*, 482-490. https://doi.org/10.1016/j.proeng.2017.03.140
38. Qader, K.S., Kemal, C. (2024). Influence of blockchain and artificial intelligence on audit quality: Evidence from Turkey. *Heliyon, 10,* 1-12. https://doi.org/10.1016/j.heliyon.2024.e30166
39. Pan, L., Owen V., Craig S.W. (2023). A private and efficient triple-entry accounting protocol on bitcoin. *Journal of Risk and Financial Management*, *16*(400), 1-9. https://doi.org/10.3390/jrfm16090400

40. Parmoodeh, A.M. (2023). An exploratory study of the perceptions of auditors on the impact on Blockchain technology in the United Arab Emirates. *International Journal of Auditing*, *October 2021*, 24-44. https://doi.org/10.1111/ijau.12299
41. Pimentel, E., Boulianne, E. (2020). Blockchain in Accounting Research and Practice: Current Trends and Future Opportunities*. *Accounting Perspectives*, *19*(4), 325-361. https://doi.org/10.1111/1911-3838.12239
42. Pimentel, E., Boulianne, E., Eskandari, S., Clark, J. (2021). Systemizing the challenges of auditing blockchain-based assets. *Journal of Information Systems, 35(2),* 61-75. https://doi.org/10.2308/ISYS-19-007
43. Pizzi, S., Venturelli, A., Variale, M., Macario, G.P. (2021). Assessing the impacts of digital transformation on internal auditing: A bibliometric analysis. *Technology in Society*, *67*, 1-11. https://doi.org/10.1016/j.techsoc.2021.101738
44. Pramono, I.P. (2020). Blockchain Technology and How It Will Affect Accounting in the Future. *Research Journal of Finance and Accounting*, *11*(10), 58-64. https://doi.org/10.7176/rjfa/11-10-06
45. PwC (2018). *PwC's Global Blockchain Survey.* Available at: https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.pwc.com/jp/ja/knowledge/thoughtleadership/2018/assets/pdf/blockchain-in-business-en.pdf, 3 July 2025.
46. Renik, K., Łuczak, K., Zhou, H. (2025). *Emerging trends and future directions of AI in auditing: Insights from a bibliometric perspective.* Proceedings on 28th European Conference on Artificial Intelligence ECAI 2025 – InMan Workshop. *Intelligent Management and Artificial Intelligence: Trends, Challenges, and Opportunities, Vol. 1*, 58-72. https://doi.org/10.18276/978-83-8419-028-9-05
47. Roszkowska, P. (2021). Fintech in financial reporting and audit for fraud prevention and safeguarding equity investments. *Journal of Accounting & Organizational Change, 17(2),* 164-196. https://doi.org/10.1108/JAOC-09-2019-0098
48. Rozario, A.M., Thomas, C. (2019). Reengineering the Audit with Blockchain and Smart Contracts. Business Source. *Journal of Emerging Technologies in Accounting*, *16*(1), 21-35. https://doi.org/DOI: 10.2308/jeta-52432
49. Rozario, A.M., Vasarhelyi, M.A. (2018). Auditing with Smart Contracts. *The International Journal of Digital Accounting Research*, *18(December 2017),* 1-27. https://doi.org/10.4192/1577-8517-v18
50. Sargent, C.S. (2022). Replacing Financial Audits with Blockchain: The Verification Issue. *Journal of Computer Information Systems, 62(6),* 1145-1153. https://doi.org/10.1080/08874417.2021.1992805
51. Schmitz, J., Leoni, G. (2019). Accounting and Auditing at the Time of Blockchain Technology: A Research Agenda. *Australian Accounting Review*, *29*(2), 331-342. https://doi.org/10.1111/auar.12286

52. Secinaro, S., Dal Mas, F., Brescia, V., Calandra, D. (2021). Blockchain in the accounting, auditing, and accountability fields: a bibliometric and coding analysis. *Accounting, Auditing and Accountability Journal*, *35*(9), 168-203. https://doi.org/10.1108/AAAJ-10-2020-4987
53. Shbail, M.O.A., Bani-Khalid, T.O., Ananzeh, H., Al-Hazaima, H., Shbail, A.A. (2023). Technostress impact on the intention to adopt blockchain technology in auditing companies [Special issue]. *Journal of Governance & Regulation*, *12(3),* 285-294. https://doi.org/10.22495/jgrv12i3siart10
54. Shevchuk, V., Radelytskyy, Y. (2024). Adaptation of accounting and audit education to the challenges of artificial intelligence. *Economics, Entrepreneurship, Management*, *11*(2), 46-54. https://doi.org/10.56318/eem2024.02.046
55. Silva, R., Inácio, H., Marques, R.P. (2021). Effective and Potential Implications of Blockchain Technology for Auditing. *Advances in Intelligent Systems and Computing, 1368,* 435-451. Springer International Publishing. https://doi.org/10.1007/978-3-030-72654-6_42
56. Silva, R., Inácio, H., Marques, R.P. (2022). Blockchain implications for auditing: a systematic literature review and bibliometric analysis. *The International Journal of Digital Accounting Research, 22,* 163-192. https://doi.org/10.4192/1577-8517-v22
57. Singhvi, M., Hossain, A., Brodmann, J. (2021). New auditors are coming: Disrupting the fixed mindset and exploring dynamic changes in auditing. *EDPACS, 63(2),* 1-8. https://doi.org/10.1080/07366981.2020.1812813
58. Šindelář, M., Dlask, L. (2021). *The Future of Audit: Literature Review of Possibilities of Automation and Blockchain Technology* (pp. 25-35). https://doi.org/10.1007/978-3-030-55277-0_3
59. Tan, B.S., Low, K.Y. (2019). Blockchain as the Database Engine in the Accounting System. *Australian Accounting Review*, *29*(2), 312-318. https://doi.org/10.1111/auar.12278
60. Tiberius, V., Hirth, S. (2019). Impacts of digitization on auditing: A Delphi study for Germany. *Journal of International Accounting, Auditing and Taxation, 37,* 1-14. https://doi.org/10.1016/j.intaccaudtax.2019.100288
61. Tiron-Tudor, A., Deliu, D., Farcane, N., Dontu, A. (2021). Managing change with and through blockchain in accountancy organizations: a systematic literature review. *Journal of Organizational Change Management*, *34*(2), 477-506. https://doi.org/10.1108/JOCM-10-2020-0302
62. van Eck, N.J., Waltman (2010). *VOSViewer: Visualizing Scientific Landscapes [Software]*. Retrieved from: https://www.vosviewer.com, 23.02.2024.
63. White, B.S., King, C.G., Holladay, J. (2020). Blockchain security risk assessment and the auditor. *Journal of Corporate Accounting and Finance*, *31*(2), 47-53. https://doi.org/10.1002/jcaf.22433
64. Zemánková, A. (2019). Artificial intelligence and blockchain in audit and accounting: Literature review. *WSEAS Transactions on Business and Economics*, *16*, 568-581.

65. Zhang, Y., Xiong, F., Xie, Y., Fan, X., Gu, H. (2020). The Impact of Artificial Intelligence and Blockchain on the Accounting Profession. *IEEE Access*, *8*, 110461-110477. https://doi.org/10.1109/ACCESS.2020.3000505
66. Ziemba, E., Renik, K., Maruszewska, E., Mullins, R. (2025). Blockchain adoption in auditing: A systematic literature review. *Central European Management Journal, 3*. https://doi.org/10.1108/CEMJ-06-2024-0196