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An Assessment of Big Data Analytics on Auditing and Accounting: A Bibliometric Analysis

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Abstract
This article examines the emerging trend of big data studies within the realms of accounting, auditing, and finance and explores the theoretical underpinnings of big data in the area of finance, focusing on the research process and data analysis methods employed. Utilizing the Scopus scientific database and VosViewer bibliography software, an extensive assessment of available literature was conducted. Furthermore, the study presents a network examination of commonly recurring keywords in highly cited articles and show cases of three influential publications. This study recommends that Iranian companies embrace these advancements to promote research and development. Additionally, it advises utilizing notable keywords, highly cited authors, and leading countries in big data research within the financial sector. Through the study of citation patterns, it was revealed that Vasarhely emerged as a highly influential author within the domain of big data studies in accounting, auditing, and finance. The United States, China, and England emerged as the top contributors to the field, having published the highest number of articles. The research also delves into Iran's position in this context, highlighting potential areas for growth and development.

Introduction

The utilization of big data in financial accounting plays a pivotal role in enhancing organizational financial performance and this has become an issue of great importance recently. Given the exponential growth of financial information generated within organizations daily, the extraction of valuable insights and their efficient utilization for optimal decision-making in financial management have become imperative and The study of the big data in financial is a topic under intense research. Proficiency in big data and data analytics,

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as acquired during postgraduate studies in accounting, empowers students to develop the necessary competencies to tackle the intricacies of contemporary accounting challenges. One of the key uses of big data in the area of financial accounting lies in its ability to facilitate the collection and storage of vast and intricate financial data within organizations. These datasets encompass a broad range of information, including financial data from various organizational units, financial transactions, invoices, financial statements, and budgetary data. Leveraging advanced methods for big data analysis, organizations are empowered to analyze such datasets comprehensively, extracting valuable patterns and insights that can inform and enhance decision-making processes in financial management. In recent years there has been an increased interest in exploring methods for the inclusion of big data in financial accounting provides accountants with the ability to efficiently and expeditiously dissect and scrutinize financial data. By conducting a meticulous examination of these datasets, one can discern financial patterns, trends, and risks, thereby utilizing this information as a navigational compass for making judicious managerial and strategic decisions. (Bose and Bhattacharjee 2023). The utilization of big data in the realm of financial accounting offers several noteworthy advantages. One particular advantage arising from big data is the improvement in the accuracy and credibility of financial information, resulting in enhanced data quality. Additionally, the ability to integrate big data offers a great advantage over reducing errors and minimizes the time required for the preparation of financial reports. By leveraging large datasets and employing sophisticated algorithms, organizations are empowered to analyze and interpret financial data with precision. This enables them to identify patterns, trends, and potential financial risks. Consequently, this valuable insight serves as a guiding tool in making informed managerial and strategic decisions. It is worth highlighting that the increasing technological developments and substantial transformations witnessed in the area of accounting have underscored the importance of exploring and harnessing the potential of big data and data analysis. Consequently, within the context of Masters Programs in accounting, students now recognize the paramount significance of acquiring knowledge and proficiency in utilizing these advanced technologies and intelligent algorithms for proficiently collecting, analyzing, and effectively leveraging extensive financial datasets. A major advantage is that the inclusion of big data in the area of accounting can provide a crucial need, namely the ability to comprehend and analyze vast volumes of financial data. By data analysis methods and intelligent algorithms, students can effectively examine financial transactions, financial statements, and other pertinent financial data on a large scale. This facilitates the identification of financial patterns, trends, and risks, thereby enabling the establishment of comprehensive insights. Moreover, these technologies allow students to refine their data analysis skills and harness their potential for practical implementation. This encompasses the study of organizational data, forecasting financial performance, improving financial processes, and identifying strategic opportunities. Given the perpetual growth and development of financial data, proficiency in the realm of big data and data analysis empowers students to acquire the requisite readiness for tackling the challenges inherent in contemporary accounting practices. (Mcbride and Philippou, 2022).

Many researchers have investigated the auditing quality. Today, big data has become important for accountants from various angles, but accountants have little understanding of the necessary steps to

convert big data into useful and practical information Huang, F., No, W. G., Vasarhelyi, M. A., & Yan, Z. (2022). Big data (BD) is defined as information assets with large volume, high speed, and great variety. Big data can be described as a huge collection of unstructured data that has been collected in different forms from different sources and so It is bulky, which is measured in terms of terabytes and zettabytes. Gartner, a big data expert, explains that: this data must be analyzed or processed in a new path to be relevant and useful for decision-making (Nissim, D. (2022). Big data as a concept is often discussed together with data analytics Alez and Gray also point out that big data in accounting literature is often defined through various kinds of analysis (Ahmed, S. et al. 2022). Instead of using big data as a kind of data source, new predictions can be made by using and analyzing them. Researchers state that for auditors, big data and information (or its content) refers to collections of multiple kinds of data that can include a mixture of financial data with traditional structure and non-financial data, support data, sensor data, Emails, phone calls, social media data, blogs among other internal and external data (Yang, Zhao, Han, Liu, and Yang; 2021). Today, with the expansion of technology, in almost every industry, the accounting sector is also experiencing significant changes by evolving through traditional methods. Hence, accounting professionals need to keep pace with advanced technologies to stay ahead of their competitors in the financial sector. To do this, major accounting firms are starting to use technologies like big data, robotics, and artificial intelligence (AI) in their business models. Accounting professionals will gain from learning about the potentially significant advantages of big data and the unavoidable challenges and obstacles to its use (Vasarhelyi, M. A., Kogan, A., & Tuttle, B. M. (2015). Of all the hot topics out there, big data is affecting almost every aspect of the accounting industry. This helps produce audits based on better data and creates a better experience for clients and auditors Bhimani, A., & Willcocks, L. (2014). Saghafi and Javani Qalandari (2016), stated that big data in accounting makes information transparent. It can therefore be important for stakeholders. In the tax process, big data helps evaluate tax codes, reduce fraud, and monitor tax budgets and expenditures, thereby saving time, money, and stress for cases. The advisory section helps identify and monitor queries and generate better reports to improve business performance. Big data can help to identify discrepancies between fair value accounting proposed in international financial reporting standards and accounting principles. Big data is about volume, velocity, and variety, and is therefore often characterized by the 3 Vs where -volume - indicates large amounts of data, Velocity - indicates high-speed data flow; Variety - represents a broad range of data, especially in unstructured or semi-structured forms such as images and texts (Brown-Liburd et al. (2015) Based on the review of existing articles and literature, establishing and expanding a theoretical framework in the area of big data use in accounting and auditing is an important issue that requires careful examination. Therefore, this investigation aims to create and propagate theoretical underpinnings in the area of big data in accounting and auditing. Additionally, another aim of this research is to identify commonly employed words and concepts, and to showcase influential articles and scholars for researchers and students. The objective of the current investigation is to review big data research in auditing and accounting and also to identify highly cited articles prominent authors and important keywords used in this field. In the following, the theoretical underpinnings and background

were explained, and then the actual method, findings, and conclusions were presented.

Literature Review

How is big data making its way into the accounting industry?

Data analysis: Big data contains large amounts of unstructured data that need to be organized. Applying data analytics to big data creates possibilities for accounting firms to gain meaningful insights, predict future outcomes, and automate unusual financial tasks. An accountant must learn the technical and analytical skills to manage statistics and implement large data sets with data mining and statistical analysis tools such as Statistical Analysis System (SAS) to add to their knowledge base. In today's big data era, it helps businesses deliver more value and transform their decision-making skills. Identifying the danger of providing risk-free financial services to customers is essential for companies these days, as big data comes with many security threats, big data enables accountants to proactively identify issues related to real-time access to data. Accounting businesses can base their decision-making more on hard evidence and facts rather than relying on guesswork and assumptions about customers, employees, and vendors. Data visualization was done with the aid of visualization software such as Tableau.

Accountants can see large volumes of data, which in turn helps users see patterns, trends, anomalies, and exceptions more easily. These tools have helped accountants see data in ways that were previously possible using traditional methods. In addition, making it easier to link data from different sources to provide new realizations into reports, these tools also permit accountants and CPAs to perform advanced statistical analysis using more variables, real-time data, and advanced modeling. Audit analysis has indicated that internal and external auditors have been at the forefront of big data in the accounting industry. Today, traditional auditing methods that involve analyzing billions of transactions in a ledger based on sampling are no longer used. Although auditors still work on large data sets, audit analytics enables them to graphically illustrate a broad range of financial and non-financial data. This helps identify exceptions and pressure points so auditors can focus on areas of significant risk (Cao, M., Chychyla, R., & Stewart, T. (2015)). Audit evidence is all information, whether obtained from audit procedures or other sources, used by the auditor to reach the outcomes on which the auditor's opinion is based. Audit evidence includes information that supports management's assertions about the financial statements or internal control over financial reporting and information that contradicts those assertions. Big data helps auditors a lot in collecting information and audit evidence. The link between data and their analysis and automation of processes can be an introduction to machine learning. Emerging technologies such as data analytics and machine learning are impacting the accounting profession. In particular, significant variations in auditing and assurance methods are expected owing to these effects. One of these potential changes is audit sampling. Since audit sampling provides only a small snapshot of the entire population, one feasible solution is to use audit data analytics and machine learning to enable an examination of the entire population instead of a sample of transactions Huang, F., No, W. G., Vasarhelyi, M. A., & Yan, Z. (2022).

Big data is used in different sectors by industrial managers, as mentioned below:

- Decision-making support for retaining and attracting customers: By studying big data from surveys and analyzing customer interests and preferences, appropriate decisions can be made to attract new

customers and fulfill the requests of existing customers.

- Product development: Big data can effectively assist manufacturers in designing and developing the right products by classifying key features of successful products and modeling their commercial success.
- Anticipation of troubleshooting: By reviewing error messages and reported problems, big data can be utilized to model and manufacture cost-effective and efficient equipment and parts.
- Operational efficiency: Planning based on asset numbers and financial considerations helps drive production towards meeting higher demand. Today, marketing decisions also require the use of big data. Complex data and large volumes cannot be processed efficiently with traditional programs and necessitate appropriate technology. Some impacts of big data in digital marketing include running more successful campaigns, making better pricing decisions, and creating relevant web content.

The internal and external background

Several research groups have been working on big data in accounting, auditing, and finance. According to Saghafi and Javani Qalandari (2016), big data consists of large data sets that are typically challenging to analyze using traditional software programs or database management systems. The term refers to the growing volume of data accessible through developments in computing, remote communication technologies, especially the Internet, and environmental measurements. As various kinds of data become more accessible, big data has significant consequences for financial accounting. Textual, video, audio, and image information obtained through big data can enhance financial accounting and improve financial reporting procedures. By leveraging big data, the quality and significance of accounting information can be enhanced, thereby increasing transparency and facilitating better decision-making by stakeholders. Moreover, big data can play a crucial role in formulating and refining accounting standards within financial reporting. Additionally, it ensures that the accounting profession continues to provide valuable insights as the dynamic, global, and real economy evolves.

Mohammadi (2019) states that information and communication technologies have led to the development and increased availability of information resources, including financial information. Consequently, the need for solutions to report and audit them has become necessary. While traditional auditing methods have served the profession for decades, auditors must innovate and change their approaches to meet the evolving demands of technology and stakeholder expectations.

According to Hejazi and Bayat (2019), business organizations worldwide experience annual losses of approximately 5% of their revenues due to fraud, amounting to over 3.5 trillion dollars. Additionally, in 2017, Rezaei and Wang found that the existence of fraudulent financial statements damages the integrity and efficiency of financial markets. This research explores the use of massive data analysis in detecting accounting fraud. Based on the opinions of Chinese academics and experts regarding the importance, demand, relevance, benefits, and use of big data, the following points were gathered:

1- The demand for big data analysis and its relationship with accounting fraud will increase.
2- Big data analysis should be included in business programs from undergraduate and graduate levels.

3- Many topics discussed in big data should be included in accounting and business curricula.
4- 4-Many techniques of descriptive analysis and forecasting of large data are important in the training and method of doing accounting work.

In their 2022 study, Jamalianpour and Alipour Fallah Pasand explored the fields of robotic automation processes, machine learning, blockchain, and data analysis science. The results of this review shed light on the significance of auditors acquiring relevant knowledge to deliver professional services in this domain. Additionally, auditors should familiarize themselves with resources, technologies, mechanisms, and methods associated with big data to enhance their position and ensure its stability. Furthermore, it is proposed that developing a coherent system for effectively handling big data within Iran's auditing profession is a crucial step forward.

Cockcroft and Russell (2018) conducted a study to explore research opportunities regarding the utilization of "big data" in the fields of accounting and finance. The objective of their work was to address the following research question: What are the primary subjects covered in big data research, and where do the existing gaps lie within the literature on accounting and finance? Their analysis encompassed 47 reputable journals focusing on accounting, finance, and information systems from the period spanning 2007 to 2016. The findings revealed six areas related to big data that were insufficiently researched within the realms of accounting and finance. These areas include risk and security, data visualization, and predictive analytics, as well as data management and data quality. By conducting further research in these specific domains, it is expected that industry practices will be enhanced, leading to new prospects for interdisciplinary studies.

The rapid progress of technology and the exponential growth of business information have posed challenges to traditional auditing methods. This paper aims to explore the integration of big data analysis into the auditing process by conducting a comprehensive review of existing literature. Biglari, V., & Pourabedin, Z. (2022) found that auditors are increasingly relying on big data analysis tools to enhance the depth and quality of their assurance services. Consequently, the utilization of big data analysis not only strengthens the legitimacy of auditing firms but also fosters social trust in them. Despite the considerable advancement of technology in the auditing field and extensive research on big data analytics, there is a dearth of academic studies specifically focused on this subject.

According to Putra et al. (2022), financial fraud exposes businesses to significant financial risks that can jeopardize their profitability and public image. The advent of big data and data analytics has revolutionized the business landscape, leading to the emergence of highly competitive companies. Big data is being hailed as the next frontier for enhancing productivity, driving innovation, and improving competitiveness across various industries.

Financial frauds occurring worldwide pose a grave threat, which profoundly influences the financial sector, as highlighted by Gupta, A., & Lohani, M. C. (2022). To combat these diverse forms of financial fraud effectively, financial institutions must refine their fraud detection mechanisms to detect such activities at an early stage. Several recent studies have demonstrated that the implementation of machine learning (ML) and big data analysis has significantly enhanced the efficiency of these methods.

Research Methodology

The present study aims to showcase the application of academic big data research in the fields of information systems, accounting, and finance. Additionally, it aims to identify potential areas for future exploration within accounting and finance. To achieve these objectives, an attempt was made to a bibliometric search methodology to examine existing literature on the topic of big data analysis and its impact on the auditing profession. Various resources were utilized, including both online and print sources, such as journal articles and book chapters. Most data used in the study have been obtained from the Scopus scientific database within the timeframe spanning from 2004 to 2023, using the following search formula. The resulting findings were saved in CSV format, and the outcomes were presented in the results section accordingly.

This is the typical research formula followed in the current study:

(TITLE-ABS-KEY (big AND data) AND TITLE-ABS-KEY (accounting OR auditing OR finance)) AND (LIMIT-TO (PUBYEAR, 2023) OR LIMIT-TO (PUBYEAR, 2004)) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "ECON")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j")).

Findings

It should be noted that the group consisted entirely of published articles, 1006 journal articles and 140 conference articles, 76 book chapters, 66 review articles, and 29 books were found in the Scopus database. The upward trend in the number of articles from 2004 to 2022 is schematically shown in Fig. 1. The latest article at the time of writing on 21 January 2023, was" How are reinforcement learning and deep learning algorithms used for big data-based decision making in financial industries–A review and research agenda by Vinay Singh et al. By summarizing data collected from this research, it was clear that Shawnee et al. with 864, Pradeepk et al 559, and Nigel Nicholson526 were the most cited authors.

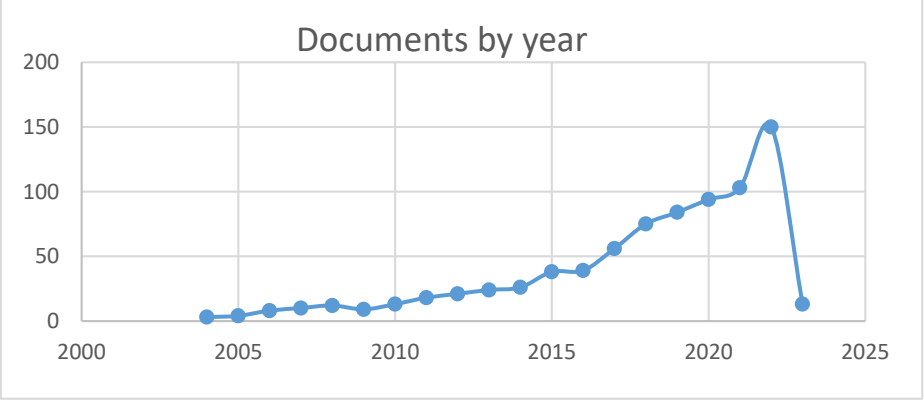

Fig. 1. Document by year.

A snapshot and a schematic of published documents from 2004-2023 are shown in Fig1. The reason for the decrease in the publication of articles after 2022 may be explained by the possibility that the new year has just started and the articles in print have not yet been indexed in scientific databases.

Figure 2. Shows graphically that Vasarhelyi has published the most articles in Scopus by seven s in the field of big data and accounting or auditing and finance. Dumay, John with five articles and Appelbaum, Deniz and Baskerville, Rachel Francis and Ghozali, Imam and Hassan, Mohammad Kabir and Law, Philip K.F. with four articles and the rest with three articles ranked in the next steps. The rest of the authors are also specified in the diagram. According to this diagram, for

future studies, it is better to use the works of these authors in the theoretical foundations or research literature and history. Considering the lack of theoretical resources in Farsi, the solution is to apply an appropriate translation of the mentioned articles, which guarantees updating the knowledge of auditors, accountants, financial managers, and researchers.

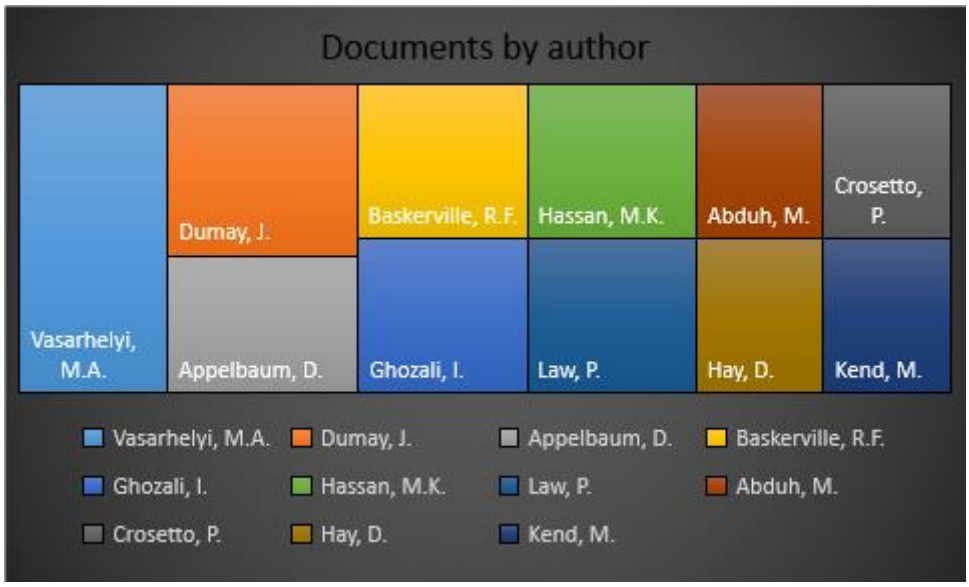

Fig. 2. Chart of the number of articles written by authors.

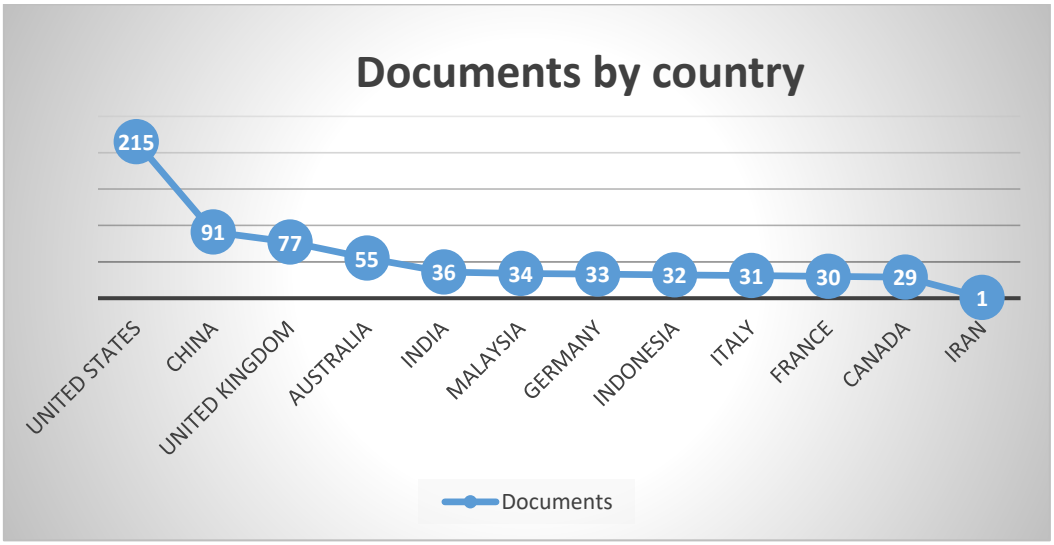

Fig 3. Chart by country - number of documents for up to 12 countries

An overall summary of the results of several published documents by countries is given in Fig 3. The graph shows that the United States of America published the most articles with 215 China with 91 and England with 77. This chart included all the articles from magazines authoritative conferences and book chapters.

In the subsequent phase of the study, the most frequently utilized keywords in the articles were examined and gathered once again from the Scopus database. Following the download in Excel format, the data was subsequently transferred to the Vosviewer visualization software using the following steps. Similarly to the previous stage, a search was conducted for the keywords "big data," "accounting," and "auditing" within the article titles, resulting in the extraction of 1006 articles from the initial search.

In the advanced search phase, filters were implemented to enhance the accuracy of the study. Only research articles and review articles published in reputable journals within the field of business and economics, written in English, were considered. To ensure precision, book chapters and conference articles were excluded from the research scope. As a result, after meticulous manual examination and removal of duplicate articles by the researcher, the final number of documents reached 875. Using this set of articles, visualization maps depicting co-occurrences, co-authorships between countries, and the most cited articles were generated.

VOSviewer, a freely available software version 1-6-18 developed by Nees Jan van Eck and Ludo Waltman, was employed to create these maps. Implemented in the Java programming language, VOSviewer enables the creation and exploration of maps based on network data. It facilitates the construction of networks involving scientific publications, journals, researchers, research organizations, countries, keywords, or terms. VOSviewer utilizes bibliographic database files (e.g., Scopus, Web of Science, Lens, PubMed, and Dimensions) as input to generate networks.

The software enables the creation, visualization, and exploration of maps that incorporate items of interest to researchers. These items are represented by colored circles, with larger circles indicating greater significance or importance. Each item is assigned a non-negative weight value to indicate its relative importance within the map. The items can represent various entities such as organizations, authors, or keywords, and typically, a map focuses on a single type of item.

Links can be established between any pair of items on the map, visually representing connections or relationships. These links are depicted as curved or straight lines of varying thickness. A thicker line with a shorter length signifies a stronger and more significant relationship between the two connected items. The strength of each link is displayed using a positive numerical value.

The advanced search formula in the Scopus scientific database was as follows: (TITLE-ABS-KEY (big AND data) AND TITLE-ABS-KEY (accounting OR auditing OR finance)) AND (LIMIT-TO (PUBYEAR, 2023) OR LIMIT-TO (PUBYEAR, 2004)) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (SUBJAREA, "BUSI") OR LIMIT-TO (SUBJAREA, "ECON")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j")).

Figure 4 presents a network visualization of the co-occurrence map of authors' keywords. Co-occurrence refers to the occurrence of two phrases near each other within a specific discipline, either indicating semantic proximity or idiomatic usage. From a corpus of 875 articles extracted from the

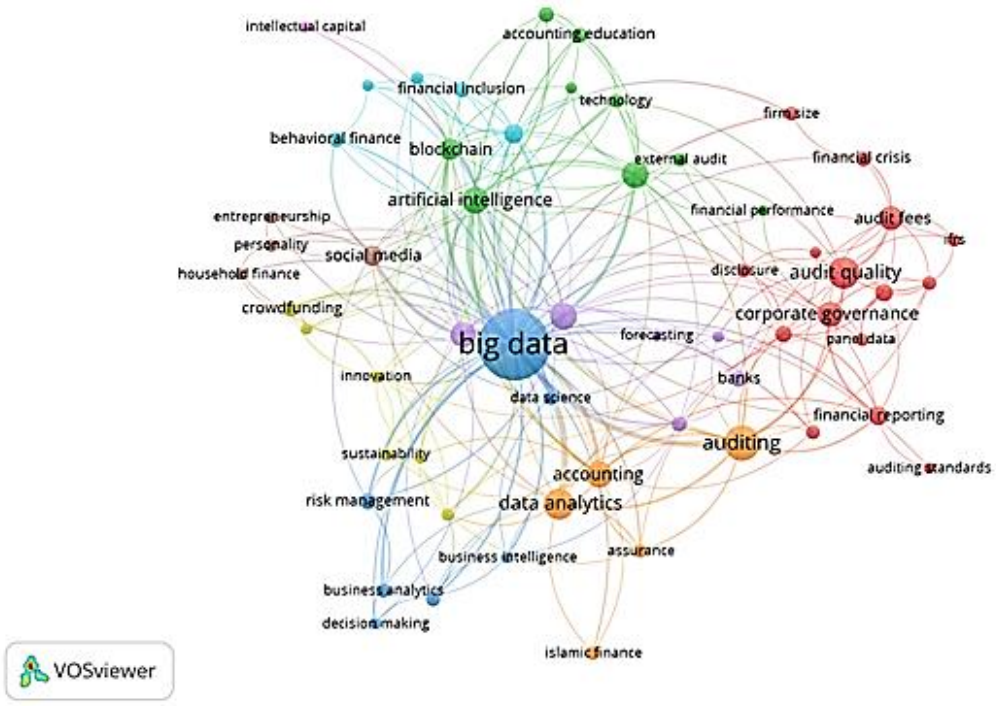

Fig. 4. Network visualization of co-occurrence map of authors' keywords.

Scopus scientific database, comprising a total of 2,711 keywords, we employed the free data visualization software VOSviewer to identify 79 keywords that co-occurred at least 5 times across different articles.

To refine the analysis, we manually removed 20 duplicate words through a search process, specifically excluding names of countries and geographical regions that did not contribute to advancing the research. Consequently, we constructed a final illustration map consisting of 59 words. Each word is represented by a node with a circle symbol, with the size of the circle corresponding to the frequency of appearance of the word in the articles. For example, in the depicted map, the word "big data" appears in 175 articles, while "auditing" appears in 43 articles. The size of the circle serves as an indicator of content production within the investigated field. A larger circle implies more extensive scientific production, whereas a smaller circle suggests a relatively limited body of research, guiding future investigations. Based on the co-occurrence rates with more similar articles, the 59 keywords were categorized into nine clusters, each depicted with a distinct color. For instance, the word "big data" belongs to cluster number 3, represented by the color blue, along with seven other words such as "business analytics," "business intelligence," "data science," "decision making," "management accounting," and "risk management. The lines connecting the nodes represent the links between them. Thicker lines and shorter distances between nodes signify a stronger association and a greater frequency of occurrence in shared articles. In the provided map, "big data" exhibits the strongest link with "data analytics," possessing a total link strength of 24. The distance between circles and the absence of connections between nodes indicate the lack of research and scientific production in the corresponding areas. Researchers can consider these unconnected fields for future exploration.

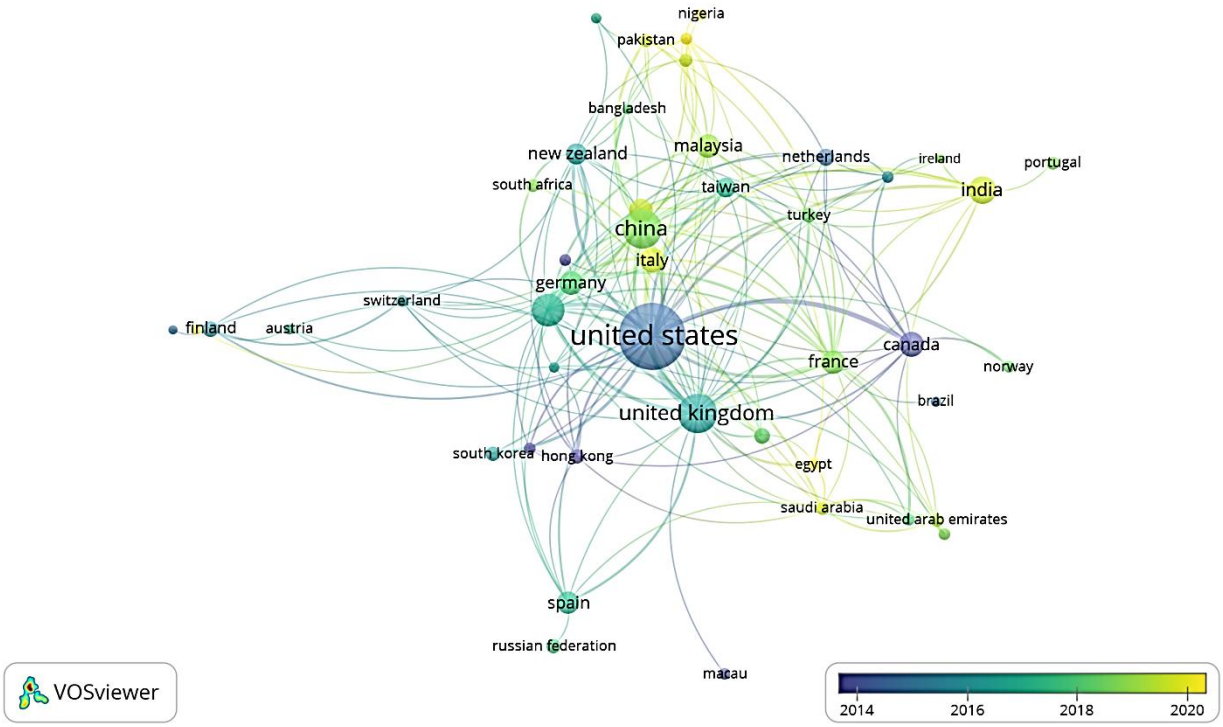

Fig. 5. Overlay visualization of co-authorship of countries.

In the picture, it is evident that the United States of America, the United Kingdom, and Germany have displayed the highest level of collaboration with other countries in the field of Big Data scientific content production over time. The use of color in overlay maps indicates the temporal trend. Nodes with colder colors (leaning towards purple) denote older data, whereas warmer colors (pale green, yellow, and red) signify newer information. Consequently, we can observe that between 2012 and 2016, the focus on big data, accounting, and auditing was prominent in the United States, Canada, and Hong Kong. However, starting in 2018, France, Italy, Egypt, and India began exploring these keywords in their scientific articles.

Several studies have been published examining the big data in auditing and accounting, out of the 875 documents extracted, six were identified as having been cited at least 200 times. A summary of the three most notable articles about the intersection of big data and accounting and auditing is given in Table 1.

Discussion and Conclusion

The objective of this article was to investigate the advancements in big data research within the realm of accounting and auditing spanning the years 2004 to 2023. The primary research methodology employed in this study involved bibliometric analysis and the techniques proposed can be generalized to any similar research, which entailed an examination of various attributes of published articles, including author collaborations across countries, topics, and keywords, as well as the identification of the most frequently cited articles. The sample for this research comprised 875 articles in the field of big data in accounting and auditing, all of which were indexed in the Scopus database over the aforementioned period. The findings revealed a consistent upward trend in the publication of articles, with the highest

Fig. 6. Network visualization of the most cited articles.

Table 1. Most notable articles about the intersection of big data and accounting and auditing

ranking	Number of citation	Publish year	author	article
1	864	2004	Shawnee K Vickery, Jayanth Jayaram, Cornelia Droge, Roger Calantone	The effects of an integrative supply chain strategy customer service and financial performance: an analysis of direct versus indirect relationships
2	559	2010	Pradeep K. Chintagunta, Shyam Gopinath, Sriram Venkataraman	The Effects of Online User Reviews on Movie Box Office Performance: Accounting for Sequential Rollout and Aggregation Across Local Markets
3	526	2005	Nigel Nicholson Emma Soane, Mark Fenton-O'Creevy &Paul Willman	Personality and domain-specific risk-taking

the number being recorded in 2021. The most commonly used terms in this field are "big data," "audit," "audit quality," "artificial intelligence," and "data analysis." The article titled "The Effects of an Integrative Supply Chain Strategy, Customer Service, and Financial Performance: An Analysis of Direct versus Indirect Relationships" by Shawnee K Vickery, Jayanth Jayaram, Cornelia Droge, and Roger Calantone is highly cited. The United States stands out as the most active publisher in this domain. Consequently, the progression of keywords can be categorized as follows: 1) Audit fees and quality, 2) Accounting and the four major audit firms, 3) Accounting education and the accounting profession, 4) Behavioral finance, data science, and business intelligence, and 5) Automation, digital transformation, and a retrospective analysis of the advancements in big data research in accounting and auditing. These developments are influenced by the business environment and contribute to comprehending, analyzing, and interpreting the evolution of accounting and auditing in response to changing societal expectations.

The examination of the provided maps demonstrates that researchers have primarily concentrated their attention on specific areas of study, emphasizing key

concepts such as big data, auditing, and data analysis. This analysis highlights a research gap in financial crises, accounting education, financial behavior, and risk management. Owing to this has not been previously investigated in the literature, scholars can address this topic by bringing it into focus and bridging this gap through rigorous research, thereby contributing to the advancement of scientific knowledge.

Moreover, the analysis of the second map demonstrates that in Iran, the topics of big data, auditing, and accounting are not receiving substantial attention from researchers and this is an area that requires further exploration. Iranian researchers can aid in elevating the country's scientific standing at the international level by considering trending keywords, publishing their articles in English, and indexing them in reputable academic databases. In this way, they can contribute to enhancing the scholarly stature of the country on a global scale.

Because there is still a lot of work required to do, It is suggested that researchers launch similar research studies in scientific databases other than Scopus and compare the results obtained from these studies.

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