AI in Accounting: Insights from a Bibliometric Analysis

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Abstract

Artificial intelligence has ushered in a new era of technological innovation, fundamentally transforming various sectors, including accounting. As businesses increasingly operate in a data-driven environment, the demand for real-time financial analysis and predictive insights has surged. This study aims to perform a bibliometric literature analysis focusing on significant literature, countries, authors, keywords, thematic evolution, citations, and documents, which researchers can reference in future studies related to the implementation of AI in accounting. VOSviewer software tool is used to create various maps based on the bibliographic data. The dataset was extracted from the Scopus database. Citation analysis, bibliographic coupling analysis, co-citation analysis, and co-occurrence analysis of author keywords are conducted. The analysis shows a sharp increase in research on AI and accounting from 2019, with 72 publications in 2023 and 66 publications by mid-2024, indicating rising interest and progress in this field. The bibliometric analysis reveals the dominant role of the United States in AI and accounting research. The co-occurrence analysis of author keywords shows important themes and their connections in AI and accounting, with artificial intelligence being the central theme, closely linked with other key concepts like accounting, machine learning, and big data. The findings underscore the practical implications of AI integration in accounting, emphasizing its potential to enhance efficiency, accuracy, and strategic decision-making in financial practices.

1. Introduction

Artificial intelligence (AI) is among the most developed and innovative technologies that will significantly impact the future. AI is transforming the world and altering our perceptions. The term *artificial intelligence*, introduced by John McCarthy, Emeritus Professor at Stanford University, in 1955, was defined by him as "the science and engineering of creating intelligent machines" (McCarthy *et al.*, 2006). AI refers to systems that display intelligent behavior by assessing their environment and taking action with some degree of autonomy to achieve specific objectives (Boucher, 2020). Over the last decade, its application has progressively expanded across various areas such as healthcare, finance, accounting, management, education, robotics, automotive, e-commerce, etc.

AI significantly influences traditional accounting practices and rapidly transforms the accounting profession by enhancing and reengineering activities within the field. For instance, AI-driven automation tools can handle

repetitive tasks such as data entry and transaction categorization, allowing accountants to focus on more strategic activities. Moreover, AI-powered analytics can provide deeper insights into financial data, improving decision-making processes. AI also reshapes traditional accounting education and teaching methods by incorporating advanced technologies into the curriculum.

In recent years, AI technologies, including machine learning, natural language processing, deep learning, and robotic process automation, have advanced rapidly, offering unprecedented capabilities in data analysis, pattern recognition, and decision-making processes. These innovations are especially relevant to the accounting field, where AI applications are transforming traditional practices by improving efficiency, accuracy, and strategic insight. AI technologies allow accountants to quickly process large volumes of data, detect anomalies, and generate more accurate forecasts. Despite these advancements, there is a need to understand the full extent of AI's impact on accounting, particularly regarding the integration of these technologies into everyday practices and their implications for the profession's future.

This study aims to conduct a bibliometric analysis of various scientific literature to identify the main topics, sources, authors, and widely cited articles and countries researching the implementation of artificial intelligence in accounting. Also, the co-occurrence analysis is applied to clarify the conceptual points of a domain. By synthesizing existing research and providing a comprehensive overview, this review aims to contribute to the ongoing discourse with AI's transformative impact on the accounting profession.

The article is structured as follows: The first section introduces the topic. The second section contains the literature review and the third part describes the methodology and the dataset analyzed. The fourth section presents and discusses the results. The final part summarizes the main conclusions from the bibliometric analysis and briefly discusses its implications for future research.

2. Systematic literature review

Numerous studies analyze the impact of AI technologies on accounting, including on the accounting profession and accounting education. Some of the publications presented below are not indexed in the Scopus database, but contain fundamental contributions and results in AI and the accounting field.

Issa *et al.* (2016) discussed the AI applications in auditing processes. Their results show that AI will replace auditors in automated tasks, designing audit plans and AI will continuously improve the audit process with self-correction capabilities. Dai and Vasarhelyi (2017) explored the blockchain's role in accounting, auditing and smart contracts. The authors proposed blockchain for real-time accounting and automated assurance systems. Lee and Tajudeen (2020) examined the adoption and impact of AI-based accounting software in Malaysian organizations. Their findings reveal that AI-based accounting tools are primarily used for depositing document images, automatically capturing invoice information, monitoring invoice approvals, managing risks, and tracking user activities.

Alghafiqi and Munajat (2022) provided an overview of the latest developments in artificial intelligence, big data and machine learning in the accounting profession. Their results showed that AI, big data, machine learning impact accounting profession globally. Using a quantitative approach with a questionnaire and SPSS-22 analysis, Solikin and Darmawan (2023) examined the usage of artificial intelligence in the accounting industry and its effects on the sector's expansion. The authors established that AI is transforming accounting methods and professionals need to adapt to AI systems in accounting. They found that AI techniques significantly enhance public accounting information systems. They also recommended that organizations align intelligent systems with financial targets.

Odonkor *et al.* (2024) identified challenges in AI integration, such as the need for skilled personnel, data privacy concerns, and high costs, but emphasized AI's potential to revolutionize accounting practices, fostering growth and innovation in the digital age. Kindzeka (2023) established that AI systems, including expert systems and natural language generation technologies, improve the accuracy and efficiency of accounting information. Stancheva-Todorova (2018) suggested that, while some accounting tasks may become automated, accountants can leverage new capabilities to address future challenges and opportunities. The paper emphasized the importance

of updating university curricula to meet industry demands, particularly in big data and analytics for the accounting profession.

Mihai and Duțescu (2022) assessed the impact of cloud computing on the accounting profession, examining its advantages and disadvantages, especially during the COVID-19 crisis, and discussed its potential for implementing more intelligent solutions. The results indicate that cloud accounting modernizes the business environment by providing real-time access and increased agility. AI solutions reduce errors, save time, and support decision-making. Specifically, AI impacts accounting in small companies through the use of cloud computing.

Several researchers have conducted a bibliometric analysis on the implication of AI on accounting, such as Varma *et al.* (2021), Khan *et al.* (2023), Stafie and Grosu (2023), and Oktavianto and Hardini (2024).

Ayad and El Mezouari (2022) examined research trends and prominent themes in AI applications across five accounting subfields by using VOSviewer software. They found that financial accounting is the most commonly researched area, with financial statement fraud detection being the most frequently addressed theme. Bunget and Lungu (2023) analyzed the impact of AI on the accountancy profession through bibliometric analysis. Their results showed that over 90% of relevant articles were published between 2015 and 2022, with the United States, Romania, China, and Australia being the leading countries in AI and accounting research. Tavares and Vale (2024) explored the intersection of accounting, sustainability, and AI by applying bibliometric analysis. Their findings revealed a growing convergence between these domains and indicated that most studies are co-authored and predominantly article based.

3. Research methodology

The paper aims to provide a comprehensive visualization of the research landscape on the topic *AI and accounting* to assess the current state of knowledge in this field. Applying bibliometric analysis, the study identifies prevailing research trends and suggests promising areas for future exploration. A bibliometric analysis is a structured method for understanding the dynamics of a specific knowledge domain through various analytical tools (Rejeb *et al.*, 2022). Bibliometric analysis investigates and maps published material across multiple scientific areas. The study follows a three-step research procedure: identifying relevant keywords and databases, collecting data, and conducting analysis to derive results (Varma *et al.*, 2021). The dataset was extracted from the Scopus database, a leading platform in scientific research. For the bibliometric analysis, the keywords *AI* and *accounting* were used, with search criteria limited to *article title, abstract, keyword*. The subject areas were filtered to include *business, management and accounting* (164 documents), *economics, econometrics and finance* (112 documents), and *social sciences* (111 documents). Document types were restricted to articles, book chapters, conference papers, and books, all in English. The research was conducted in June 2024, covering publications from 2005 to 2024, resulting in a final dataset of 265 documents.

Using VOSviewer software, this study enhances the accounting literature by examining the intersection of AI and accounting. VOSviewer is a robust tool for creating and visualizing bibliometric maps. The analyses performed include citation analysis, bibliographic coupling, co-citation analysis, and co-occurrence analysis of author keywords. By these methods, this study provides a detailed overview of current research trends and highlights key areas for future research in the integration of AI within accounting.

4. Results and discussion

Using VOSviewer, various maps were created from the bibliographic data, which includes 265 documents. Figure 1 illustrates the annual distribution of articles from 2005 to 2024. A noticeable increase in publications, including the keywords *AI* and *accounting*, began after 2019 (nine publications). This increase suggests a growing recognition of the relevance and potential of AI in the accounting field. The trend continues to rise sharply, peaking in 2023 with 72 articles. By mid-2024, 66 articles had already been published, indicating that the upward trend is ongoing. It is reasonable to project that the total number of publications for 2024 will surpass the previous year's peak if the current pace continues.
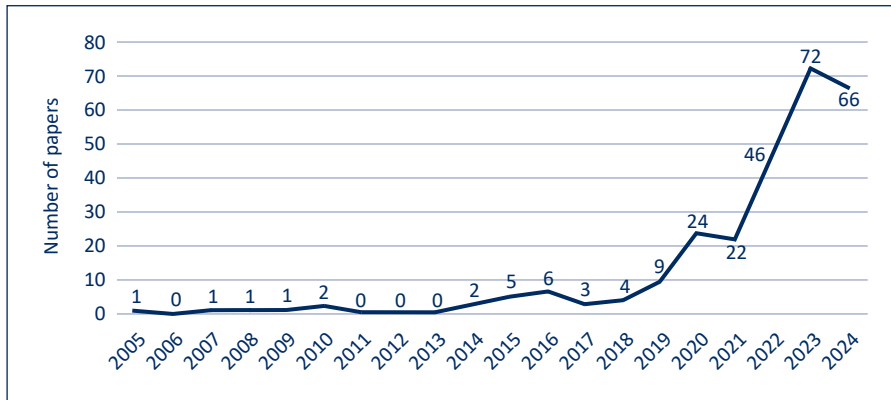
Figure 1. Number of papers (by years)

For the analysis, VOSviewer's powerful tools, focusing on two key attributes: links and total link strength, are used. *Links* indicates the number of connections a variable has with other variables, while *total link strength* measures the overall strength of these connections. In the visualizations, an item's size reflects its total link strength, and the thickness of the connecting lines represents the link strength.

4.1. Citation analysis of sources

Table 1 lists the most productive journals, with 12 out of 202 meeting the minimum threshold of three documents. The Journal of Emerging Technologies in Accounting leads with ten articles, indicating its prominence and influence in the research area AI and accounting. Sustainability (Switzerland) follows with eight articles, while the Artificial Intelligence Approaches to Sustainable Accounting and Journal of Risk and Financial Management have five and four articles, respectively.

In addition, the Journal of Emerging Technologies in Accounting has the highest number of citations, totaling 169. The next most cited journal is the International Journal of Accounting Information Systems, with 105 citations, followed by the Journal of Applied Accounting Research, which has 94 citations.

When examining the impact through the indicator *average article citations* (total citations per journal/total number of articles), the International Journal of Accounting Information Systems stands out with an impressive average of 35 citations per article, highlighting the high relevance of its publications, despite having only three articles. Similarly, the Journal of Applied Accounting Research has a significant average of 31.33 citations per article, reinforcing its importance in the field.

Table 1. List of sources ranked based on citation total link strength

Source	Documents	Citations	Average number of citations	Total link strength
Journal of Emerging Technologies in Accounting	10	169	16.90	4
Artificial Intelligence Approaches to Sustainable Accounting	5	0	0.00	3
International Journal of Accounting Information Systems	3	105	35.00	2
Journal of Applied Accounting Research	3	94	31.33	2
Critical Perspectives on Accounting	3	2	0.67	1
Advances in Accounting Education: Teaching and Curriculum Innovations	3	2	0.67	0
Financial and Credit Activity: Problems of Theory and Practice	3	5	1.67	0
IEEE Transactions on Engineering Management	3	0	0.00	0

Source	Documents	Citations	Average number of citations	Total link strength
International Journal of Data and Network Science	3	38	12.67	0
Journal of Risk and Financial Management	4	20	5.00	0
Sustainability (Switzerland)	8	82	10.25	0
Technological Forecasting and Social Change	3	67	22.33	0

Figure 2 depicts the network visualization map of the journals with the strongest link strength of citations in the field of AI and accounting. Only five journals meet all criteria and are connected to each other. Notably, the Journal of Emerging Technologies in Accounting stands out as the most influential and pioneering journal on the topic of AI and accounting, with the highest total link strength of four. This indicates that it is central to discussions on AI and accounting. Other journals also show strong connections, highlighting a collaborative research environment with frequent knowledge sharing.

Figure 2. Network visualization map of the journals
with the strongest link strength of citation

Source: VOSviewer

4.2. Citation analysis of countries

Table 2 highlights the leading countries contributing to research in AI and accounting regarding the number of publications and citations. The United States leads with 61 publications and 785 citations, emphasizing its significant role in this field. The United Kingdom follows with 22 documents and 636 citations, indicating its strong research presence. Australia, Germany, and India also make substantial contributions, with 17, 16, and 11 publications, respectively. Notably, the Netherlands, although having only six publications, shows the highest average number of citations per article (39), reflecting the high impact of its research. Five European countries – the United Kingdom, Germany, Finland, the Netherlands, and Austria – are among the top ten, demonstrating Europe's active engagement in this research area. Unfortunately, Bulgaria is not listed among the top contributors. This distribution indicates a diverse geographical interest in AI and accounting, with notable research activity concentrated in North America, Europe, and parts of Asia.

Table 2. List of top 26 countries by number of citations and documents

Country	Documents	Citations	Average number of citations	Total link strength
United States	61	785	12.87	37
United Kingdom	22	636	28.91	14
Australia	17	371	21.82	5
Germany	11	333	30.27	1

Country	Documents	Citations	Average number of citations	Total link strength
India	16	273	17.06	1
Finland	15	262	17.47	25
Netherlands	6	234	39.00	0
Austria	8	123	15.38	23
Taiwan	10	108	10.80	0
United Arab Emirates	7	105	15.00	1
China	20	96	4.80	3
Canada	6	90	15.00	5
Jordan	11	88	8.00	5
France	6	87	14.50	2
Saudi Arabia	10	75	7.50	13
Vietnam	5	69	13.80	3
Portugal	9	49	5.44	4
Malaysia	6	34	5.67	2
New Zealand	5	32	6.40	11
Indonesia	9	20	2.22	5
Sweden	5	19	3.80	0
Italy	6	14	2.33	2
Spain	6	11	1.83	0
South Africa	6	7	1.17	4
Bahrain	7	6	0.86	1
Russian Federation	9	4	0.44	0

Figure 3 illustrates the international collaboration in AI and accounting research. The United States emerges as a central hub, collaborating with researchers from 15 other countries and possessing the highest total link strength of 37. The United Kingdom also shows significant collaboration with countries such as Malaysia, Portugal, Finland, Vietnam, Saudi Arabia, Jordan, Austria, and the United States.
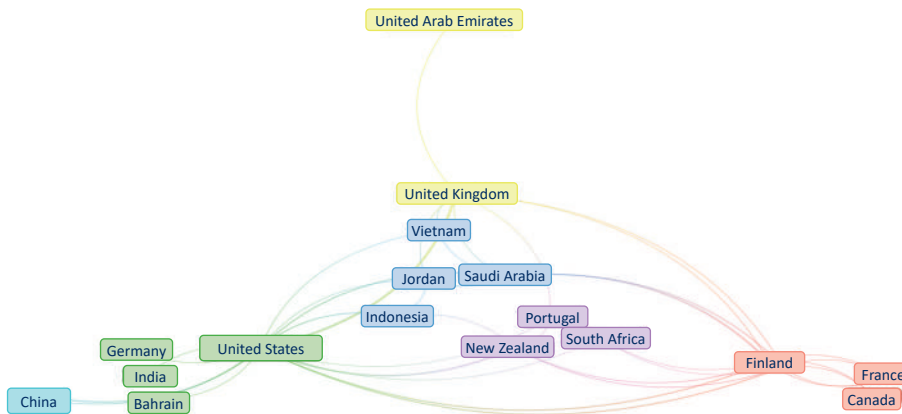

Figure 3. Network visualization map of countries' collaborative relationships in terms of citations

Source: VOSviewer

4.3. Citation analysis of documents

Bibliometric analysis is employed to identify the most cited documents in the field of AI and accounting. Table 3 presents the top 13 cited publications, with the highest citation count attributed to *Revisiting the Risk of Automation*, by Arntz, Gregory, and Zierahn (259 citations), followed by *The Role of Internet-related Technologies in Shaping the Work of Accountants: New Directions for Accounting Research*, by Moll and Yigitbasioglu (235 citations), and *The Ethical Implications of Using Artificial Intelligence in Auditing*, by Munoko, Brown-Liburd, and Vasarhelyi (155 citations).

Arntz *et al.* (2017) concluded that specialized jobs have fewer automatable tasks, reducing automation potential, and workers focus on non-automatable niches within their profession. Their results reveal that automation risk drops from 38% to 9% in US jobs. Moll and Yigitbasioglu (2019) determined that cloud, big data, blockchain, and AI transforming accounting practices. The authors established that accountants need to develop skills and policies for technology governance. Additionally, research gaps exist in understanding the technology's impact on accountants. Munoko *et al.* (2020) found that AI in auditing offers efficiency, insight, and competitive advantages. The results show that ethical concerns may negate benefits. Continuous ethical consideration is crucial.

Wieringa (2020) defined algorithmic accountability based on accountability theory and algorithmic accountability literature. Tiwari and Khan (2020) discussed Industry 4.0's impact on sustainability accounting and reporting. The authors supposed that the validity of empirical formulation needs further research for sustainability accounting. Han *et al.* (2023) examined the intersection of blockchain technology and accounting, particularly focusing on AI-enabled auditing. The results reveal that blockchain technology has changed record-keeping in accounting. The study discusses how blockchain can reduce information asymmetry and improve stakeholder collaboration. Gotthardt *et al.* (2020) discussed robotic process automation (RPA) and artificial intelligence challenges in accounting and auditing. The authors recognize that the potential of RPA and AI in the realm of accounting and auditing is on the rise and is currently being seized.

Table 3. Top 13 cited publications

Authors	Title of the article	Journal and year of article publication	Number of citations
Arntz, M., Gregory, T., Zierahn, U.	*Revisiting the Risk of Automation*	Economics Letters, 2017	259
Moll, J., Yigitbasioglu, O.	*The Role of Internet-related Technologies in Shaping the Work of Accountants: New Directions for Accounting Research*	The British Accounting Review, 2019	235
Munoko, I., Brown-Liburd, H.L., Vasarhelyi, M.	*The Ethical Implications of Using Artificial Intelligence in Auditing*	Journal of Business Ethics, 2020	155
Wieringa, M.	*What to Account for When Accounting for Algorithms: A Systematic Literature Review on Algorithmic Accountability*	Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency, 2020	146
Mahroof, K.	*A Human-Centric Perspective Exploring the Readiness Towards Smart Warehousing: The Case of a Large Retail Distribution Warehouse*	International Journal of Information Management, 2019	110
Tiwari, K., Khan, M.S.	*Sustainability Accounting and Reporting in the Industry 4.0*	Journal of Cleaner Production, 2020	103

Authors	Title of the article	Journal and year of article publication	Number of citations
Han, H., Shiwakoti, R.K., Jarvis, R., Mordi, C., Botchie, D.	*Accounting and Auditing with Blockchain Technology and Artificial Intelligence: A Literature Review*	International Journal of Accounting Information Systems, 2023	94
Sood, K., Dhanaraj, R.K., Balusamy, B., Grima, S., Maheshwari, R.U.	*Big Data. A Game Changer for Insurance Industry*	Emerald Studies in Finance, Insurance, and Risk Management, 2022	76
Damerji, H., Salimi, A.	*Mediating Effect of Use Perceptions on Technology Readiness and Adoption of Artificial Intelligence in Accounting*	Accounting Education, 2021	72
Bhargava, A., Bester, M., Bolton, L.	*Employees' Perceptions of the Implementation of Robotics, Artificial Intelligence, and Automation (RAIA) on Job Satisfaction, Job Security, and Employability*	Journal of Technology in Behavioral Science, 2021	68
Gotthardt, M., Koivulaakso, D., Paksoy, O., Saramo, C., Martikainen, M., Lehner, O.	*Current State and Challenges in the Implementation of Smart Robotic Process Automation in Accounting and Auditing*	ACRN Journal of Finance and Risk Perspectives, 2020	68
Leitner-Hanetseder, S., Lehner, O.M., Eisl, C., Forstenlechner, C.	*A Profession in Transition: Actors, Tasks and Roles in AI-Based Accounting*	Journal of Applied Accounting Research, 2021	65
Kend, M., Nguyen, L.A.	*Big Data Analytics and Other Emerging Technologies: The Impact on the Australian Audit and Assurance Profession*	Australian Accounting Review, 2020	63

4.4. Citation analysis of authors

Table 4 illustrates the four most cited authors in the domain of AI and accounting. Leading the citation count is Lehner, with a total of 98 citations across six published papers, making him the most productive author. Following Lehner, Rodgers ranks second with 53 citations. Notably, Rodgers holds the highest average number of citations per article, with an impressive 17.67.

Table 4. Top four cited authors

Authors	Citations	Documents	Average number of citations
Lehner, O.M.	98	6	16.33
Rodgers, W.	53	3	17.67
Firmansyah, I.	16	3	5.33
Hamdan, A.	3	3	1.00

4.5. Bibliographic coupling based on documents

Bibliographic coupling is a link between two documents that both cite the same third document. Consequently, this common third document appears in the references of the other two documents. Table 5 and Figure 4 provide insights into the bibliographic coupling among authors in the field of AI and accounting.

Lehner is with the strongest link strength of 605, the highest among all authors. Lehner has authored six documents, accumulating 98 citations, indicating his prolific contributions and the high impact of his work. Eisl takes second place, with a total link strength of 473, based on two documents and 65 citations. This suggests that, while Eisl has fewer publications, the referenced documents are highly influential, leading to strong bibliographic connections. Cooper, Ewing, and Mishra all share an equal link strength of 467, each with two documents and 32 citations.

Table 5. Bibliographic coupling based on authors (Top five authors)

Authors	Citations	Documents	Total link strength
Lehner, O.M.	98	6	605
Eisl, C.	65	2	473
Cooper, H.B.	32	2	467
Ewing, M.T.	32	2	467
Mishra, S.	32	2	467

Figure 4 visually represents these connections, with Lehner positioned at the center of a network map, underscoring his central role in the bibliographic coupling within the AI and accounting research topic. Authors with higher link strengths appear closer to the center, indicating their pivotal role in the scholarly discourse on AI and accounting. Authors with higher link strengths are positioned nearer to the center, highlighting their central role in the academic discussion on AI and accounting. To summarize, bibliographic coupling occurs when two documents reference a common third document, establishing a link between the authors of those documents.
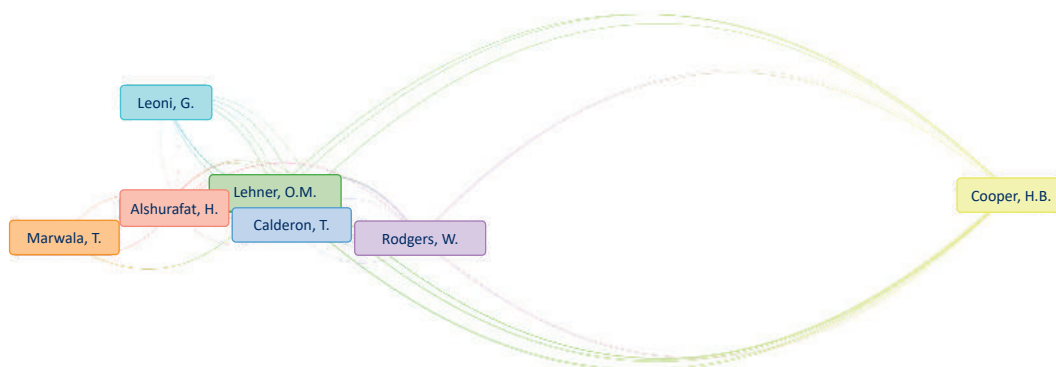

Figure 4. Bibliographic coupling visualization map by authors

Source: VOSviewer

4.6. Co-citations analysis of authors

Co-citation occurs when a new document cites two other documents. According to Ramos-Rodríguez and Ruíz-Navarro (2004), co-citation is useful for identifying related topics and authors with shared interests in the field.

Table 6 summarizes the top ten co-cited authors, the number of times a document is co-cited with other documents, and the link strength in the AI and accounting topic. Vasarhelyi emerges as the most co-cited author, with 88 citations. Sun, Kokina, and Dai also demonstrate substantial co-citations, indicating their significant contributions to the examined field.

Table 6. Co-cited authors (Top ten authors)

Authors	Citations	Total link strength
Vasarhelyi, M.A.	88	1,251
Vasarhelyi, M.A.	57	900
Sun, T.	55	881
Vasarhelyi, M.A.	52	824
Kokina, J.	51	727
Dai, J.	34	683
Kogan, A.	41	623
Arnold, V.	41	594
Zhang, C.	37	574
Wang, Y.	40	562

Figure 5 provides a network visualization map of co-citation cited authors, with the greatest total link strength. The number of authors is 39 and they form three clusters. Vasarhelyi is at the center of the network map, indicating his extensive collaborations with other top researchers.
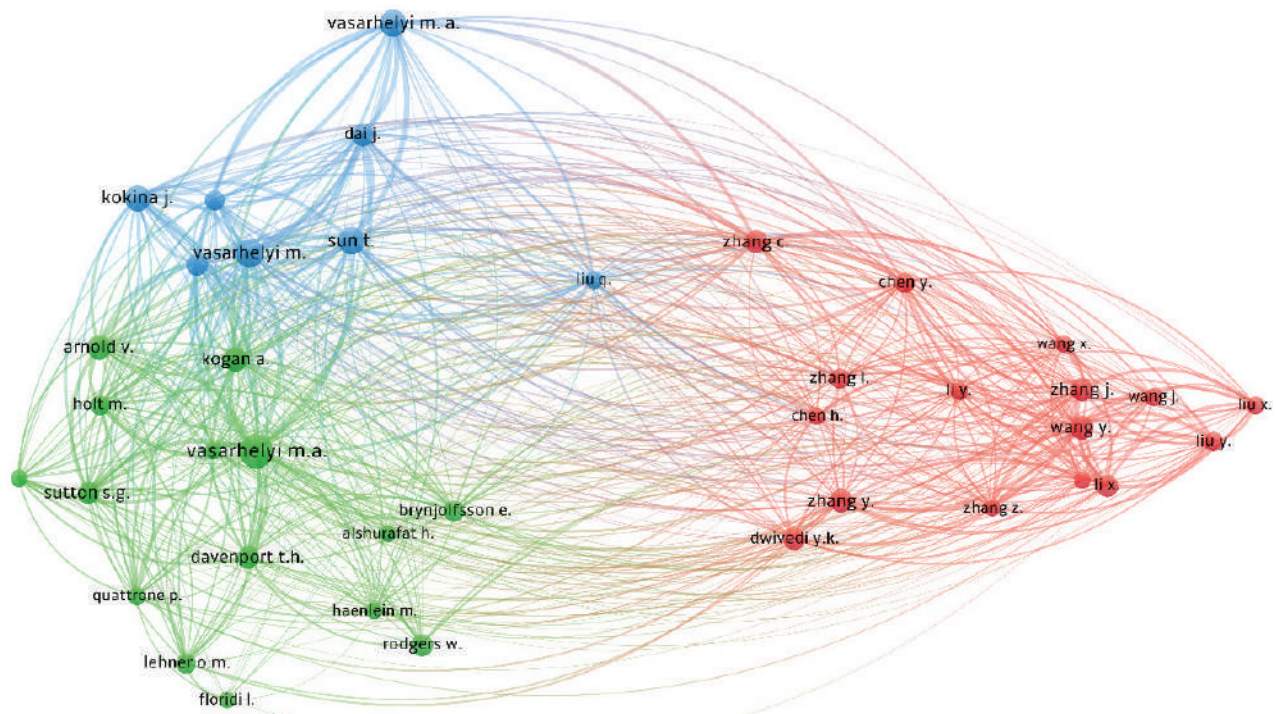

Figure 5. Network visualization map of the co-citation cited authors

Source: VOSviewer

4.7. Co-authorship analysis by organizations

Co-authorship analysis by organizations reveals the institutions with the highest number of documents. Table 7 lists the top 11 organizations by the number of documents and citations in the field of AI and accounting. Henken School of Economics in Helsinki, Finland, emerges as the most productive university, with seven documents

and 166 citations in the field of AI and accounting. Following Henken, the University of Applied Sciences Upper Austria (two documents and 85 citations), and Deakin University, Australia (two documents and 32 citations), also demonstrate notable contributions.

Table 7. List of top 11 organizations by number of documents and citations

Organizations	Documents	Citations
Henken School of Economics, Helsinki, Finland	7	166
Controlling, Accounting and Financial Management, School of Business and Management, University of Applied Sciences Upper Austria, Steyr	2	85
Faculty of Business and Law, Deakin University, Victoria, Australia	2	32
Financial University under the Government of the Russian Federation, Moscow	2	3
School of Accounting, University of Johannesburg, South Africa	2	2
University of Johannesburg, South Africa	2	2
Ahlia University, Manama, Bahrain	3	2
University of Applied Sciences, Austria	2	1
Rostov State University of Economics, Rostov-on-Don, the Russian Federation	2	1
Haldia Institute of Technology, India	2	0
University of Aveiro, Portugal	2	0

The organizations with the greatest total link strength are presented in Figure 6. The universities are grouped into two clusters. The cluster 1 (red) contains the University of Applied Sciences Upper Austria (Controlling, Accounting and Financial Management, School of Business and Management) and the Henken School of Economics, Helsinki, Finland. The cluster 2 (green) has only one item – the University of Applied Sciences, Austria. The Henken School of Economics is with greatest link strength – four. To sum up, Henken School of Economics, as the leading contributor, appears as a central node in the network, indicating its extensive collaborations with other institutions.

Figure 6. Network visualization map of co-authorship of organizations

Source: VOSviewer

4.8. Co-occurrence author keyword analysis

Keyword co-occurrence analysis involves constructing co-occurrence networks, by identifying keywords in the text, calculating the frequencies of co-occurrences, and analyzing the networks to find central words and clusters of themes. In the visualization, the size of each circle corresponds to the frequency of the keyword's occurrence in the publication set from Scopus. The bigger the circle, the more frequently the keyword appears. Each keyword is assigned to a cluster based on a computer algorithm, with each cluster represented by a distinct colour. Each one of the keywords is linked with the others with a line. Thicker lines denote stronger link strengths,

signifying that these keywords frequently appear together in the literature. Keywords that co-occur frequently tend to be located close to each other in the visualization.

The co-occurrence analysis is based on 861 authors' keywords and, to be included in the visualization, author keywords should occur a minimum of five times. Only 19 keywords meet this threshold.

Table 8 shows the author keywords, the number of occurrences, and the total link strength. The most frequent author keyword is *artificial intelligence*, with 97 occurrences and a total link strength of 106. The other five most common author keywords are *accounting* (30 occurrences and 53 total link strength), *machine learning*, *big data*, *accounting education*, and *blockchain*.

Table 8. Author keyword occurrence

Author keywords	Occurrences	Total link strength
Artificial intelligence	97	106
Accounting	30	52
Machine learning	22	36
Big data	12	27
Accounting education	11	20
Blockchain	8	19
Data analytics	8	18
Auditing	9	17
AI	13	16
Artificial intelligence	26	16
ChatGPT	9	12
Decision-making	8	12
Technology adoption	5	12
Accountancy profession	8	10
Deep learning	8	10
Ethics	7	10
Automation	5	8
Finance	5	6
Sustainability	5	5

Figure 7 presents a network visualization map of co-occurrence on the author keyword. The link strength between the keywords *artificial intelligence* and *accounting* is 20, indicating a strong association between these two themes. All keywords form four clusters with different colours and each color represents a thematic cluster:

✓ **Red cluster** contains the following keywords: *artificial intelligence, automation, big data, blockchain, data analytics, deep learning*, and *machine learning*. These keywords are closely related and often co-occur, reflecting the central theme of technological advancements and data-driven approaches in AI and accounting research.

✓ **Green cluster** contains keywords such as *accounting*, *AI*, *finance*, and *sustainability*. These keywords are grouped together, suggesting a thematic connection between accounting practices, financial applications of AI, and sustainability considerations within the field.

✓ **Blue cluster.** Keywords include *accounting education*, *accounting profession*, *auditing*, and *technology adoption*. This cluster represents themes related to the educational aspects of accounting, professional practices, auditing procedures, and the adoption of technology in accounting processes.

✓ **Yellow cluster.** This combines the following keywords: *artificial intelligence*, *ChatGPT*, *decision-making*, and *ethics*. This cluster encompasses themes associated with ethical considerations, decision-making processes, and the application of AI, particularly through platforms like ChatGPT, in accounting contexts.
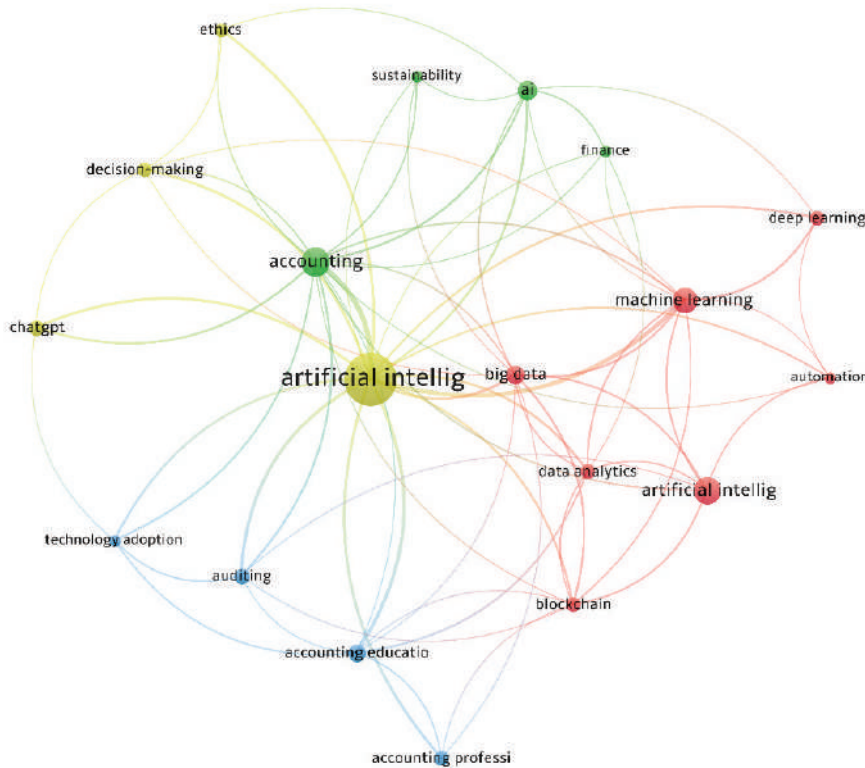

Figure 7. Network visualization map of co-occurrence on author keywords

Source: VOSviewer

4.9. Co-occurrence index keyword analysis

Co-occurrence index keyword analysis involves identifying and analyzing keywords that frequently appear together in a set of publications. This process helps to uncover the relationships and thematic connections between different keywords. Figure 8 displays a network visualization map that illustrates the co-occurrence relationships among index keywords in the field of AI and accounting. The index keywords form three clusters. The green cluster contains the keywords *artificial intelligence*, *machine learning*, *decision-making*, *sustainability*, and *sustainable development*. The red cluster contains the keywords *machine learning*, *deep learning*, *learning systems*, and *forecasting*. The blue cluster contains the keywords *information systems*, *economics*, and *economic and social effects*.

The keyword *artificial intelligence* is centrally located and highly connected to other keywords. The visualization map reveals that there is a robust link between *artificial intelligence* and *machine learning*, as well as *decision-making*, highlighting their frequent co-occurrence. Additionally, keywords positioned close to each other on the map, such as *machine learning* and *artificial intelligence*, are often discussed together in research, reflecting their interrelated nature.
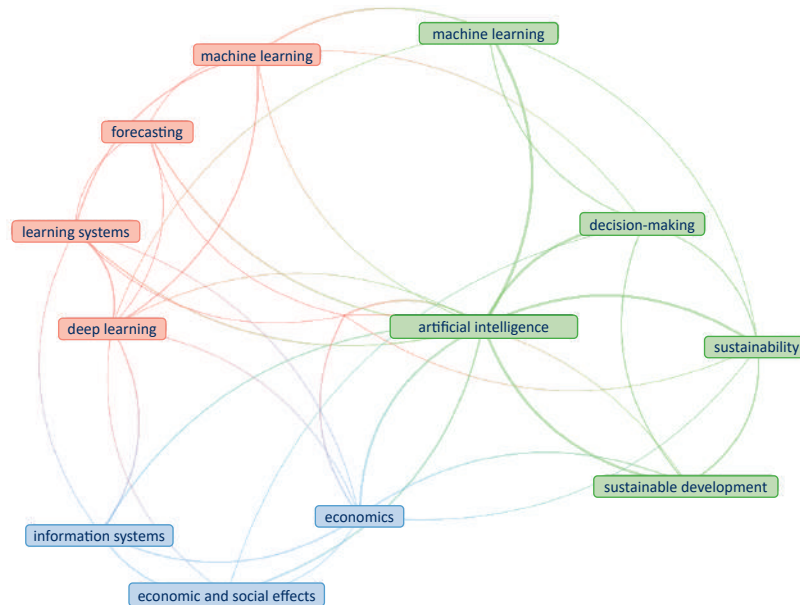
Figure 8. Network visualization map of co-occurrence on index keywords

Source: VOSviewer

5. Conclusion

The integration of AI in accounting has transformed the field, enhancing efficiency, accuracy, and decision-making processes. This study's bibliometric analysis reveals the significant growth and impact of AI applications in accounting research, highlighting key trends and influential contributions.

The growing number of publications since 2019, including 72 in 2023 and 66 by mid-2024, highlights the increasing importance and use of AI in accounting research. The bibliometric analysis shows that the Journal of Emerging Technologies in Accounting has the highest number of citations (169 citations) and the highest number of papers (ten documents). The results reveal the leading role of the United States in AI and accounting research, with 61 publications and 785 citations, followed by the United Kingdom, with 22 documents and 636 citations. The Netherlands' high average citations per article (39) is noteworthy, despite its fewer publications, revealing impactful research. The citation analysis of authors reveals that Lehner as the most cited and productive researcher in the field of AI and accounting. Vasarhelyi emerges as the most co-cited author, with 88 citations. The co-occurrence analysis of author keywords shows important themes and their connections in AI and accounting, with *artificial intelligence* being the central theme, closely linked with other key concepts like *accounting*, *machine learning*, and *big data*. Additionally, the most frequent author keyword is *artificial intelligence*, with 97 occurrences and a total link strength of 106.

These findings have important implications for both academics and practitioners. The identification of key themes and influential authors provides a roadmap for future research endeavors and collaboration opportunities. Practitioners can leverage insights from highly cited works to implement cutting-edge AI technologies in accounting practices effectively.

Future research should explore the ethical implications and regulatory challenges of integrating AI in accounting, as these areas remain unexplored. Additionally, longitudinal studies examining the evolution of AI applications in accounting could provide deeper insights into long-term trends and impacts. This bibliometric analysis methodologically contributes to the field by providing a comprehensive overview of the research landscape, identifying key contributors, and elucidating major themes and trends. It serves as a valuable resource for guiding future research and fostering a deeper understanding of the interplay between AI and accounting.

References

1. Alghafiqi, B., Munajat, E. (2022), *Impact of Artificial Intelligence Technology on Accounting Profession*, Berkala Akuntansi dan Keuangan Indonesia, Vol. 7, No. 2, pp. 140-159, https://doi.org/10.20473/baki.v7i2.27934.

2. Arntz, M., Gregory, T., Zierahn, U. (2017), *Revisiting the Risk of Automation*, Economics Letters, Vol. 159, pp. 157-160, https://doi.org/10.1016/j.econlet.2017.07.001.

3. Ayad, M., El Mezouari, S. (2022), *Research on the Implication of Artificial Intelligence in Accounting Subfields: Current Research Trends from Bibliometric Analysis, and Research Directions*, International Journal of Accounting, Finance, Auditing, Management and Economics, Vol. 3, No. 5-1, pp. 503-522, https://doi.org/10.5281/zenodo.7195995.

4. Bhargava, A., Bester, M., Bolton, L. (2021), *Employees' Perceptions of the Implementation of Robotics, Artificial Intelligence, and Automation (RAIA) on Job Satisfaction, Job Security, and Employability*, Journal of Technology in Behavioral Science, Vol. 6, No. 1, pp. 106-113, https://doi.org/10.1007/s41347-020-00153-8.

5. Boucher, P. (2020), *Artificial Intelligence. How Does It Work, Why Does It Matter, and What We Can Do About It?*, Directorate General for Parliamentary Research Services, European Parliament, https://data.europa.eu/doi/10.2861/44572.

6. Bunget, O.-C., Lungu, C. (2023), *A Bibliometric Analysis of the Implications of Artificial Intelligence on the Accounting Profession*, CECCAR Business Review, No. 4, pp. 9-16, https://doi.org/10.37945/cbr.2023.04.02.

7. Dai, J., Vasarhelyi, M.A. (2017), *Toward Blockchain-Based Accounting and Assurance*, Journal of Information Systems, Vol. 31, No. 3, pp. 5-21, https://doi.org/10.2308/isys-51804.

8. Damerji, H., Salimi, A. (2021), *Mediating Effect of Use Perceptions on Technology Readiness and Adoption of Artificial Intelligence in Accounting*, Accounting Education, Vol. 30, No. 2, pp. 107-130, https://doi.org/10.1080/09639284.2021.1872035.

9. Gotthardt, M., Koivulaakso, D., Paksoy, O., Saramo, C., Martikainen, M., Lehner, O. (2020), *Current State and Challenges in the Implementation of Smart Robotic Process Automation in Accounting and Auditing*, ACRN Journal of Finance and Risk Perspectives, Vol. 9, No. 1, pp. 90-102, https://doi.org/10.35944/jofrp.2020.9.1.007.

10. 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, Vol. 48, https://doi.org/10.1016/j.accinf.2022.100598.

11. Issa, H., Sun, T., Vasarhelyi, M.A. (2016), *Research Ideas for Artificial Intelligence in Auditing: The Formalization of Audit and Workforce Supplementation*, Journal of Emerging Technologies in Accounting, Vol. 13, No. 2, pp. 1-20, https://doi.org/10.2308/jeta-10511.

12. Kend, M., Nguyen, L.A. (2020), *Big Data Analytics and Other Emerging Technologies: The Impact on the Australian Audit and Assurance Profession*, Australian Accounting Review, Vol. 30, No. 4, pp. 269-282, https://doi.org/10.1111/auar.12305.

13. Khan, H.M.R., Ahmad, S., Javed, R., Nasir, N. (2023), *The Significance of Artificial Intelligence in Business and Accounting: A Bibliometric Analysis*, Pakistan Journal of Humanities and Social Sciences, Vol. 11, No. 2, https://doi.org/10.52131/pjhss.2023.1102.0417.

14. Kindzeka, K.C. (2023), *Impact of Artificial Intelligence on Accounting, Auditing and Financial Reporting*, American Journal of Computing and Engineering, Vol. 6, No. 1, pp. 29-34, https://doi.org/10.47672/ajce.1433.

15. Krishna, S.H., Pattnaik, M., Patil, A., Rao, K.T.V., Muda, I., Saravanan, S. (2022), *Artificial Intelligence Influence on Accounting Methods*, in *2022 5th International Conference on Contemporary Computing and Informatics (IC3I)*, Uttar Pradesh, India, pp. 2120-2125, https://doi.org/10.1109/IC3I56241.2022.10073067.

16. Lee, C.S., Tajudeen, F.P. (2020), *Usage and Impact of Artificial Intelligence on Accounting: Evidence from Malaysian Organisations*, Asian Journal of Business and Accounting, Vol. 13, No. 1, pp. 213-240, https://doi.org/10.22452/ajba.vol13no1.8.

17. Leitner-Hanetseder, S., Lehner, O.M., Eisl, C., Forstenlechner, C. (2021), *A Profession in Transition: Actors, Tasks and Roles in AI-Based Accounting*, Journal of Applied Accounting Research, Vol. 22, No. 3, pp. 539-556, https://doi.org/10.1108/JAAR-10-2020-0201.

18. Mahroof, K. (2019), *A Human-Centric Perspective Exploring the Readiness Towards Smart Warehousing: The Case of a Large Retail Distribution Warehouse*, International Journal of Information Management, Vol. 45, pp. 176-190, https://doi.org/10.1016/j.ijinfomgt.2018.11.008.

19. McCarthy, J., Minsky, M.L., Rochester, N., Shannon, C.E. (2006), *A Proposal for the Dartmouth Summer Research Project on Artificial Intelligence, August 31, 1955*, AI Magazine, Vol. 27, No. 4, https://doi.org/10.1609/aimag.v27i4.1904.

20. Mihai, M.S., Duţescu, A. (2022), *How Cloud Accounting and Integrated Services Based on AI Can Impact Accounting Companies?*, Proceedings of the International Conference on Business Excellence, Vol. 16, No. 1, pp. 849-858, https://doi.org/10.2478/picbe-2022-0079.

21. Moll, J., Yigitbasioglu, O. (2019), *The Role of Internet-related Technologies in Shaping the Work of Accountants: New Directions for Accounting Research*, The British Accounting Review, Vol. 51, No. 6, https://doi.org/10.1016/j.bar.2019.04.002.

22. Munoko, I., Brown-Liburd, H.L., Vasarhelyi, M. (2020), *The Ethical Implications of Using Artificial Intelligence in Auditing*, Journal of Business Ethics, Vol. 167, No. 2, pp. 209-234, https://doi.org/10.1007/s10551-019-04407-1.

23. Odonkor, B., Kaggwa, S., Uwaoma, P.U., Hassan, A.O., Farayola, O.A. (2024), *The Impact of AI on Accounting Practices: A Review: Exploring How Artificial Intelligence Is Transforming Traditional Accounting Methods and Financial Reporting*, World Journal of Advanced Research and Reviews, Vol. 21, No. 1, pp. 172-188, https://doi.org/10.30574/wjarr.2024.21.1.2721.

24. Oktavianto, R., Hardini, E.N.S. (2024), *A Comprehensive Study of Artificial Intelligence on Financial Analysis: A Bibliometric Analysis*, Nominal Barometer Riset Akuntansi dan Manajemen, Vol. 13, No. 1, pp. 98-117, http://dx.doi.org/10.21831/nominal.v13i1.66248.

25. Ramos-Rodríguez, A.-R., Ruíz-Navarro, J. (2004), *Changes in the Intellectual Structure of Strategic Management Research: A Bibliometric Study of the Strategic Management Journal, 1980-2000*, Strategic Management Journal, Vol. 25, No. 10, pp. 981-1004, https://doi.org/10.1002/smj.397.

26. Rejeb, A., Rejeb, K., Abdollahi, A., Al-Turjman, F., Treiblmaier, H. (2022), *The Interplay Between the Internet of Things and Agriculture: A Bibliometric Analysis and Research Agenda*, Internet of Things, Vol. 19, https://doi.org/10.1016/j.iot.2022.100580.

27. Solikin, I., Darmawan, D. (2023), *Impact of Artificial Intelligence in Improving the Effectiveness of Accounting Information Systems*, Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, Vol. 14, No. 2, pp. 82-93, https://doi.org/10.58346/JOWUA.2023.I2.007.

28. Sood, K., Dhanaraj, R.K., Balusamy, B., Grima, S., Maheshwari, R.U. (2022), *Big Data. A Game Changer for Insurance Industry*, Emerald Studies in Finance, Insurance, and Risk Management, Vol. 6, https://doi.org/10.1108/9781802626056.

29. Stafie, G., Grosu, V. (2023), *The Impact of Artificial Intelligence on Accounting*, in Busu, B.M. (Editor), *Digital Economy and the Green Revolution*, Springer Nature, Switzerland, pp. 247-265, https://doi.org/10.1007/978-3-031-19886-1_18.

30. Stancheva-Todorova, E.P. (2018), *How Artificial Intelligence Is Challenging Accounting Profession*, Economy & Business Journal, Vol. 12, No. 1, pp. 126-141, https://ideas.repec.org/a/isp/journl/v12y2018i1p126-141.html.

31. Tavares, M.C., Vale, J. (2024), *The Intersection Between Accounting, Sustainability, and AI: A Bibliometric Analysis*, in Tavares, M.C., Azevedo, G., Vale, J., Marques, R., Bastos, M. (Editors), *Artificial Intelligence Approaches to Sustainable Accounting*, IGI Global, Chapter 1, pp. 1-25, https://doi.org/10.4018/979-8-3693-0847-9.ch001.

32. Tiwari, K., Khan, M.S. (2020), *Sustainability Accounting and Reporting in the Industry 4.0*, Journal of Cleaner Production, Vol. 258, https://doi.org/10.1016/j.jclepro.2020.120783.

33. Varma, A., Piedepalumbo, P., Mancini, D. (2021), *Big Data and Accounting: A Bibliometric Study*, The International Journal of Digital Accounting Research, Vol. 21, pp. 203-238, https://doi.org/10.4192/1577-8517-v21_8.

34. Wieringa, M. (2020), *What to Account for When Accounting for Algorithms: A Systematic Literature Review on Algorithmic Accountability*, in *Proceedings of the 2020 Conference on Fairness, Accountability, and Transparency*, Barcelona, Spain, pp. 1-18, https://doi.org/10.1145/3351095.3372833.