A Bibliometric Analysis of the Implications of Artificial Intelligence on the Accounting Profession

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Abstract

Society is going through a digital transformation, and the accounting and financial services industry is no exception. The integration of artificial intelligence (AI) has led to significant changes in the way accounting and financial services are delivered, resulting in more efficient and accurate processes. This study proposes the analysis of the relevance of specialized literature in the field of AI to highlight the impact generated by these technologies on the accounting profession. The research studies 82 references extracted from the Web of Science Core Collection database, published between 1991 and 2023. The mapping of the scientific literature was carried out by means of the Biblioshiny programme. The results of the study outline an increasing trend in the number of publications analyzing the impact of AI technologies on the accounting profession since 2015. We also note a greater concentration of articles published in highly developed countries such as the United States of America, China and Australia. Finally, the results revealed a strong connection between the concept of artificial intelligence and the accounting profession. Our study contributes to the literature on AI technologies and the accounting profession by highlighting key concepts specific to previous research, the spatial distribution of publications and outstanding scientific papers in the field.

⊃ Introduction

The digitization trend of the modern world economy is causing changes in approaches to doing business. Presuming a further increase in competition in domestic and international markets, most companies are betting on new innovative technologies that produce fundamental changes in all aspects of society and by means of which an increase in the global economy can be achieved.

Artificial intelligence (AI) expands business opportunities. Currently, the activities of commercial entities consist of the production and use of information technologies to streamline all other forms of production and ensure a new quality of economic growth. This trend can also be traced in the economy, in particular in accounting, analytical and management activities, where new digital technologies are mastered and implemented.

For this reason, the central hypothesis of this article is formulated as follows: *There is a significant connection between the concept of artificial intelligence and the accounting profession*.

To validate the research hypothesis, the objectives that we have established within our scientific approach consist of the quantitative analysis of specialized publications that have as their subject the implications of artificial intelligence on the accounting profession in the light of the key terms mentioned by the authors. At the same time, the given article presents a geographical analysis in graphic form of the studies carried out on this subject.

The paper is structured as follows: the first part will refer to specialized literature, opinions and findings of some Romanian and foreign authors, by means of which we will try to formulate a theoretical conceptual basis as extensive as possible on the subject addressed. The study continues with the presentation of the methodology used and the description of the analyzed sample. The results are presented and discussed in the third section. The final section summarizes the main conclusions resulting from the bibliometric analysis, with a brief discussion of its implications for future research.

⊃ Specialized literature overview

In an era of digitization, AI solutions for business are attracting a lot of interest, as are their negative implications in our lives. In recent years, this topic has become of significant interest to both the academic and the business environment.

Artificial intelligence is the academic field of study that deals with the technical knowledge of creating computers and computer software that are capable of intelligent and more accurate behaviour than humans (Elaine, 2020). From another perspective, artificial intelligence can be considered a programmable device capable of performing activities that can be expected from the human brain.

Like most liberal professions in this information age, accounting professionals have implemented AI-type solutions in their work. For example, Deloitte, which is part of the Big Four audit companies, was among the first companies that implemented AI technology in audit missions. According to the reviews provided by the company, the AI technology implemented as far back as 2016 and developed during these years, called *Deloitte financial Robot*, has contributed to "reducing data processing time, labour costs, work efficiency and a more effective understanding of the financial risks related to each and every client" (Müller & Bostrom, 2016).

In his paper, Khanom (2017) concludes that AI technology can improve work efficiency in the accounting field by taking over the repetitive and voluminous tasks of accounting professionals. However, in line with the latest advances in the field of AI, such as ChatGPT, many representatives of the accounting community believe that "AI in accounting will not only handle simple data manipulation, but also perform more complex tasks of analyzing data and providing decision support" (Junkroski, 2023; Pillans, 2023).

Secondly, AI technology can improve the quality of accounting information provided (Gulin *et al.*, 2019). For commercial companies, financial information is a management priority, and its quality is particularly critical. If information technologies can accurately present reality quickly, they represent a significant criterion for measuring the quality of the generated information. In addition, artificial intelligence acts as a system for preventing the introduction of erroneous data into the company's accounting basis, automatically reporting the error as a wrong data entry, which can be corrected to improve the quality of accounting information (Jędrzejka, 2019).

Thirdly, artificial intelligence can help reduce labour costs. This fact is explained by taking over data processing tasks and repetitive activities from entry-level accounting employees. "Advanced technologies make it possible for part of the accounting, auditing and fiscal activity to be completed by financial robots or intelligent software, which implies a reduction in the demand for human resources from companies, implicitly in operating expenses." (Emetaram & Uchime, 2021)

However, it should be noted that the process of combining accounting activity with AI technology has both positive and negative sides, which cannot only improve the activity and fulfill a large volume of work, but also negatively influence it. The specialized literature presents the following negative aspects that can reshape the traditional activity of a professional accountant:

● **High IT and AI knowledge requirements.** "Otherwise, they risk not keeping up with the pace of modern accounting and losing their jobs." (Bakarich & O'Brien, 2020);

● **Considerable costs of training and continuous development of staff in the use of accounting AI technologies.** Businesses will need accounting professionals familiar with the technology. For the efficient management of these systems, entities will be required to bear the cost of employee training courses;

● **Problems related to the security of financial data.** During the application of AI technology, "data circulates through computer networks or through different components of the accounting system, which can be considered a weak point in the security of financial data" (Stancheva-Todorova, 2018).

Spreading the idea of disappearance of the accounting profession was undoubtedly caused by the fast development of digital technologies. In 2013, Frey and Osborne's (2013) study on the US labour market outlook ranked the financial auditor and accounting professions as the most likely to disappear in the near future due to the automation of their activities.

On the other hand, Gonçalves *et al.* (2022) conclude that accountants will be replaced by AI technology in their routine tasks, creating more opportunities for other accounting activities, such as data analysis. At the same time, according to the authors, the role of accountants will continue to be decisive for businesses, despite the expected changes in their professional duties.

Losbichler and Lehner (2021) see the dominant role of accountants in the accounting process, rather than information technology, noting their visible advantages when interacting with technology.

Approaching the problem from another perspective, Chugunov *et al.* (2020) believe that the demand for the services of an accountant under the influence of computerization and automation will decrease, but only for those members of the profession who have an average or low qualification. For highly qualified accountants, artificial intelligence technologies will create opportunities to develop professional judgment and interpret the results of data analysis.

A wider range of research objectives was set by Stoller (2021), who studied in detail the results presented in modern publications on the impact of digital technologies not only on the activities of accountants, but also on other financial professions. In his scientific approach, the author notes that currently there is no clear picture of the future, although the trends are obvious, and these require further analysis, despite the fact that the digital technologies themselves are still at a rather low level.

Summarizing the ideas set out above, we conclude that accounting professionals must possess the necessary skills to transform the challenges generated by AI into opportunities regarding the further development of the accounting industry and the society as a whole.

➲ Research methodology

This study aims to analyze the relevance of the literature in the field of artificial intelligence, to highlight its implications for the accounting profession. In this respect, we used the bibliometric analysis of scientific publications.

The data needed to carry out the scientific approach was extracted from the Web of Science Core Collection database, one of the most popular platforms in the field of scientific research. I used the key terms *artificial*

intelligence and *accounting profession*. Thus, the statistical sample we have obtained contains 82 scientific papers published between 1991 and 2023.

In Figure 1 we have graphically illustrated the number of publications whose subject is the implications of artificial intelligence on the accounting profession and their annual distribution during the years 1991-2023.
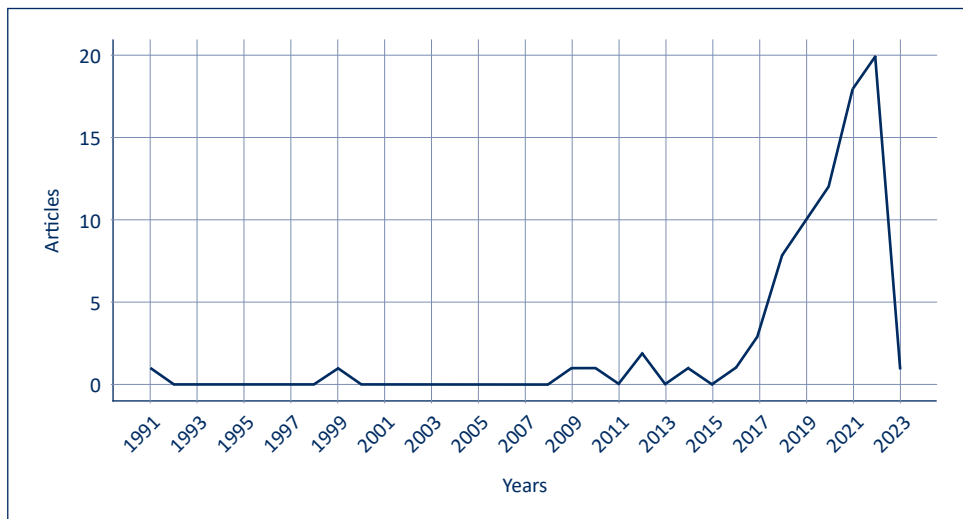

Figure 1. Distribution by year of scientific papers whose subject is represented
by the implications of artificial intelligence on the accounting profession

Source: The authors' processing by means of the Biblioshiny programme.

We observe that the interest in the subject addressed has a predominantly increasing trend from 2009 to 2022. The period 1991-2015 is characterized by a low interest of research on the subject addressed. However, with the development and large-scale implementation of AI technologies within large corporations, we identify an increase in the number of publications from 2015 to 2022.

In Table 1 we show the most relevant sources for the studied field, the journals being presented in descending order of the number of articles published.

Table 1. The most relevant sources for the analysed subject

Sources	Articles
Journal of Emerging Technologies in Accounting	7
Brain: Broad Research in Artificial Intelligence and Neuroscience	3
Proceedings of the International Conference on Business Excellence	3
Accounting Horizons	2
IEEE Access	2
International Journal of Accounting and Information Management	2
Journal of Corporate Accounting and Finance	2

Source: The authors' processing by means of the Biblioshiny programme.

Later, after obtaining the relevant sample, I proceeded to the actual bibliometric analysis using the scientific mapping method by means of the specialized software Biblioshiny, a tool developed for the construction and visualization of bibliometric networks.

⊃ Results and discussions

The analysis of the 82 scientific papers generated a total number of 296 key terms. According to the network generated by Biblioshiny, illustrated in Figure 2, 23 relevant key terms related to the addressed subject are identified, the first being *artificial intelligence* (with 37 occurrences), *machine learning* (with 11 occurrences), *accounting* and *accounting profession* (with nine occurrences), *blockchain* (with eight occurrences).
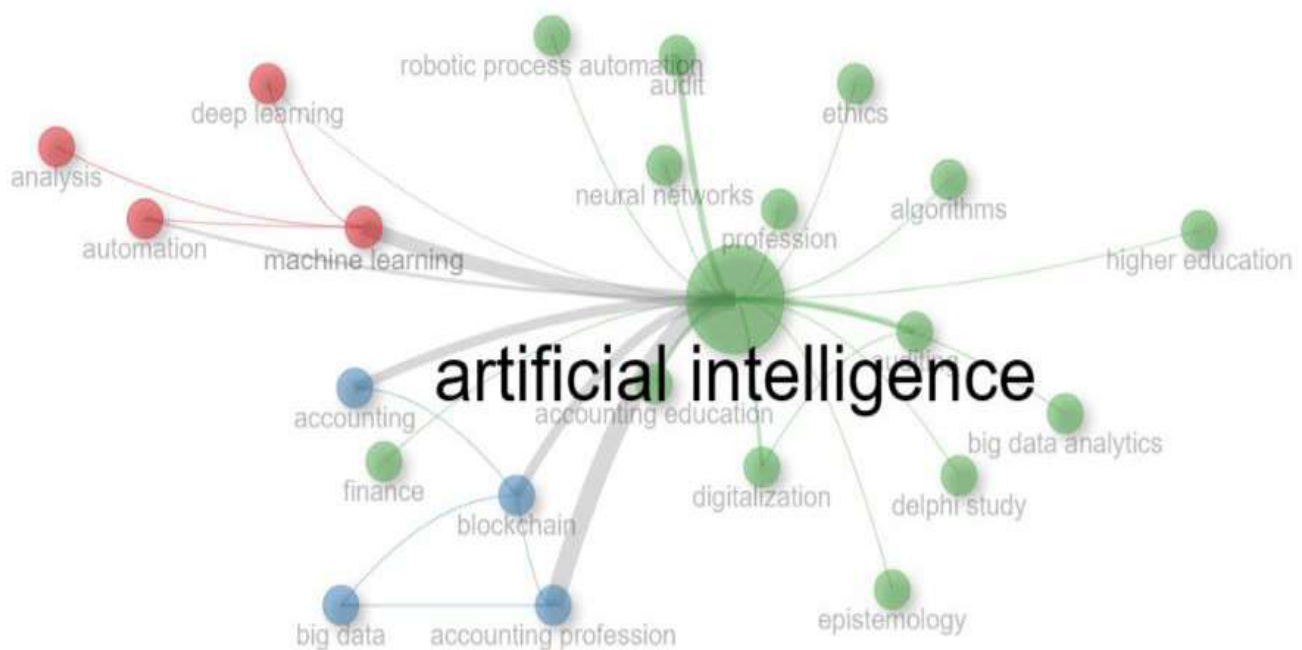

Figure 2. Key terms Linking Network

Source: The authors' processing by means of Biblioshiny programme.

The relevance of each key term can also be illustrated using connecting nodes whose size indicates the degree of importance: the larger the node, the more relevant the term it represents within the analyzed sample.

Thus, Figure 2 highlights the existence of strong links between *artificial intelligence, accounting profession, machine learning, blockchain* and *accounting*. As can be seen, the most relevant key terms are in English, since the scientific works identified on the topic of the impact of AI on the accounting profession are mostly written in this language.

The most relevant countries in the research of this topic are the United States of America, Romania and China.

We also noted that the most productive states hold a top place in the ranking of the most cited. According to Table 2, the most cited articles related to the analyzed topic come from countries such as Great Britain, the United States of America, Germany, Italy and China.
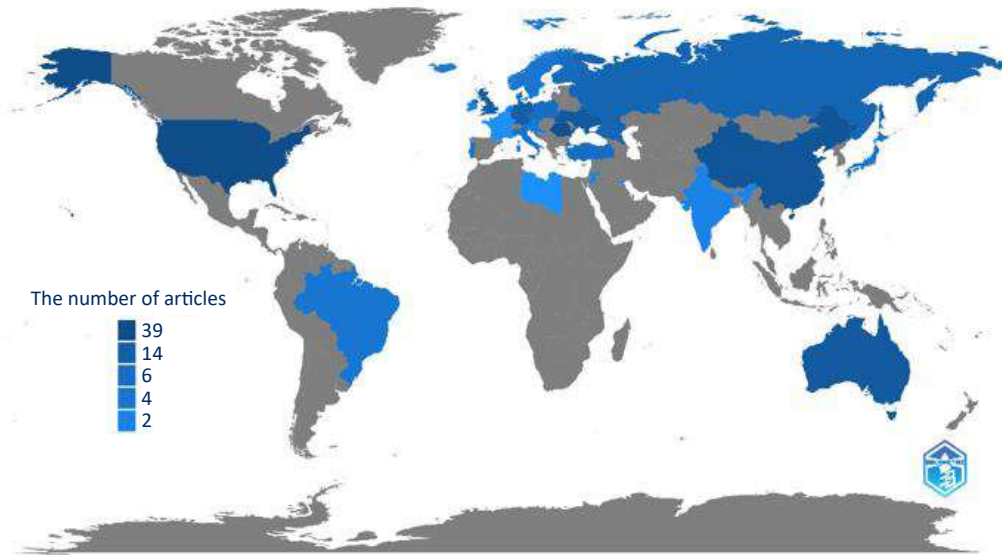
Figure 3. Global distribution of scientific productivity

Source: The authors' processing by means of Biblioshiny programme.

Table 2. Top of the most cited countries

The state	Number of citations	Average per year
United Kingdom	158	39.5
United States of America	144	11.1
Germany	70	17.5
Italy	50	50.0
China	39	5.6
Australia	38	5.4
Austria	35	17.5
United Arab Emirates	27	13.5
Norway	22	11.0
Slovenia	22	22.0

Source: The authors' processing by means of the Biblioshiny programme.

The bibliometric analysis provides information users with the list of the main authors who have shown interest in research in the analyzed field. In Table 3, they are presented in descending order of the number of citations from the specialized literature.

Table 3. Top of the most cited authors

Authors	Title of the article	Journal and year of article publication	Number of citations	Average per year
J. Moll, O. Yigitbasioglu	*The Role of Internet-Related Technologies in Shaping the Work of Accountants: New Directions for Accounting Research*	The British Accounting Review, 2019	97	19.40

Authors	Title of the article	Journal and year of article publication	Number of citations	Average per year
S. Secinaro, D. Calandra, A. Secinaro, V. Muthurangu, P. Biancone	*The Role of Artificial Intelligence in Healthcare: A Structured Literature Review*	BMC Medical Informatics and Decision Making, 2021	50	16.66
I. Munoko, H. Brown-Liburd, M.A. Vasarhelyi	*The Ethical Implications of Using Artificial Intelligence in Auditing*	Journal of Business Ethics, 2020	48	12.00
V. Tiberius, S. Hirth	*Impacts of Digitization on Auditing: A Delphi Study for Germany*	Journal of International Accounting, Auditing and Taxation, 2019	47	9.40
K. Albitar, A.M. Gerged, H. Kikhia, K. Hussainey	*Auditing in Times of Social Distancing: The Effect of COVID-19 on Auditing Quality*	International Journal of Accounting and Information Management, 2020	33	11.00
C. Zhang	*Intelligent Process Automation in Audit*	Journal of Emerging Technologies in Accounting, 2019	28	5.60
A. Qasim, F. Kharbat	*Blockchain Technology, Business Data Analytics, and Artificial Intelligence: Use in the Accounting Profession and Ideas for Inclusion into the Accounting Curriculum*	Journal of Emerging Technologies in Accounting, 2019	27	6.75
Y. Zhang, F. Xiong, Y.F. Xie, X. Fan	*The Impact of Artificial Intelligence and Blockchain on the Accounting Profession*	IEEE Access, 2020	23	5.75
M. Kend, L.A. Nguyen	*Big Data Analytics and Other Emerging Technologies: The Impact on the Australian Audit and Assurance Profession*	Australian Accounting Review, 2020	23	5.75
T. Sun	*Applying Deep Learning to Audit Procedures: An Illustrative Framework*	Accounting Horizons, 2019	23	4.60

Source: The authors' processing by means of the Biblioshiny programme.

➲ Conclusions

This paper explores the relationship between AI technologies and the accounting profession by performing a bibliometric analysis based on the evolution of relevant publications, annual citation structure, analysis of key terms and of the number of publications by country.

A quantitative analysis of over 30 years of specialized literature shows that over 90% of the articles found in the analyzed sample were published between 2015 and 2022, and the subject has gained increased attention in recent years.

The results obtained from the analysis of key terms by means of graphical nodes support previous findings (Gonçalves *et al.*, 2022; Losbichler & Lehner, 2021; Chugunov *et al.*, 2020) and validate the research hypothesis

regarding the existence of a **strong link between the concept of artificial intelligence and the accounting profession**. At the same time, the spatial distribution of the total production in the field shows that the most relevant countries in the research on the implications of AI on the accounting profession are the United States of America, followed by Romania, China and Australia.

According to the results obtained, we conclude that the topic analyzing the connection between AI technologies and the accounting profession has become one of the most popular in the current context in which the technological development is reshaping the effective way of carrying out human activities.

Considering the subjective nature of qualitative research, we believe that this article developed based on a bibliometric analysis of scientific approaches indexed in international databases can contribute by means of the utility conferred to the accounting research activity both to the bodies representing the accounting profession and to the researchers interested in this subject.

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