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Bibliometric Analysis of Research on The Relationship of Accounting and Information Systems / Technologies

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ABSTRACT

Purpose – The world has made very rapid progress in terms of the development of technology in the last quarter century. This progress also affects many sectors and professions. One of these effects is experienced in the field of accounting. Accounting processes and the profession have undergone significant transformation and change in recent years. This change is the subject of research in the field of accounting. In this research, it is aimed to examine the research on the relationship between accounting and information systems/technologies with the bibliometric analysis method. Thus, the effects of developments in information system / technology in the accounting literature are determined.

Design/methodology/approach – In this research, research on the relationship between accounting and information systems / technology were examined with the bibliometric analysis method. Within the scope of the research, eight keywords or phrases, including "Information System or Information Technology ", "Big Data", "Blockchain", "Artificial Intelligence", "Cloud Computing", "Industry 4.0 or Industry 5.0", "Mobile App", Metaverse", were determined. Each of these keywords, together with the keyword "accounting", was searched in the database only in the research titles. A total of 1,060 studies were determined as samples and analyzed. Some bibliometric indicators such as number of articles, number of citations, top publishing universities and author network analysis were used in the analysis. In the process of obtaining the data, the SCOPUS database was used and covers the years between 1970 and 2021. In addition, the data were visualized as mesh and density graphs using the VOSviewer software.

Findings – It was determined that the countries with the most research were China and America. Although China is generally ahead in the number of research, it lags behind the United States in the number of citations to research. It has been observed that the research mostly consist of articles and conference proceedings. According to the subject area, it has been determined that the research in the fields of "business, management and accounting" and "computer science" constitute the majority. When the source of the research is examined, it has been determined that conference proceedings and journal resources are in the first place, and an important part of them is information system / technology-related resources.

Discussion – It is seen that the research in which accounting and other keywords are included in the same title have increased rapidly after the 2000s. It is thought that the number of research will increase faster with the development of technology and the interest of researchers in accounting information system / technology areas.

1. Introduction

Technological development is an important element of providing competitiveness and superiority for both countries and businesses. It also plays a decisive role in economic and social change. This development includes many new concepts in our life day by day, changes our business habits, and reshapes or completely eliminates professions.

The accounting profession is naturally affected by technological developments (Karakuş and Yüksel, 2019:198; Büyükarıkan, 2021:271; Bağdat, 2022:27). When the future of the accounting profession is foreseen, it is observed that accounting will become digital (Tenik, 2019:3825). The use of developing technologies in the accounting profession moves this profession from being task-oriented to an analysis, interpretation and consultancy basis. It makes it necessary for accountants to bring their analytical and critical thinking skills to the forefront. This change naturally affects accountants and research on accounting issues.

Accounting Information Systems, when included in the field of Information and Technology systems, is a tool designed to assist in the management and control of economic-financial activities of organizations (Soudani, 2012:136) and automates the accounting information that forms the basis on which financial reports are

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produced (Ezenwoke et al., 2019:168). In other words, Accounting information systems / technologies are used to collect, store and process financial data and to produce reports that can be used by managers or other parties when making commercial decisions (Azhar and Meiryani, 2019: 8). It is stated in the research that technological developments greatly help the accounting systems of commercial organizations and increase business performance (Lim, 2013:104). In particular, it is stated in the research results that the use of information technology can offer significant advantages in improving company performance findings, not only in terms of providing more information, but also increasing the reliability, accuracy and timeliness of the financial reporting process (Moghadam and Chegini, 2013:82).

In the literature, there are research of accounting with different disciplines. Research that combine accounting and information systems are examples of this. Recently, it is seen that there has been an increase in the research on the effects and results of information systems or information technologies on accounting. However, questions such as what are the key issues in accounting information systems and technologies, how large are these issues in the literature, and what are their effects are still waiting to be answered. For accounting researchers, knowledge of potential new areas or areas that have lost their importance becomes very important.

In this research, research on the relationship between accounting and information systems or technologies were examined by bibliometric analysis method. For this purpose, data of research in the Scopus database on this subject such as the number by years, the type of research, the country and university/institution where the research was done, and the number of citations were presented from different perspectives. In this respect, it is thought that the research will provide a broad perspective to the literature on accounting and information systems/technology, reveal research gaps and opportunities, and contribute to determining the direction of the literature.

2. Literature Analysis

Ezenwoke, Ezenwoke, Eluyela, and Olusanmi (2019) quantitatively analyzed the volume and impact of the accounting information systems literature in their study. In the study, the data were obtained from the Scopus database and 727 publications were analyzed bibliometrically. The results of the study showed that there was no steady growth in the volume of publications on AIS (Accounting Information System) research. In addition, Malaysia was among the top 10 countries that contributed the most to AIS research. 159 authors contributed to 727 publications on AIS research. It has been determined that the publications with double authors are more than the others. In addition to the keywords 'accounting information system', keywords such as Internal Control, Audit, Compliance with Legislation, Management Control were dominant. It has been stated that AIS has been adopted in most developed countries.

The recent accounting literature on the effects of emerging technologies on the role and skills of accountants in Cron, Alves, and Martin (2021) studies has been reviewed. Through a systematic literature review following the five-step approach described by Denyer and Tranfield, the Web of Science and Scopus databases were used as an article collection resource. Thus, the analysis was carried out with a total of 157 articles. The results of the study reveal the skills that today's accountants should have and what role they are given.

Varma, Piedepalumbo and Mancini (2021) aimed to examine the literature on Big Data and Accounting bibliometrically in their study. For this purpose, they used the Scopus database to identify journals, authors and countries. VOSviewer software was used to visualize the data. The results presented with a visual analysis reveal the current situation in Big Data and Accounting, important implications and opportunities for future studies.

Zor and Ala (2021) done a literature review in the Journal of Emerging Technologies in Accounting and Dergi Park database in their study and aimed to analyze the trends of studies on the adaptation of technological innovations in the field of accounting and a comparative analysis of prominent keywords. According to the results, it was stated that the most used topics are XBRL, artificial intelligence, data analytics and blockchain in terms of technology and auditing in terms of accounting. In addition, it was stated that the number of studies in the Turkish literature lags behind the English ones. On the other hand, it has been determined that the limited number of Turkish studies seem compatible with the English literature in terms of subject, content and scope.

Chiua, Liub, Muehlmannc, and Baldwin (2019) contribute to academic knowledge about the methodologies used in accounting information systems journals, accounting fields studied and emerging technologies. A comprehensive bibliometric and comparative analysis of 681 accounting articles published from 2004 to 2016 is presented. The results show that these journals do not have a singular focus. All accounting articles in ISAFM are for emerging technologies, and followed by JETA (73.8%), IJDAR (54.6%), IJAIS (40.0%) and JIS (30.5%).

Rahmawati and Subardjo (2022) aimed to analyze accounting and blockchain with a bibliometric study. Scopus database was used for the research. The sample consists of 67 documents found using the accounting and blockchain keywords covering the period 2017-2021. VOSviewer software was used to visualize the research results. The research revealed the changes in the number of publications between the relevant period, document types, sources and various aspects such as citations. According to the results, especially in the last three years, the increase in the number of publications on accounting and blockchain issues was remarkable. According to the results of the network research, it was stated that accountants accept the existence of blockchain technology and can use blockchain technology to facilitate their research.

Agustí and Orta-Pérez (2022) done bibliometric analysis on a sample of 247 articles in their study, to describe the development of Big Data and Artificial Intelligence in the fields of accounting and auditing and to understand their future development directions. The study, which uses different bibliometric methodologies, aims to expand the knowledge in these areas, to develop the publishing activity and to identify the most influential authors and journals. In addition, the study provides insights about potential new directions and diminishing perspectives while summarizing the literature. The results of the research have revealed that academic interest in this subject has increased especially in recent years.

In the study of Sabuncu (2022), the accounting practices that are increasingly involved in the digital transformation process, how this transformation process is met by the accounting professionals, what the professionals who are the subject of the research do, their needs and how they will manage this process in the future are evaluated. Qualitative research methods were used in the study. In order to answer the research questions, focus group interviews were held with professional accountants who have an office in Denizli. The findings showed that professionals who need a radical change in their profession should adapt to this digital transformation without delay in order to survive professionally and economically.

3. Methodology

This research is based on the analysis of the literature on the identified keywords related to "accounting information systems and technologies". In the research, first of all, the literature on accounting information systems and technologies was searched and some words used in these research were determined as keywords. Then, the research in which the determined “keywords” and “accounting” were included in the same title were examined with the bibliometric analysis method. The data covering the years between 1970 and 2021 were obtained from the SCOPUS database. All publications such as articles, books, book chapters, and papers in the database were included in the scope of the research. First, a selected keyword and accounting keyword were searched together in the database. Research involving both keywords were detected. In this context, "Information system or information technology" (761), "Big data"(101), "Blockchain"(79), "Artificial intelligence"(70), "Cloud computing" (34), "Industry 4.0" or industry 5.0" (10), “Mobile app”(5), Metaverse”(0), a total of 1060 research, in which each of those eight keywords are included separately with “accounting”, were determined. by considering only the titles. These research were classified and analyzed according to the determined bibliometric indicators. In the research, bibliometric indicators such as the number of research by years, source, type, countries, universities/institutions and subject area, the number of citations, and citation network analysis by countries were used. The results of each keyword obtained were explained under a separate sub-title and the same processes were carried out for all keywords. The main purpose of taking the year 1970 as the starting date is to determine when the first research was done and the rate of increase of the research. The data were both analyzed comparatively and visualized in the form of network graphs using the VOSviewer software.

4. Findings

4.1. Analysis of Research on Accounting and Information System / Technology

Here, first of all, the search for the research in which the keywords "Accounting" and " Information System or Technology " are included in the same title was carried out in the Scopus database. It was determined that both keywords were included in the titles of 794 research published between 1970-2021. However, when all these research were examined in detail, it was seen that 761 research were related to accounting. The distribution of these research by years is given in Figure 1.

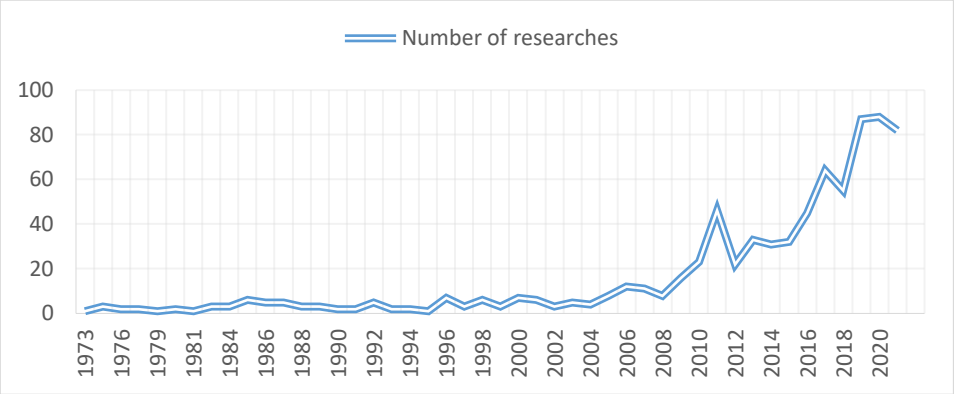

Figure 1: Number of Research by Years

According to Figure 1, it is seen that the first research was done by H. Moskowitz and R. Mason in 1973, and after 2006, the number of research reached double digits and entered a rapid increase trend. According to The number of research in which “accounting” and “information system or information technology” are included together according to the first 20 sources, is given in Table 1, and the distribution by years according to the first 5 sources is given in Figure 2.

Table 1: Number of Research by Source (1970-2021)

	Source	Number of Research		Source	Number of Research
1	International Journal Of Accounting Information Systems	32	11	Academy Of Accounting And Financial Studies Journal	10
2	Journal Of Engineering And Applied Sciences	22	12	International Journal Of Applied Business And Economic Research	10
3	ACM International Conference Proceeding Series	17	13	Accounting Education	8
4	Journal Of Information Systems	15	14	International Journal Of Supply Chain Management	8
5	Journal Of Theoretical And Applied Information Technology	14	15	Accounting	7
6	International Journal Of Scientific And Technology Research	13	16	Advanced Materials Research	7
7	Journal Of Physics Conference Series	13	17	Advances In Intelligent Systems And Computing	7
8	Accounting Organizations And Society	12	18	Iop Conference Series Materials Science And Engineering	7
9	Journal Of Accounting Education	12	19	Journal Of Asian Finance Economics And Business	7
10	Lecture Notes In Information Systems And Organisation	12	20	Applied Mechanics And Materials	6

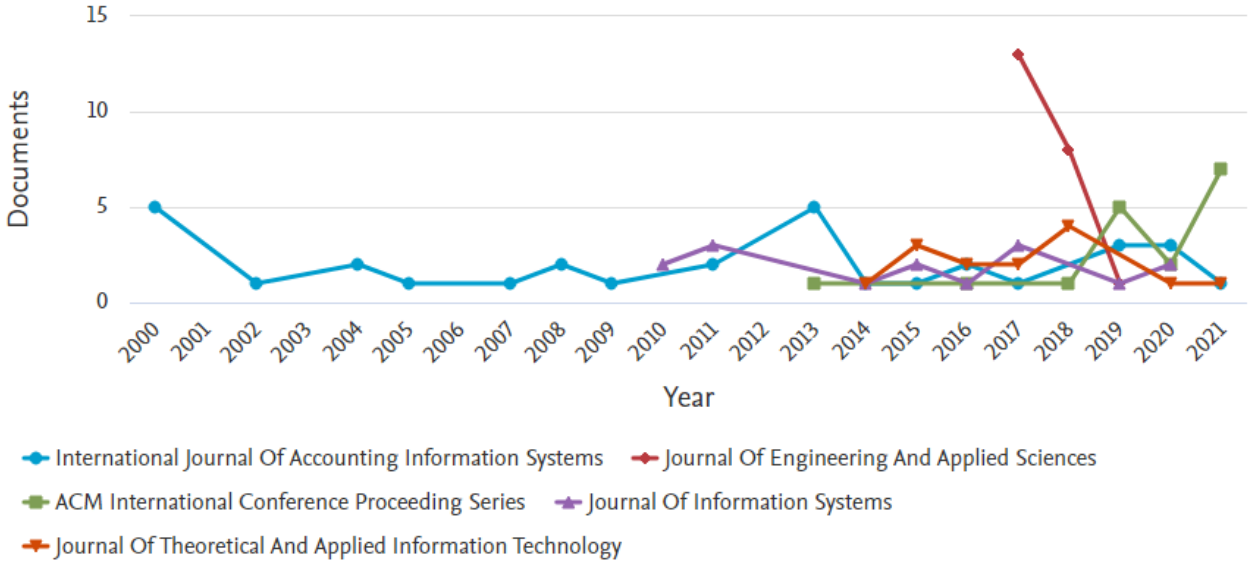

Figure 2: Number of Research by Source and Years

As listed in Table 1, The Journal of Accounting Information Systems is first with 32 publications in the ranking of the most publications by source. This is followed by references to The Journal Of Engineering And Applied Sciences and conference proceedings. In the first 20 research, there are 6 sources containing the accounting keyword. Figure 2 shows the change of the first 5 sources by years. Research on the subject, which started in the Journal of Accounting Information Systems since 2000, has followed a horizontal trend. It is seen that conference papers containing these keywords started in 2013. The distribution of the research in which "accounting" and "information system or information technology" are included according to the author and country is given in Figures 3 and 4.

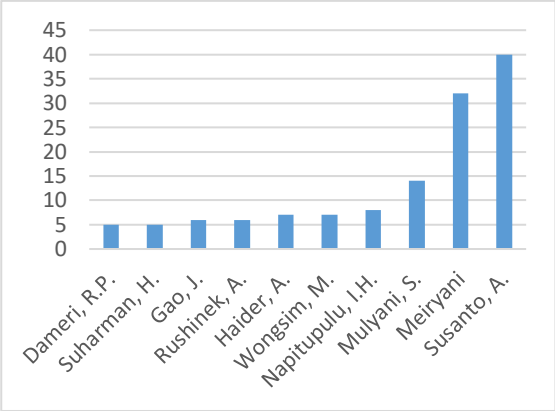

Figure 3: Number of Research by Author

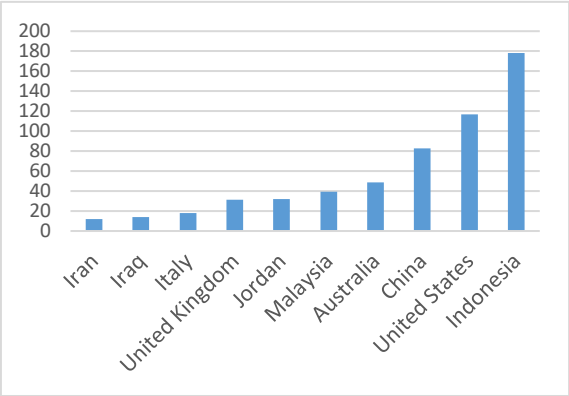

Figure 4: Number of Research by Country

As shown in Figure 4, most of the research were done in Indonesia and the USA between 1970-2021. Turkey is the 18th among the related countries with 8 research. The authors with the most research are Susanto, A. and Meiryani. The distribution of the percentages of the research in which "accounting and "information system or information technology" are included by type and subject area are given in Figures 5 and 6.

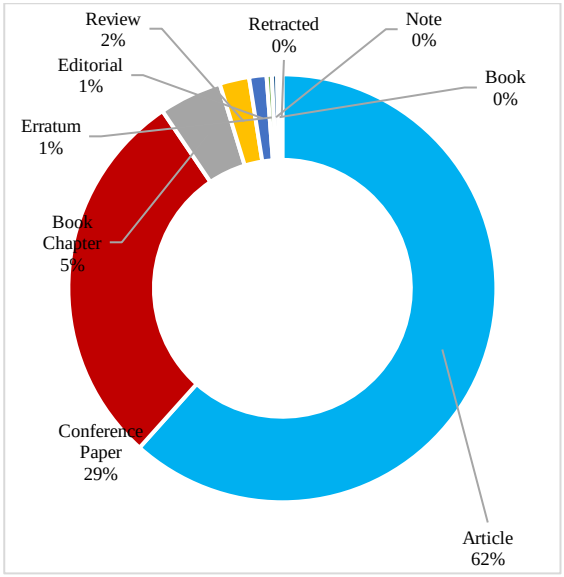

Figure 5: Percentage of Research by Type

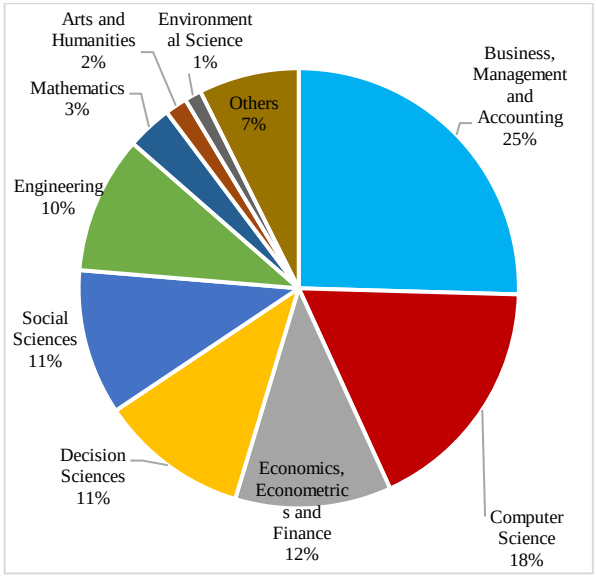

Figure 6: Percentage of Research by Subject Area

62% of all research between 1970-2021 were articles and 29% were proceedings as shown in Figure 5. In Figure 6, among all research, accounting publications in the field of "business management and accounting" are in the first place with 25%. It is followed by publications related to accounting in computer sciences with 18%.

Table 2: Number of Research by University / Institution

	University / Institution	Number of Research
1	Universitas Padjadjaran	62
2	Bina Nusantara University	40
3	University of South Australia	16
4	Universitas Komputer Indonesia	10
5	Universiti Utara Malaysia	9
6	Universiti Teknologi MARA	9
7	Jadara University	8
8	Tilburg University	7
9	Al-Balqa Applied University	7
10	Politeknik Negeri Medan	7

Table 3: Number of Citations by Author

Author	Number of Research	Citation
Gordon, L.A.	3	299
Grabski, S.V.	4	297
Miller, D.	2	277
Leech, S.A.	2	269
Schmidt, P.J.	2	269
Susanto, A.	35	174
Choe, J.M.	4	173
Geerts, G.L.	4	156
Wilkin,C.L.	2	150
Rohde, C.	1	148

According to Table 2, the top 10 universities / Institutions are listed according to the number of research between the years 1970-2021, and "Universitas Padjadjaran" in Indonesia is in the first place with 62 research. In Table 3, the authors are listed according to the number of citations and "Gordon, L.A."took the first place with 299 citations to her three research. 259 of these citations belong to a research mentioned in the bibliography. On the other hand, Susanto, A. received 174 citations for 35 research.

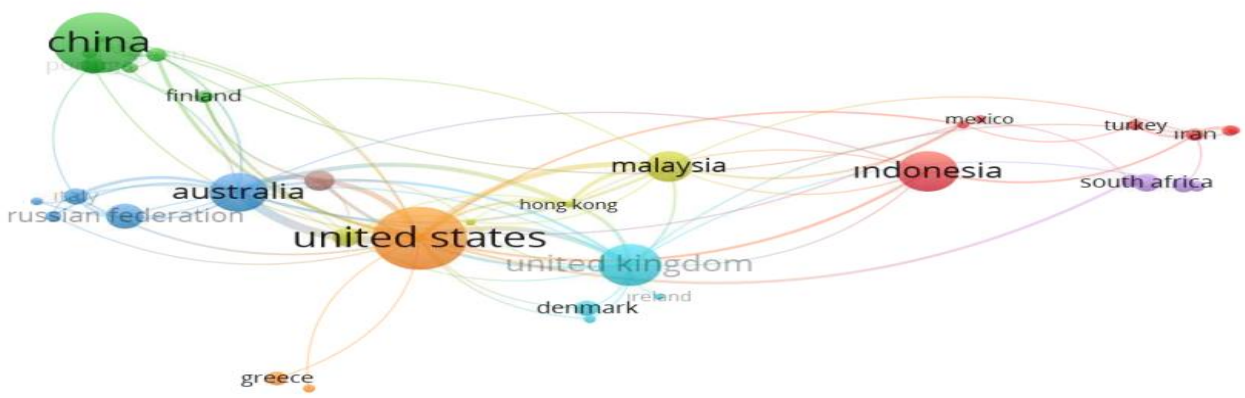

Figure 7: Citation Network Map by Country

Figure 7 taken from the VOSviewer program, the number of documents cited from the countries was selected as a minimum of 1 in the program and all 94 countries met the threshold value. But some of the 64 countries in the network are not connected to each other. The largest set of linked items consists of 64 countries and 13 clusters. The largest cluster consists of 13 countries and Turkey is included in this cluster. In the citation network map according to these 36 country groups, the USA ranks first in terms of citation and link count with 117 publications, 2158 citations and 191 total link relationships. Turkey has 8 publications, 30 citations and a total of 18 links.

When we look at all the research according to the language of writing, 743 of the 761 research (approximately 97%) were in English. This is followed by Chinese with 7 research and Portuguese, Spanish and Ukrainian with 3 research each.

4.2. Analysis of Research on Accounting and Big Data

Here, first of all, the keywords "Accounting" and "Big Data", which are included in the same title, were searched in Scopus. Between 1970-2021, a total of 101 research were identified that met this criterion. However, when the research that were determined not to be related to accounting were excluded, 93 research remained. The distribution of these research by years is given in Figure 8.

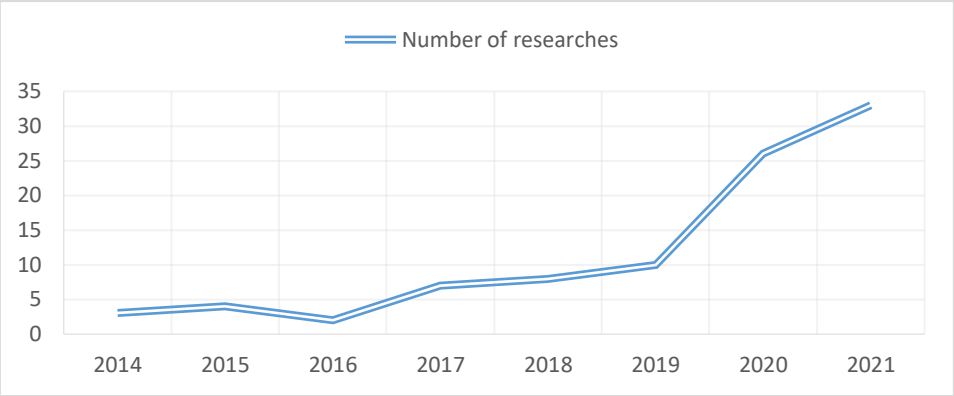

Figure 8: Number of Research by Years

According to Figure 8, it is seen that the research first started in 2014 and that there has been a rapid increase in recent years. The number of research in which the keywords “accounting” and “big data” are included together is given in Table 4 according to the first 20 sources, and the distribution by years according to the first 5 sources is given in Figure 9.

Table 4: Number of Research by Source (1970-2021)

	Source	Number of Research		Source	Number of Research
1	Journal Of Physics Conference Series	13	11	Lecture Notes Of The Institute For Computer Sciences Social Informatics And Telecommunications Engineering Lnicst	2
2	ACM International Conference Proceeding Series	7	12	Accounting Auditing And Accountability Journal	1
3	Advances In Intelligent Systems And Computing	6	13	Australian Accounting Review	1
4	Iop Conference Series Materials Science And Engineering	6	14	Big Earth Data	1
5	Accounting Horizons	5	15	Chemical Engineering Transactions	1
6	E3s Web Of Conferences	3	16	Contemporary Studies In Economic And Financial Analysis	1
7	Journal Of Accounting Education	3	17	Emerging Markets Finance And Trade	1
8	Journal Of Information Systems	3	18	European Journal Of Business Science And Technology	1
9	Accounting And Business Research	2	19	Intelligent Systems In Accounting Finance And Management	1
10	Analysis And Metaphysics	2	20	International Advances In Economic Research	1

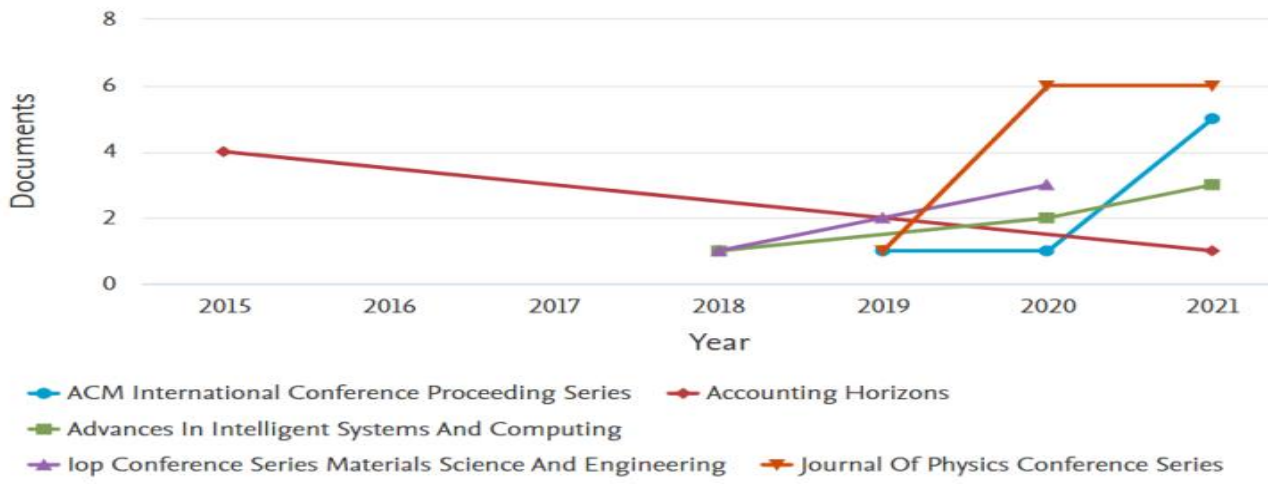

Figure 9: Number of Research by Source and Years

In Table 4, when the number of publications is sorted according to the source, there is only one accounting journal source in the top five, while the sources related to conference proceedings are in the first two rows. In Figure 9, it is seen that only the accounting-related one of the first 5 sources has a decreasing trend, while the others have an increasing trend. The distribution of the research by author and country in which the keywords "accounting" and "big data" are included is given in Figures 10 and 11.

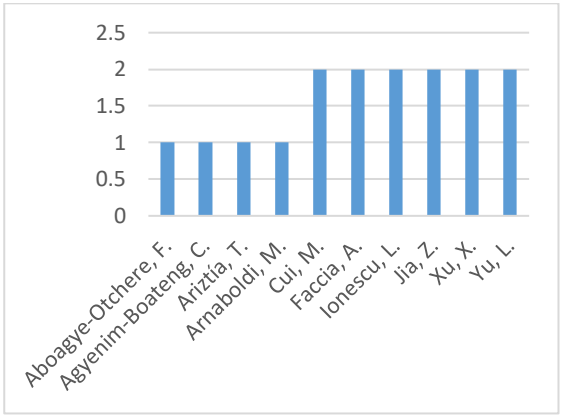

Figure 10: Number of Research by Author

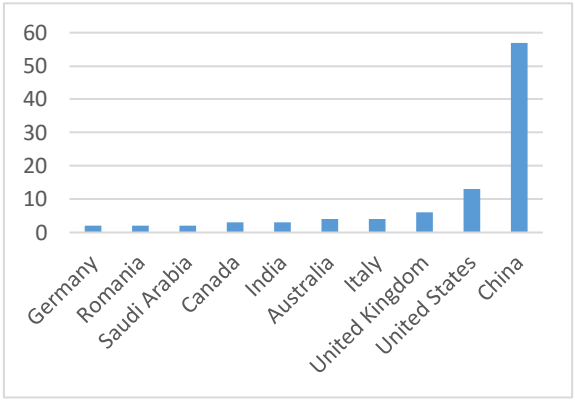

Figure 11: Number of Research by Country

Most of the research was done in China between the years 1970-2021, as can be seen in Figure 11. Turkey is not among the relevant countries. The distribution of the percentages of the research in which the keywords "accounting" and "big data" are included by type and subject area are given in Figures 12 and 13.

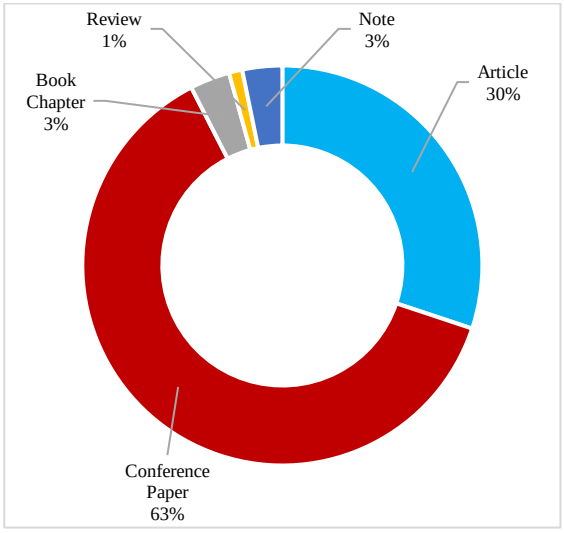

Figure 12: Percentage of Study by Type

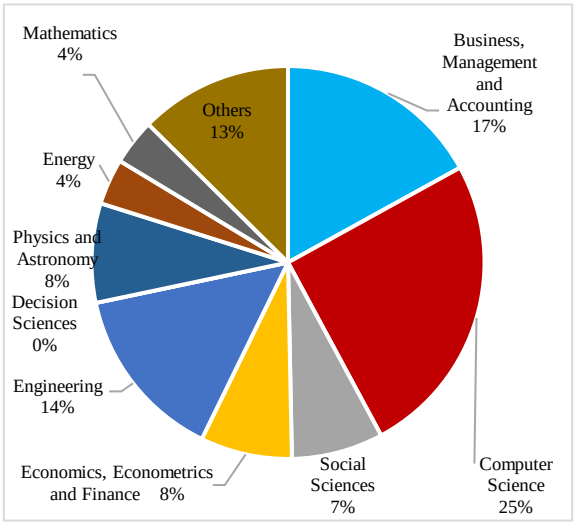

Figure 13: Percentage of Study by Subject Area

As shown in Figure 12, 63% of all research between 1970-2021 were proceedings and 30% were articles. In Figure 13, accounting-related publications in computer sciences come first with 23% of all research. Afterwards, accounting publications in the field of "business management and accounting" rank second with 16%.

Table 5: Number of Research by University /Institution

	University /Institution	Number of Research
1	Henan Institute of Economics and Trade	3
2	Wuhan University of Technology	3
3	Shandong Women's University	3
4	Yunnan Technology and Business University	3
5	Weifang Engineering Vocational College	2
6	Rutgers University-Newark Campus	2
7	North China Electric Power University	2
8	Yunnan University	2
9	Universitatea Spiru Haret	2
10	Dalian University of Science and Technology	2

Table 6: Number of Citations by Author

Author	Number of Research	Citation
Vasarhelyi, M.A.	1	198
Kogan, A.	1	198
Tuttle, B.M	1	198
Byrnes, P.	1	152
Moffitt, K.C.	1	152
Warren, J.D.	1	152
Bhimani, A.	1	152
Willcocks, L.	1	152
Krahel, J.P.	1	106
Titera, W.	1	106

Table 5 lists the top 10 universities / institutions according to the number of research between the years 1970-2021. Chinese universities / institutions are in the top 4 with the same number of research. In Table 6, the authors are listed according to the number of citations. 198 references were made to the publications of the first three authors together and mentioned in the bibliography.

When we look at all the research according to the language of writing, all of the 93 research are in English.

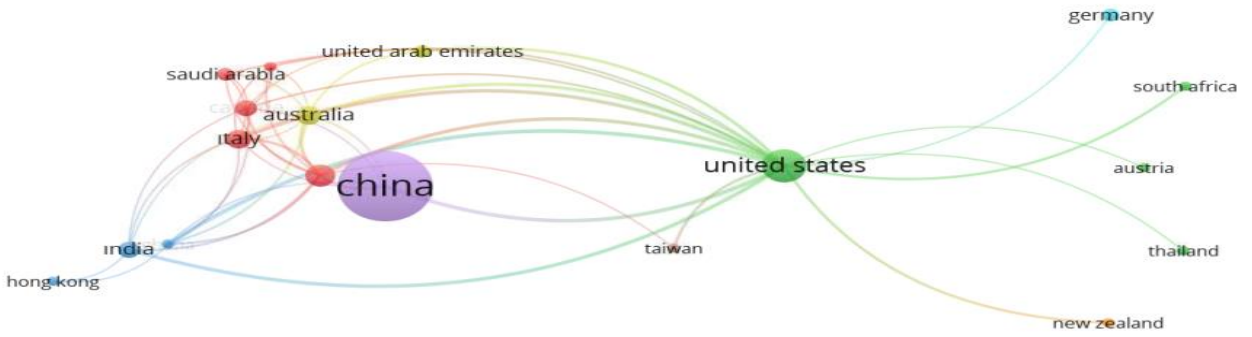

Figure 14: Citation Network Map by Country

Figure 14 taken from the VOSviewer program, the number of documents quoted from countries was selected as a minimum of 1 in the program and all 24 countries met the threshold value. But some of the 24 countries in the network are not connected to each other. The largest set of linked items consists of 18 countries and 8 clusters. In the citation network map according to these 18 country groups, the USA ranks first in terms of citation count with 13 publications, 717 citations and 59 total link relationships. On the other hand, China ranks fifth in terms of citation count, with 57 publications 113 citations and 14 total linking relationships.

4.3. Analysis of Research on Accounting and Blockchain

The keywords "Accounting" and "Block Chain" were primarily searched in Scopus, and a total of 79 research between the years 1970-2021 were identified. However, 1 study, which was determined not to be related to accounting, was removed and 78 research remained. The distribution of these research by years is given in Figure 15.

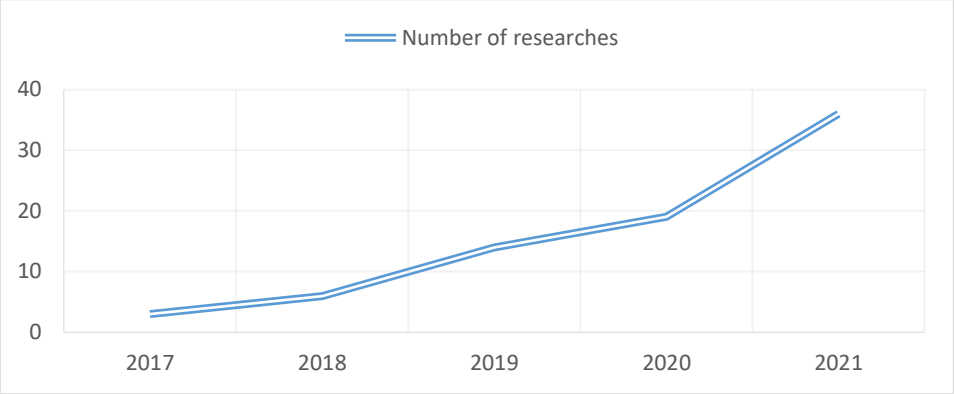

Figure 15: Number of Research by Years

According to Figure 15, it is seen that the first research emerged in 2017. In the following years, the number of research increased rapidly. The number of research in which the keywords "accounting" and "blockchain" are included, according to the first 20 sources, is shown in Table 7, and the distribution by years according to the first 5 sources is given in Figure 16.

Table 7: Number of Research by Source (1970-2021)

	Source	Number of Research		Source	Number of Research
1	Journal Of Emerging Technologies In Accounting	5	11	Journal Of Information Systems	2
2	Australian Accounting Review	4	12	Accounting And Finance	1
3	ACM International Conference Proceeding Series	3	13	Accounting Auditing And Accountability Journal	1
4	IEEE Access	3	14	Analysis And Metaphysics	1
5	Journal Of Corporate Accounting And Finance	3	15	Applied Sciences Switzerland	1
6	Journal Of Physics Conference Series	3	16	Asian Journal Of Law And Economics	1
7	Academy Of Accounting And Financial Studies Journal	2	17	Australasian Accounting Business And Finance Journal	1
8	Accounting Perspectives	2	18	Bar Brazilian Administration Review	1
9	Advances In Intelligent Systems And Computing	2	19	Contributions To Management Science	1
10	Intelligent Systems In Accounting Finance And Management	2	20	Current Issues In Auditing	1

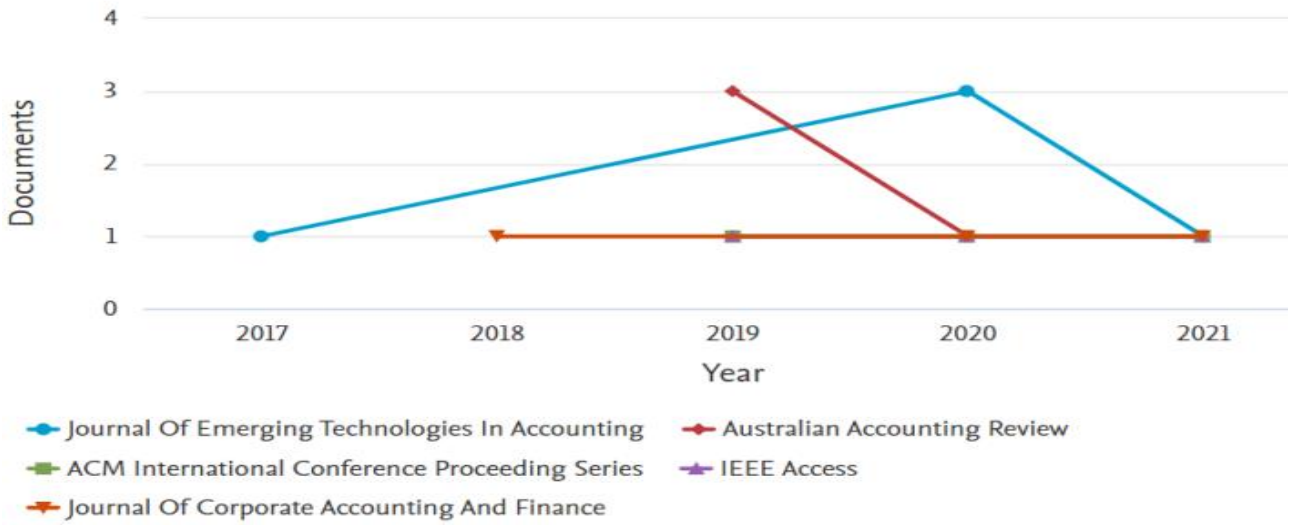

Figure 16: Number of Research by Source and Years

When Table 7 is examined, it is seen that the first two sources are accounting journal sources. Figure 16 shows the change in the research of the first 5 sources over the years. The distribution of the research by author and country which include the keywords “accounting” and “blockchain” together is given in Figures 17 and 18.

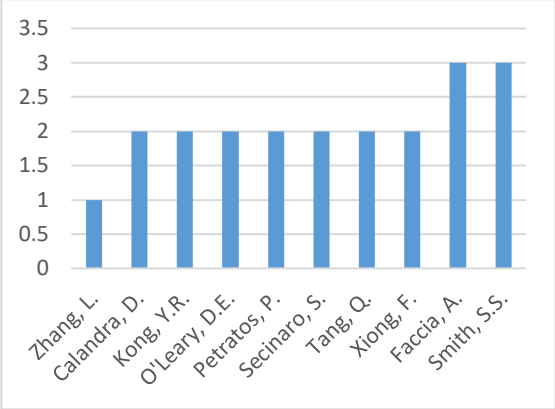

Figure 17: Number of Research by Author

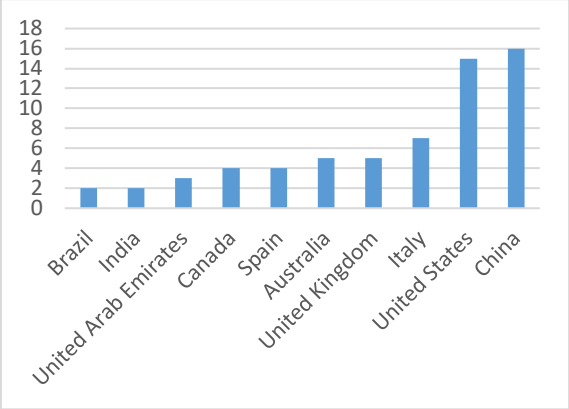

Figure 18: Number of Research by Country

In Figure 18, most of the research was done in China between the years 1970-2021. Turkey is among the related countries with 2 research. The distribution of the percentages of the research in which the keywords “accounting” and “blockchain” are included by type and subject area are given in Figures 19 and 20.

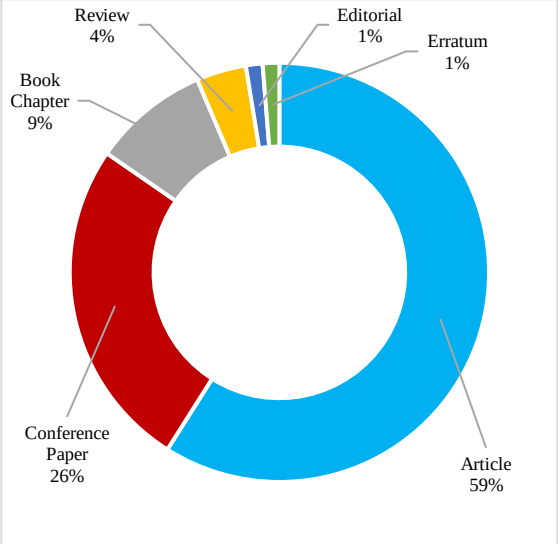

Figure 19: Percentage of Study by Type

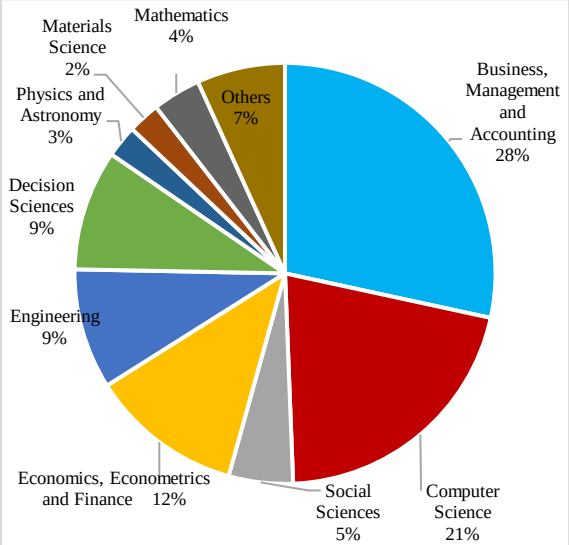

Figure 20: Percentage of Study by Subject Area

Between 1970 and 2021, 59% of all research consists of articles and 26% of proceedings, as can be seen in Figure 19. In Figure 20, accounting publications in the field of "business management and accounting" are in the first place with 28%. The publications related to accounting in computer sciences are in the second place with 21%.

Table 8: Number of Research by University /Institution

	University /Institution	Number of Research
1	City University of New York	3
2	Coventry University	3
3	Lehman College	3
4	Università degli Studi di Torino	2
5	Universidad de Huelva	2
6	Xiamen University	2
7	University of Southern California	2
8	Universidad Pablo de Olavide, de Sevilla	2
9	South China Institute of Software Engineering	1
10	Hainan College of Vocation and Technique	1

Table 9: Number of Citations by Author

Author	Number of Research	Citation
Dai, J.	1	247
Vasarhelyi, M.A.	1	247
O'Leary, D.E.	2	134
Kokina, J.	1	115
Mancha, R.	1	115
Pachamanova, D.	1	115
Leoni, G.	1	92
Schmitz, J.	1	92
Demirkan, S.	1	57
Demirkan, İ.	1	57

The first three in the ranking in Table 8 are shared by three universities / institutions, two in the USA and one in the UK, according to the number of research conducted between 1970-2021. In Table 9, the authors are listed according to the number of citations, and the first two authors received 247 citations for the same publication they published together.

When we look at all the research according to the language of writing, all of the 78 research are in English.

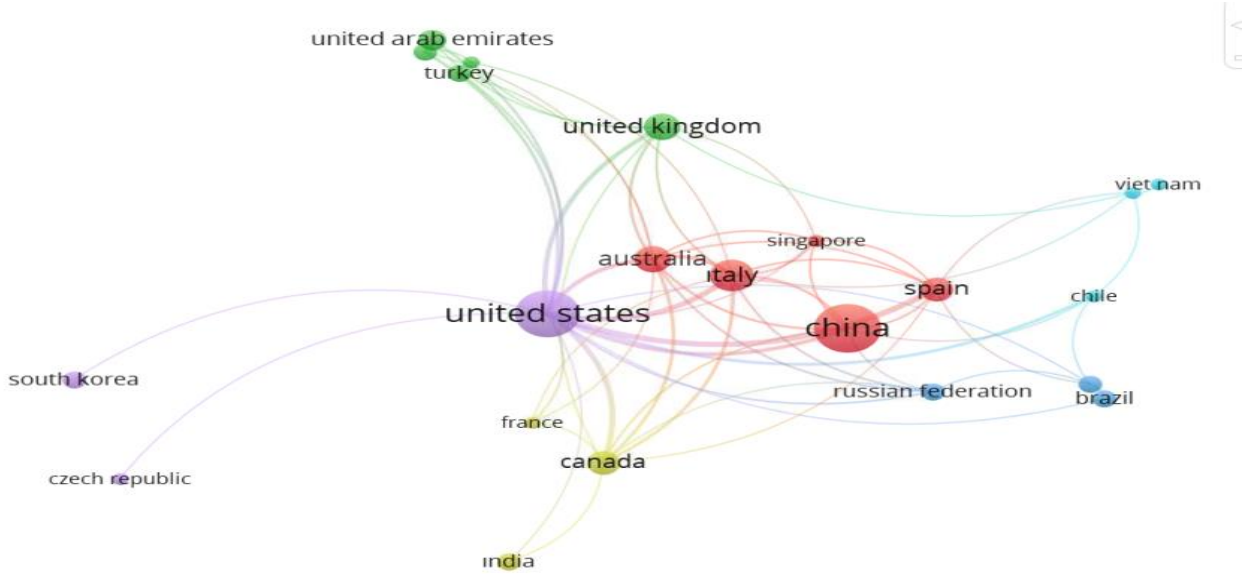

Figure 21: Citation Network Map by Country

Figure 21 taken from the VOSviewer program, the number of documents quoted from countries was selected as a minimum of 1 in the program and all 32 countries met the threshold value. But some of the 32 countries in the network are not connected to each other. The largest set of linked items consists of 22 countries and 6 clusters. In the citation network map according to these 22 country groups, the USA ranks first in terms of citation count with 15 publications, 629 citations and 84 total link relationships. Australia ranks second in terms of citation count with 5 publications with 152 citations and 34 total link relationships.

4.4. Analysis of Research on Accounting and Artificial Intelligence

The keywords "Accounting" and "Artificial Intelligence" were searched together in the Scopus database under the same title. A total of 70 research between the years 1970-2021 contain both of these keywords. However, when all these research were examined in detail, it was seen that 69 research were related to accounting. The distribution of these research by years is given in Figure 22.

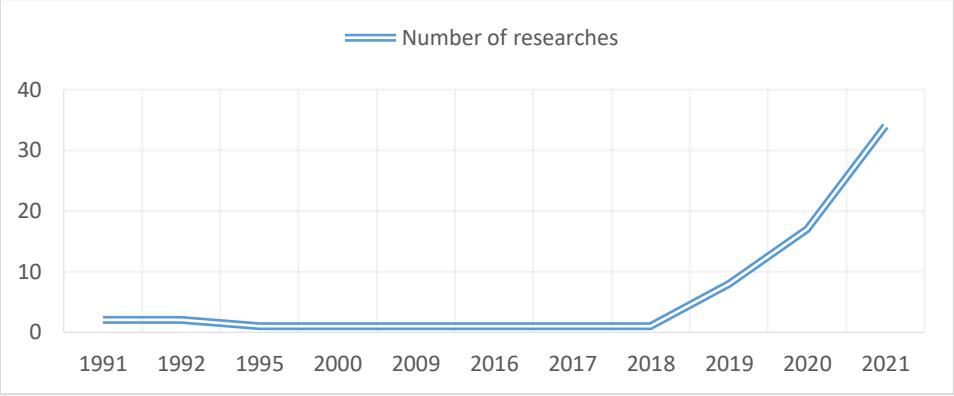

Figure 22: Number of Research by Years

According to Figure 22, it is seen that the number of research remained flat until 2018, then it experienced a very rapid increase. The number of research in which the keywords "accounting" and "artificial intelligence"

are included together, according to the first 20 sources, is given in Table 10, and the distribution by years according to the first 5 sources is given in Figure 23.

Table 10: Number of Research by Source (1970-2021)

	Source	Number of Research		Source	Number of Research
1	ACM International Conference Proceeding Series	9	11	Advances In Research On Russian Business And Management	1
2	Journal Of Physics Conference Series	6	12	Analysis And Metaphysics	1
3	Advances In Intelligent Systems And Computing	4	13	Asian Journal Of Business And Accounting	1
4	Expert Systems With Applications	3	14	Boletin Tecnico Technical Bulletin	1
5	Journal Of Emerging Technologies In Accounting	3	15	Computers And Industrial Engineering	1
6	Studies In Computational Intelligence	3	16	E3s Web Of Conferences	1
7	Accounting Education	2	17	IEEE Access	1
8	Development And Learning In Organizations	2	18	Information Sciences Letters	1
9	Academy Of Accounting And Financial Studies Journal	1	19	International Journal Of Accounting Information Systems	1
10	Advanced Sciences And Technologies For Security Applications	1	20	International Journal Of Advanced Science And Technology	1

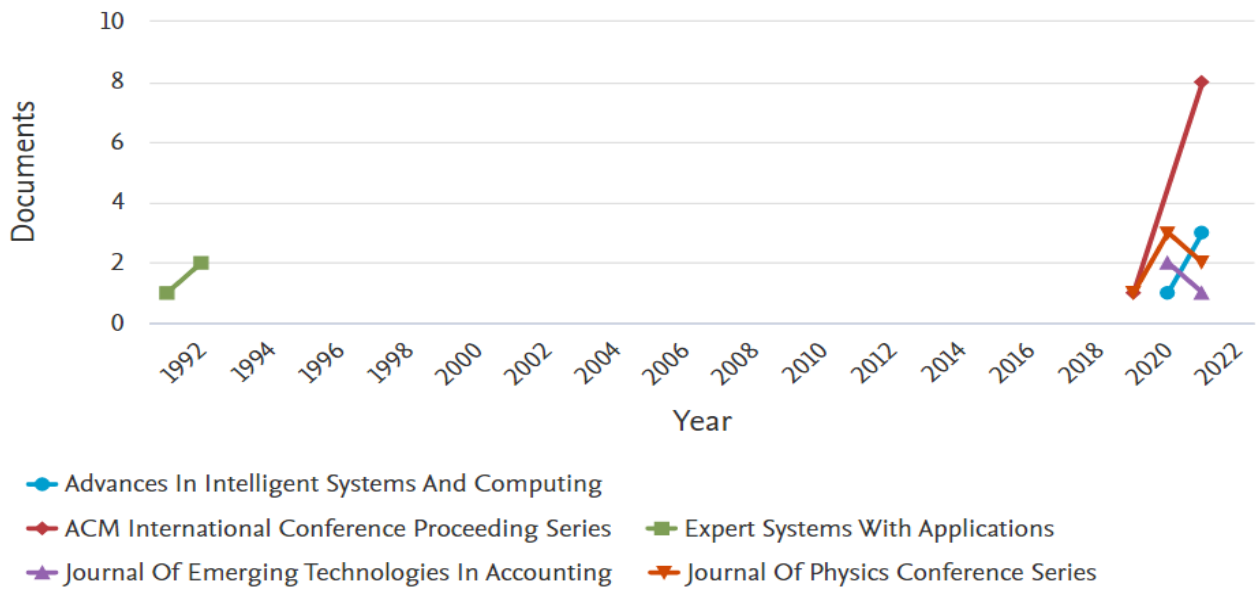

Figure 23: Number of Research by Source and Years

As can be seen from Table 10, there is no source publication related to accounting in the first four sources. The first two sources belong to the proceeding sources. In Figure 23, the change in the number of research of the first 5 sources between the relevant years is seen. The distribution of the research in which the keywords "accounting" and "artificial intelligence" are included according to the author and country is given in Figures 3 and 4.

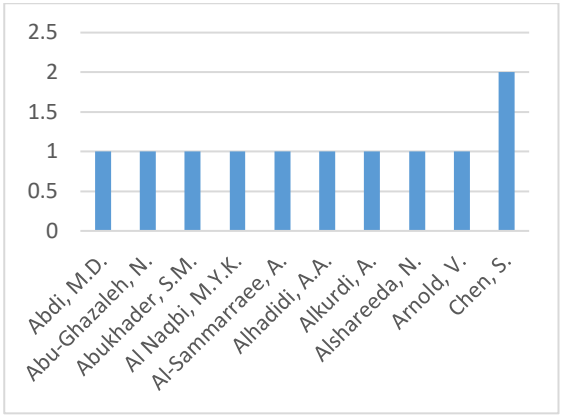

Figure 24: Number of Research by Author

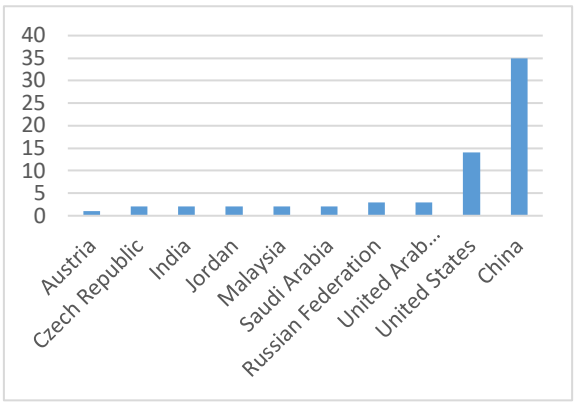

Figure 25: Number of Research by Country

As shown in Figure 25, between 1970 and 2021, 35 research were carried out mostly in China, followed by 14 research related to accounting and artificial intelligence in the USA. Turkey is not among these countries where the research were conducted. The distribution of the percentages of the research in which the keywords "accounting" and "artificial intelligence" are included according to the type and subject area are given in Figures 26 and 27.

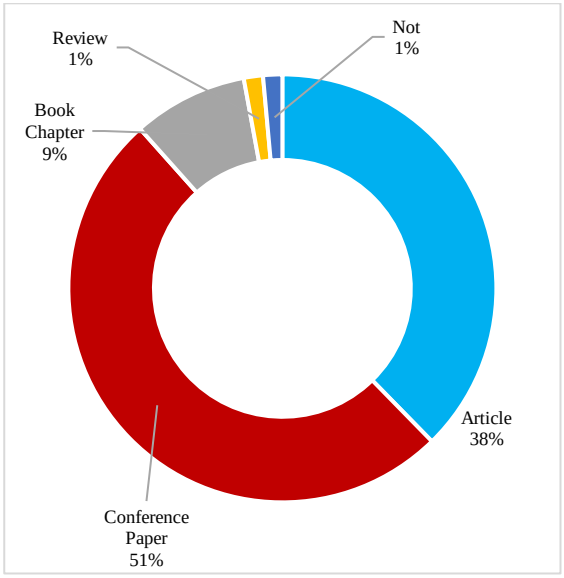

Figure 26: Percentage of Study by Type

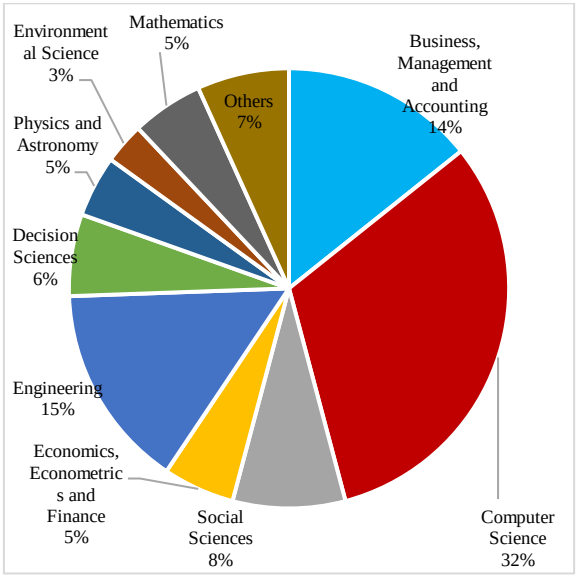

Figure 27: Percentage of Study by Subject Area

Between 1970 and 2021, 51% of all research were papers and 38% were articles as in Figure. In Figure 27, accounting publications in the field of "computer science" are in the first place with 32%, and accounting publications in the field of "engineering" are in the second place with 15%. Afterwards, publications related to the field of "business, management and accounting" come with 14%.

Table 11: Number of Research by University /Institution

	University /Institution	Number of Research
1	Fuzhou University of Foreign Studies and Trade	3
2	Zhanjiang Science and Technology College	2
3	Prague University of Economics and Business	2
4	Federal State Educational Institution of Higher Education, Volgograd State Agricultural University	2
5	Harbin Finance University	2
6	PLLC	1

Table 12: Number of Citations by Author

Author	Number of Research	Citation
Sutton, S.G.	1	56
Holt, M.	1	56
Arnold, V.	1	56
Chase, L.G.	1	34
Johnson, B.G.	1	34
Philips, F.	1	34

7	Jiangxi Vocational College of Finance and Economics	1	Kharbatt, F.F.	1	31
8	Quantum Simulations Incorporated	1	Qasim, A	1	31
9	Harbin Vocational and Technical College	1	Fan, X.	1	26
10	Water Conservancy of Shandong Technician College	1	Gu, H.	1	26

As listed in Table 11, the top 10 universities / institutions are listed according to the number of research between the years 1970-2021, and the first two are located in China. In Table 12, the authors are listed according to the number of citations. The first three authors received 56 citations to the same publication they published together.

When we look at all the research according to the language of writing, 68 of the 69 research are in English and one is in Arabic.

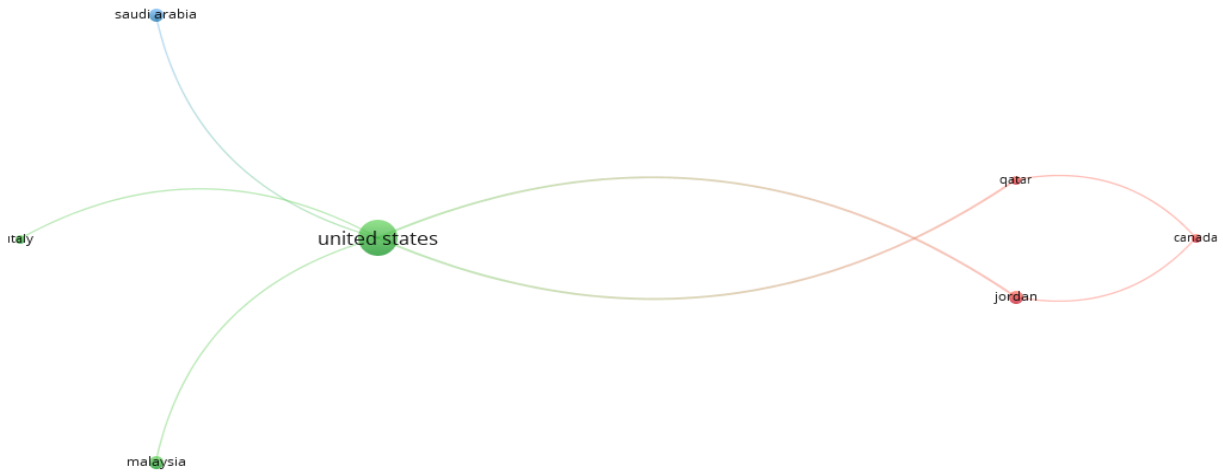

Figure 28: Citation Network Map by Country

Figure 28 taken from the VOSviewer program, the number of documents quoted from countries was selected as a minimum of 1 in the program and all 22 countries met the threshold value. But some of the 22 countries in the network are not connected to each other. The largest set of linked items consists of 7 countries and 3 clusters. According to these 7 country groups, in the citation network map, the USA ranks first in terms of the number of citations with 14 publications, 164 citations and 7 total link relationships.

4.5. Analysis of Research on Accounting and Cloud Computing

The keywords "Accounting" and "Cloud Computing" were searched together in the Scopus database under the same title. A total of 34 research between 1970 and 2021 include both of these keywords. However, when all these research were examined in detail, it was seen that 32 research were related to accounting.

It has been determined that these research have been on the rise since 2020 and that there are 3 research in 2018, 2 research in 2019, 5 research in 2020 and 11 research in 2021. Lv, S., Wang, X.F. and Weng, D.D. came to the fore as the authors who made the most research with two research each. However, China is the first country with 19 research, and the closest follower USA is the second country with 5 research. 16 of the research are proceedings and 12 of them are articles. Again, 16 of these research are in the field of computer science, 11 in the field of engineering, 7 in the field of business management and accounting. According to the order of the number of publications, the top 5 universities / institutions are located in China. Although the most publications are in China, the USA ranks first with 92 citations to 5 research. China ranks 5th with 18 citations to 19 research. In the citation ranking, Maniatis, P. and Sekar, V. are in the first place with 53 citations to their research together. According to the language of writing, all research are in English.

4.6. Analysis of Other Research

Between 1970-2021, when the keywords "Accounting" and "Industry 4.0" were searched together in the Scopus database under the same title, 10 research included both keywords, when the keywords "Accounting" and "Industry 5.0" were searched together in the Scopus database under the same title, 0 research included both keywords, when the keywords "Accounting" and "Mobile Application" were searched together in the Scopus database with the same title, it was determined that 5 research included both keywords, and when the keywords "Accounting" and "Metaverse" were searched together in the Scopus database under the same title, 0 research included both keywords.

Of the 10 research with the same title of Industry 4.0 and Accounting, 3 were published in 2019, 5 in 2020 and 2 in 2021. Although the language of all these research is in English, the country of 6 research is Turkey. While India ranks first with 56 citations to 2 research, Turkey ranks third with 9 citations to 6 research. Six of the research are in the field of business management and accounting. At the same time, 5 of these research are book chapters and 3 are articles. According to the publication order, 3 Turkish universities are among the top 5 universities / institutions.

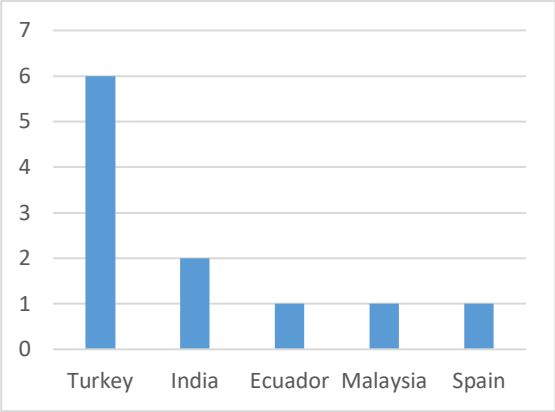

Figure 29: Number of Research by Country

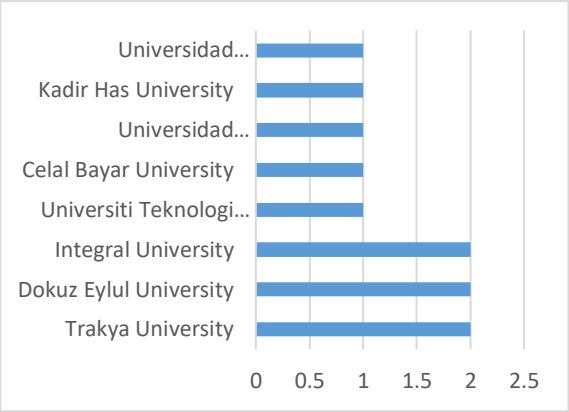

Figure 30: Number of Research by University / Institution

It was evaluated that only 3 of the 5 research in which the keywords "mobile application" and "accounting" were under the same title were related to accounting. Research are one in each of years 2018, 2020 and 2021. Two of them are in the field of computer science. One of the research is an article, one is a book chapter, and one is a proceeding. The language of all of them is English, two of them originate from England and one from Indonesia.

5-Conclusion and Discussion

The rapid development in information system or technologies also provides the development of Accounting Information Systems. With the adaptation of information systems to accounting, recording, classification and summarizing processes, which are the basic activities of accounting, have become simpler and faster. In addition, developments in the accounting information system have also changed and shaped the business processes of accountants. It is seen that the research made depending on this developing process are effective in the literature in the field of accounting.

In this research, the literature on accounting and information systems / technologies was examined. For this purpose, eight keywords (Information system / Information technology, Big data, Blockchain, Artificial intelligence, Cloud computing, Industry 4.0 / 5.0, Mobile application, Metaverse) were searched in the Scopus database together with the accounting keyword. Thus, a sample of 1060 studies was determined. Bibliometric analysis was done on this sample, using many criteria.

The results for the first keyword can be explained as follows. It has been observed that the number of research in which the keywords "accounting" and "information system / technology" are included in the same title increased rapidly after 2006. It can be said that this situation is closely related to the speed of development of technology and the interest of researchers in this subject. However, it has been determined that the most researched countries are Indonesia, America and China, respectively. Although Indonesia and China are

generally ahead in the number of research, they lag behind the United States in the number of research citations and networking with other countries. Turkey has 8 publications, 30 citations and a total of 18 links. Of the research conducted between the relevant years, 62% are articles, 29% are conference proceedings, 25% are in the field of "business management and accounting", and 18% are in the field of "computer sciences". When universities/institutions are ranked in terms of research numbers, there are three Indonesian universities/institutions in the top five.

The results for the second keyword can be explained as follows. It has been observed that the number of studies in which the keywords "accounting" and "big data" are included in the same title have entered an increasing trend after 2016. However, it has been determined that the most researched countries are China and America, respectively. Turkey is not among these countries. The United States ranks first in citations to research and in networking with other countries. Of the research conducted between the relevant years, 30% are articles, 63% are conference proceedings, 16% are in the field of "business management and accounting", and 23% are in the field of "computer sciences". When universities/institutions are ranked in terms of research numbers, Chinese universities/institutions are in the top five.

The results for the third keyword can be explained as follows. It has been determined that the research, in which the keywords "Accounting" and "Blockchain" are included in the same title, first started in 2017 and then increased rapidly. However, it has been seen that the most researched countries are China, America and Italy, respectively. Turkey is among these countries with 2 research. Although China is ahead in the number of research, it lags behind the United States in the number of citations to research and networking with other countries. Of the research conducted between the relevant years, 59% are articles, 26% are conference proceedings, 28% are in the field of "business management and accounting", and 21% are in the field of "computer sciences". When universities/institutions are ranked in terms of research numbers, there are two US, one UK, one Spain and one Italian university/institution in the top five.

The results for the fourth keyword can be explained as follows. It has been observed that the research in which the keywords "Accounting" and "Artificial intelligence" are included in the same title started to increase after 2019. However, it has been seen that the most researched countries are China, America and UAE, respectively. Turkey is not among these countries. In terms of citation to research and networking with other countries, the United States ranks first. Of the research conducted between the relevant years, 38% are articles, 51% are conference proceedings, 32% are in the field of "computer science", 15% are in the field of "engineering" and 14% are in the field of "business management and accounting". When universities / institutions are ranked in terms of research numbers, there are three Chinese universities/institutions in the top five.

We can explain the results for the fifth keyword as follows. It has been observed that the research in which the keywords "Accounting" and "Cloud Computing" are included in the same title have started to rise after 2020. China is the first with 19 studies and the USA is the second country with 5 studies. Of the research conducted between the relevant years, 12% are articles, 16% are conference proceedings, 16% are in the field of "computer science", 11% are in the field of "engineering" and 7% are in the field of "business management and accounting". When universities/institutions are ranked in terms of research numbers, all of the top five are Chinese universities/institutions.

When evaluated in general, it has been seen that research generally started after the 2000s and then started to rise. It was determined that the most research was done in the USA and China. When evaluated according to the type, it was seen that the research mostly consisted of articles and conference proceedings. According to the subject area, it has been determined that the research in the fields of "business, management and accounting" and "computer science" constitute the majority. When the source of the research is examined, it has been determined that conference papers and journal resources are in the first place. In addition, it has been observed that almost all of the publication languages of the research are in English. While Turkey is in the first place in the research containing the keywords "Accounting and Industry 4.0", in others are behind.

As a result, this research helps to explain the development of accounting information systems / technologies in the literature. In this sense, the results obtained on the subject can enable researchers to learn the current state of the research area. It can also help identify areas for improvement where there is less research and show steps that can be taken for further research. It can also help researchers evaluate the future of the accounting field.

The research also has some limitations. It may have led to the exclusion of some relevant articles because the selected keywords may not be enough to identify all the research or because some of the journals in the database may have been omitted. It can be said that inclusion of more databases and keywords in future research, and searching for keywords not only in titles but also in areas such as abstracts, can provide more detailed results.

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