

Cumbana, Diamantina Amélia Parckings Tauro; Ventura, José Biléu

Article

Transformation and overview of audit in past 20 years: a bibliometric analysis

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Transformation and overview of audit in past 20 years: a bibliometric analysis

Diamantina Amélia Parckings Tauro Cumbana^{a,b}  and José Biléu Ventura^{a,b,c} 

^aCenter for Advanced Studies in Management (CEFAGE), University of Évora, Évora, Portugal; ^bInstitute for Research and Advanced Training (IIFA), University of Évora, Évora, Portugal; ^cDepartment of Management, School of Social Sciences, University of Évora, Évora, Portugal

ABSTRACT

Audit is an important instrument that organizations used to prevent the occurrence of frauds along the years. Investigations in the field of audit are increasing, however, none of them presents quantitative overview on audit-related publications from 2003 to 2023. To fill this gap, this study aims to identify the transformation of audit related research in the past 20 years using bibliometric analysis and suggest avenues for future research in the audit fields. We analyzed a sample of 1177 articles published on Scopus and Web of Science databases. The results show that the most frequent keywords used by the authors were corporate governance, audit quality, audit and audit committee. United States of America (USA), United Kingdom (UK), China are the leader countries in this field. *Sustainability*, *Cogent Business and Management* and *Current Issues in Auditing*, are the most prolific journals. The article shows how audit is a pertinent topic and demands upcoming investigations about. This article makes an important contribution to the current literature on audit through a bibliometric analysis and describe future research and research agenda audit matter for academics.

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Environment & Business;
Regulation

JEL

M14; M42; M48; Q13;
Q56

1. Introduction

With insolvency of Enron, Artur Andersen and Parmalat, results in financial crises of early years 2000's and the auditing scandals of Deloitte & Touche and Grand Thornton, stakeholders remained confusion to understand the particularities that encourage a quality audit (Sulaiman, 2018). These scandals resulting in disappearance of Arthur Andersen (Rosati et al., 2022; Widyaningsih et al., 2019) and the appearance in 2002 of the Sarbanes-Oxley Act (SOX) caused stakeholders and auditors to pay more attention to material errors and irregularities in financial statements (Rosati et al., 2022). Quality is an important factor in audit inspection because it determines the evaluation of the records whether the audit was well or poorly done in terms of methods, evidence, documentations and qualities (Sulaiman, 2018) and contributes to reduce agency costs (Guo & Chen, 2015). Auditors are relevant to corporate governance since they respond to the controls imposed through interaction with the internal audit committees (Jiang & Zhou, 2017) and are vital because it is as an internal instrument of corporate direction, standard effectiveness and is related to the fact that companies need to have internal controls systems (ICS) and strong risk management, therefore reducing internal risks and costs of the external agency (Ismael & Roberts, 2018). Internal audit committees with audit and legal expertise can effectively reduce manipulation of unlimited spending effectively and their reputation makes managers hardworking in controlling financial statements, so that misstatements will be detected (Cheung & Chung, 2022). The internal audit committee influences the quality of the external audit report while there is a direct relationship between the effectiveness of the committee's function and the quality of the external audit report (Behrend & Eulerich, 2019).

CONTACT Diamantina Amélia Parckings Tauro Cumbana  diamantina.cumbana@uevora.pt  University of Évora, Évora, Portugal

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Agency theory assumes that agents have greater privileges in terms of information than principals, which makes it difficult for principals to understand whether their goals are being achieved (Ismael & Roberts, 2018), by principal and an agent (Guo & Chen, 2015). In his theory knowledge and skills of the corporate social responsibility committee facilitate relationships with stakeholders (García-Sánchez et al., 2021), and agents can transact with related parties to maximize the value of the company or to achieve personal goals, while in transactions made with shareholders, managers of other companies are advised not to rely on these transactions at all (Abigail & Dharmastuti, 2022). On the other hand, for Ismael and Roberts (2018) agency theory is existence of the internal audit function and the need to have strong ICS and risk management systems to reduce internal and external agency costs. But García-Sánchez et al. (2021) state that in the agency theory, knowledge and skills of the corporate social responsibility committee, facilitate relationships with stakeholders. The disagreement between them due to privileged information obtained by them, causes the agency's cost (Guo & Chen, 2015). The cost of agency can be internal, which means that there is little performance of employees, theft of assets and purposeful and unintentional manipulation of information and it can be an external cost that corresponds to the transfer of wealth from shareholders and debt holders, manipulation of information, management of profits, exaggerated demands, flight and incorrect investment decisions (Ismael & Roberts, 2018). The cost of the agency is concerned with making the agent and principal understand each other or have a middle ground, and auditing has been used to reduce this type of cost (Guo & Chen, 2015).

Bibliometric analysis shows the historical evolution of research, uses quantitative methods to understand and clarify it and helps in perceiving where and how future research can be conducted based on the current state of research (Pasko et al., 2021; Shi et al., 2020). Bibliometric analysis using R software is very comprehensive and allows the integration of other packages (C. Wang et al., 2022). The usage of bibliometric analysis methods implies researchers to have an interpretation of the audit field and recognizes the most themes in this field (Azzari et al., 2020). On the other hand, for Shi et al. (2020), bibliometric shows valuable orientations to elucidate the present state and complete impression of the investigation arena to suggest a robust and holistic contextual acknowledgement and figure out current development and hot subjects therefore might be an outstanding resource to openness and involves investigators in the field that would be interesting with. This kind of approaches are usually to quantitatively analyze academic publications by means of statistical techniques, with the purpose to offer suggestions of tendencies and general subjects to universal level (Shi et al., 2020).

This study shows authors who presently see the sustain audit pitches and the researcher focus on corporate governance, audit committee, audit quality, earning management, sustainability, fraud, financial reporting, auditing, audit, corporate social responsibility, internal audit, but not the transformations of audit in the past two decades. To perform the bibliometric analysis, data from Scopus and Web of Science were first collected, and then descriptive and bibliometric analyses were conducted at various horizons. This type of analysis shows history and geography globally, because it encompasses the most influential journals, institutions, keywords, citations and articles (Shi et al., 2020). This paper aims to identify trends in the scientific literature over time in terms of authors, documents, institutions and countries, the areas not covered by researchers, through bibliometric analysis, using leading databases Scopus and Web of Science (WoS) from 2003 and 31 July 2023. To carry out this investigation, we propose three questions, as we can see below:

The following research questions were defined as a guiding thread of the investigation:

- Q1: What is the theoretical evolution of the literature and the main documents that influence intellectual structure?
- Q2: What are the main topics and transformations undergone?
- Q3: Who are the most influential authors, sources, institutions and countries?

This article has six parts. After this introduction, as a [Section 2](#) that describes the methodology, [Section 3](#) demonstrates the results, [Section 4](#) demonstrates the discussion, [Section 5](#) provides the agenda for research and [Section 6](#) is the conclusion.

2. Method

To carry out our research, we use Scopus and WoS databases and bibliometric analysis were performed based on the definition of stages (Borges et al., 2022). This method produces outputs for the analysis and interpretation of the results. Bibliometric analysis is a statistical method in which a researcher with a robust database can, through tables and figures, understand its history, changes over time and trends (Pasko et al., 2021) and bibliometric analysis helps in the analysis of large volumes of data and has an enormous impact on research (Azzari et al., 2020; Behrend & Eulerich, 2019; Blanco-Zaitegi et al., 2022; Di Vaio et al., 2021, 2022; Donthu et al. 2021; Dwekat et al., 2020; Ezenwoke et al., 2019; Lardo et al., 2022; Maggiorani, 2022; Moher et al., 2015; Secinaro et al., 2021; Shi et al., 2020; Thottoli, 2022; Williams & Bornmann, 2016; Xu et al., 2018; Ye et al., 2020; Zulkefle et al., 2022). We use 'Audit' as a word search at the Scopus and WoS for period of 2003 and 31 July 2023, and the software R Studios, bibliometrics, Biblioshyne and Excel were used to facilitate the statistical analysis (Thottoli, 2022), and they used a R Studios, Bibliometrics and Biblioshyne softwares to obtaining quantitative results.

2.1. Data

The articles were collected on 31 July 2023, in Scopus and the WoS. 'Audit' was the word searched in both databases. Only open-access scientific articles in English were included. As shown in Figure 1, the PRISMA protocol was used to summarize the screening of scientific articles (Borges et al., 2022; Bosi et al., 2022). A total of 1.558 scientific articles were extracted from the Scopus database and 1.783 scientific articles were retrieved from the Web of Science database, totaling 3.341 articles. The two databases were then merged into the R Studios software, in which 496 duplicates were excluded. This was followed by reading the titles and abstracts, resulting in the deletion of 1.028 articles. Next, we screened the articles with full reading, and 640 were excluded. PRISMA has been used to explain

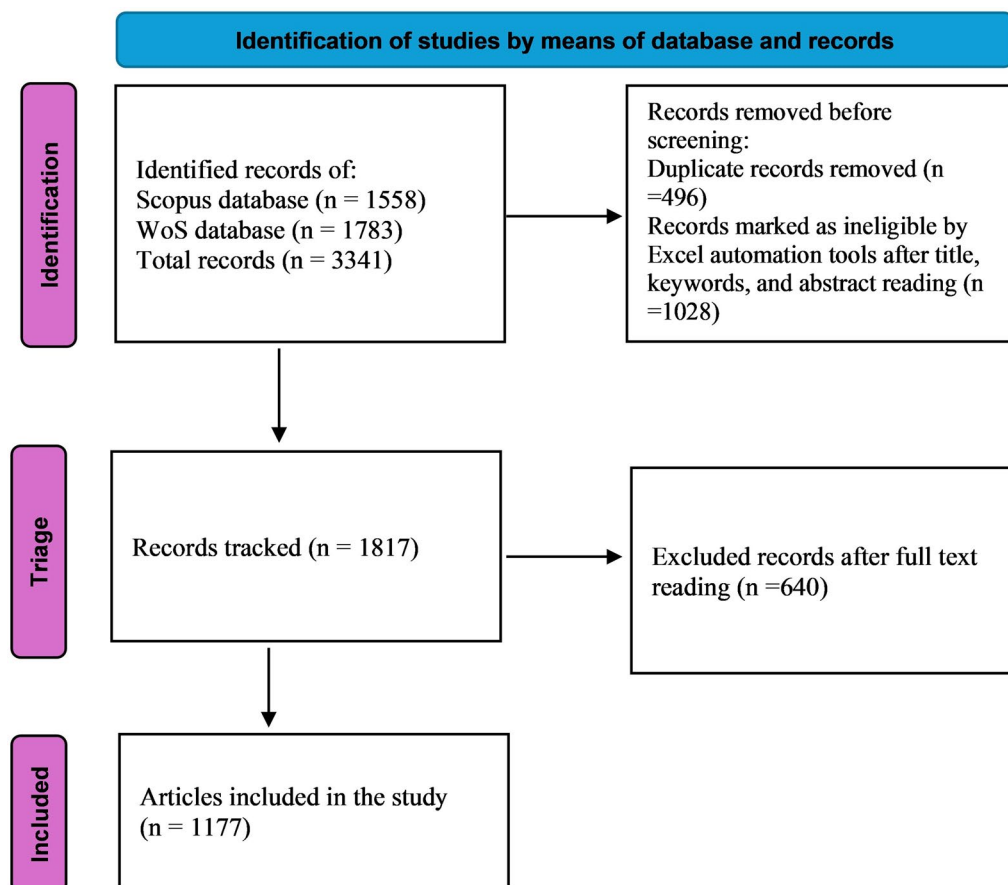


Figure 1. PRISMA diagram, proposed by Page et al. (2021). Source: Authors' elaborations.

step-by-step data collected (Bhardwaj et al., 2020; Donthu et al., 2021; Secinaro et al., 2021; Thottoli, 2022).

Table 1 shows the summary of the research process in the Scopus and Web of Science databases that started as follows:

2.1.1. Scopus database

Word searched, 'Audit' where 120.887 documents were obtained.

- Year 2003 as of 31 July 2023, which resulted in 90.986 documents.
- After the inclusion of open access, it resulted in 31.277 documents.
- Area of the discipline: Business, Management and Accounting, Environmental Science and Agriculture and Biological Science, in which 5.041 documents were obtained.
- Type of document: scientific articles resulting in 4.370 articles.
- Publication status: completed, 4.266 articles were obtained.
- Keywords: Audit quality, Audit, Audit Committee, Accountability, Quality Control, Risk Management, Audit Committees, Corporate Social Responsibility, Financial Reporting, Financial Performance, Sustainability, Sustainable Development, Audit Fees, Auditing, Environmental Management, Internal Audit,
- Fraud, Agency Theory, Internal Control, Audit Risk, Audit Independence, Accounting, Financial Reporting Quality, Auditors, External Audit, Safety, Management, with 1.604 scientific articles.
- Source type and language: journals and English, which resulted in 1.558 final articles before the extraction of duplicates.

2.1.2. Web of Science

'Audit' was the word searched and it resulted in 96.757 documents.

- Years of Publication: 2003 to 31 July 2023, with a result of 81.122 documents.
- Documents: 29.370 open access.

Table 1. Search criteria in Scopus and WoS.

Item	Criteria	
Database online	Scopus	WoS
Keywords	"Audit"= 120887 documents	"Audit" = 96757 documents
Year	2003–2023 = 90966 documents	2003–2023 = 81122 documents
Open access	31277 documents	29370 documents
Area of discipline	Business, management and accounting, environmental science and agriculture, biological science = 5041	
Citation by topic sustainability		Environmental science, economic theory, sustainability science, economics and management = 3802 documents Articles = 2249
Type of document	Scientific articles = 4370	
Publication status	Completed = 4266 articles	
Category		Business finance, management; business; environmental science = 2125 articles
Keywords	Audit quality; audit; audit committee; accountability; quality control; risk management; audit committees; corporate social responsibility; financial reporting; financial performance; sustainability; sustainable development; audit fees; auditing; environmental management; internal audit; fraud; agency theory; internal control; audit risk; audit independence; accounting; financial reporting quality; auditors; external audit; safety; management = 1604 articles	
Research area		Business economics; social science; other topics; operation research; management science; biodiversity conservation = 1330 articles
Source type	Journals	Journals
Language	English = 1558 articles	English = 1783 articles

Source: Authors' elaboration.

- Citation by topic: Environmental Science, Economic Theory, Sustainability Science, Economics and Management, which resulted in 3.802 documents.
- Type of document: articles in which 2.249 articles were selected.
- Category: Business Finance, Management, Business, Environmental Science with a result of 2.125 articles.
- Research area: Business Economics, Social Science Other topics, Operation Research Management Science and Biodiversity Conservation with a result of 1.330 articles.
- Source type and language: Journals and English which resulted in 1.783 final articles before the extraction of duplicates.

After this process, the articles were extracted from the databases through the Bibtex option and placed in the R Studios software with the Bibliometrics package so that all duplicate articles were removed, resulting in a total of 2.845 articles for having been removed, 496 duplicates were removed. Next, the analysis of the 2.845 scientific articles in Excel was carried out with the reading of the keywords, titles and abstracts of all the articles, excluding 1.028 scientific articles. The last phase of the analysis of these articles was the reading of them in full, resulting in the exclusion of 640 scientific articles.

3. Results

3.1. General description

Table 2 shows the comprehensive summary which cover the period from 2003 to 31 July and total of 1177 documents, which 1151 are articles, one is article-book chapter, 22 are article-early access and three are article-proceeding paper. The annual growth rate is 25.16%. The average citations per document is 15.26 and the bibliography as 53227 references, 2330 keyword plus (ID) and 3144 author's keywords (ED). The information characterizes a collaborative and connected environment with 2914 total authors, 132 single-authored publication and 142 single-authors documents. Figure 2 shows the word cloud (a) and tree map (b). In the theme related to an audit, the researchers have focused on matters such as corporate governance, audit quality, the audit committee, auditing, internal audit, sustainability, auditors' fees, earning management, auditor independence, corporate social responsibility, independence, earnings quality, performance, as show the word cloud (a). When it comes to the tree map (b), corporate

Table 2. General description.

<i>Description</i>	<i>Results</i>
Data	
Time period	2003:2023
References (journals, books, etc.)	318
Documents	1177
Annual growth rate %	25.18
Document overage age %	4.44
Average citation per document	15.26
Bibliography	53227
Document contents	
Keywords plus (ID)	2330
Author's keywords (DE)	3144
Authors	
Authors	2914
Authors of single-authored docs	132
Author collaborations	
Single-authors docs	142
Co-author per docs %	2.97
Document types	
Articles	1151
Article-book chapter	1
Article-early access	22
Article-proceeding paper	3

Source: Authors'elaboration.

governance leads with (147 times and represents 8%), followed by quality (132, 7%), impact (127, 7%), performance (120, 7%), earnings management (98, 5%), ownership (92, 5%), management (91, 5%),

firms (69, 4%), determinant and sustainability (61, 3%) are the 10 most used topics by investigators when it comes to the audit investigations.

3.2. Publications by years, countries, sources and authors

For the 1177 articles used for this research, it should be noted that from 2003 to 2007, there were fewer publications related to the audit subject, with fewer than 10 annual publications. From 2008 to 2022, it's seem like the publications on this area of audit were growth of exponential publications of papers related to audits, exponentially but 2011 and 2014 and 2023 were the years in which the number of publications decreased. 2022, is the year with high publications in audit with 207 articles. Before 2011, the publications were slow, but from 2012 there are significant growth in publications. When compared to 2022 and 2021 in terms of number of articles in audit, there are 39 articles and the trend of publications over time is positive and increasing, with an average annual growth rate of 25.16% as shown in Figure 3 (Statistics of articles about audit per year). Table 3. shows most 10 significant countries and geographically distribution of investigations contributions at audit research. USA is the leader with 427 publications, followed by UK (229), Indonesia (157), Malaysia (144) and Australia (125). Notably Spain (114) Netherlands (75), Germany (69) and Vietnam (66) also make important contributions on the audit research. Table 4 shows most sources of published articles related to audit field. The first three journal most publish about audit is the *Sustainability* (Switzerland) with 76 publications, followed by *Cogent Business & Management* (66), *Current Issues in Auditing* (60), *Corporate Ownership and Control* (29), *Journal of Risk and Financial Management* (24). Other journals that make notable contributions in audit are *Journal of Business Ethics* (21), *Accounting and Business Research* (20), *Journal of Auditing and Business* (19)

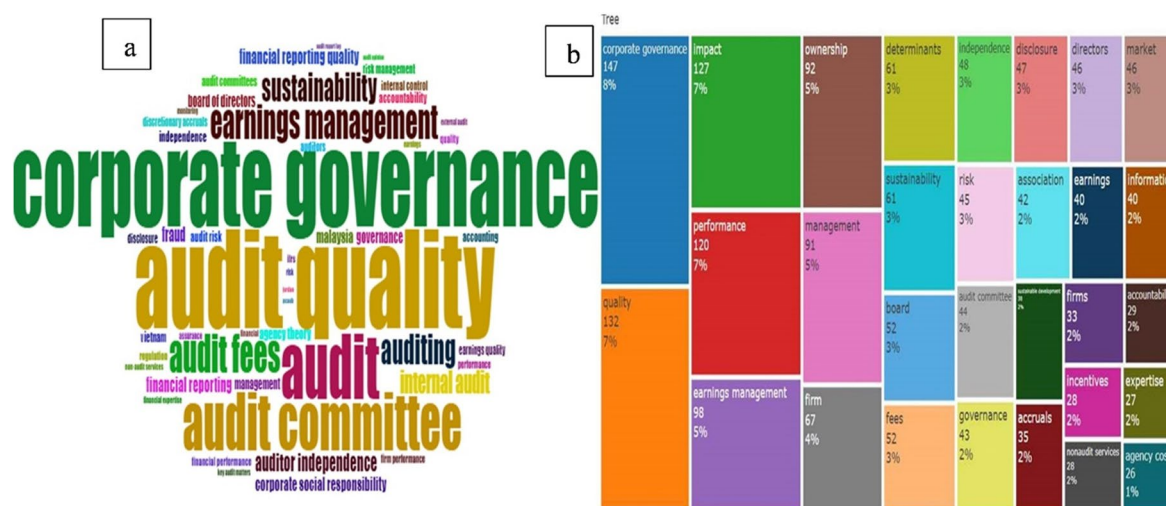


Figure 2. Word cloud (A) and tree map (B). Source: Authors' elaboration using bibliometric R-Studio.

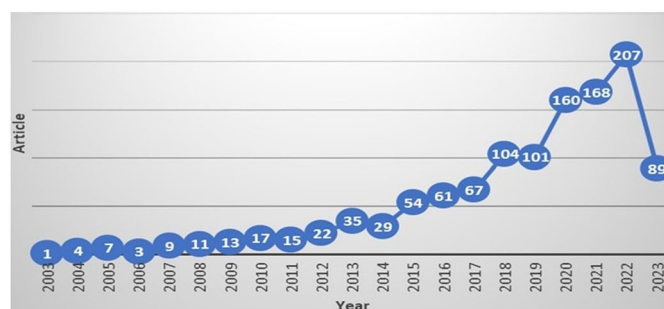


Figure 3. Statistics of articles about audit per year (n = 1,177). Source: Authors' elaboration using bibliometric R-Studio.

and the *Australasian Accounting Business and Finance Journal* (18). The most prominent authors in audit as show Figure 4, are Salehi M (eight publications), Hussainey K (six) and Sulaiman K (six). The nodes indicate the number of articles published each year and the number of citations in each year. The author with the larger circles means that in that year they had more than one publication and the larger the circle, the more citations they had in that year.

3.3. Co-occurrence networks

Using R-Studios, we see what the most prominent keywords in audit as shown in Figure 5. Corporate governance is linked to earnings management, audit committees, financial reporting quality, the board of directors, agency theory, financial expertise, financial performance, audit committees, firm performance and quality. The audit is clustered into auditing, financial reporting, internal audit, sustainability,

Table 3. Most important countries.

Country	T. production	T. citation	%
USA	427	5681	41.5
UK	299	2907	28.5
China	186	572	8.2
Indonesia	157	328	4.9
Malaysia	144	199	3.6
Australia	125	860	19.1
Spain	114	1228	24.6
Netherlands	75	307	10.6
German	69	129	5.6
Vietnam	66	96	4.4

Source: Authors' elaboration.

Table 4. Most important sources.

Sources	Articles	TC	h_index	g_index	m_index	PY_start
<i>Sustainability (Switzerland)</i>	76	632	14	21	1.273	2014
<i>Cogent Business & Management</i>	66	348	10	14	1.111	2016
<i>Current Issues in Auditing</i>	60	198	8	12	0.615	2012
<i>Corporate Ownership and Control</i>	29	135	6	10	0.286	2004
<i>Journal of Risk and Financial Management</i>	24	119	4	10	0.667	2019
<i>Journal of Business Ethics</i>	21	1,412	13	21	0.813	2009
<i>Accounting and Business Research</i>	20	414	13	20	0.722	2007
<i>International Journal of Auditing</i>	20	86	5	8	0.625	2017
<i>Journal of Asian Finance Economics and Business</i>	19	214	10	14	1.667	2019
<i>Australasian Accounting Business and Finance Journal</i>	18	128	6	10	0.6	2015

Source: Authors' elaboration.

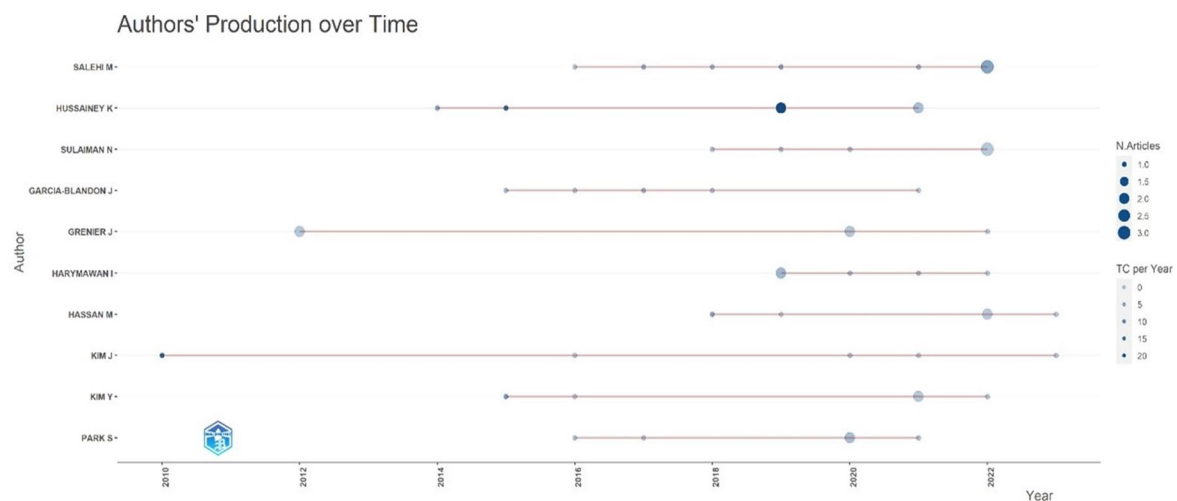


Figure 4. Most important authors. Source: Authors' elaboration using bibliometric R-Studio.

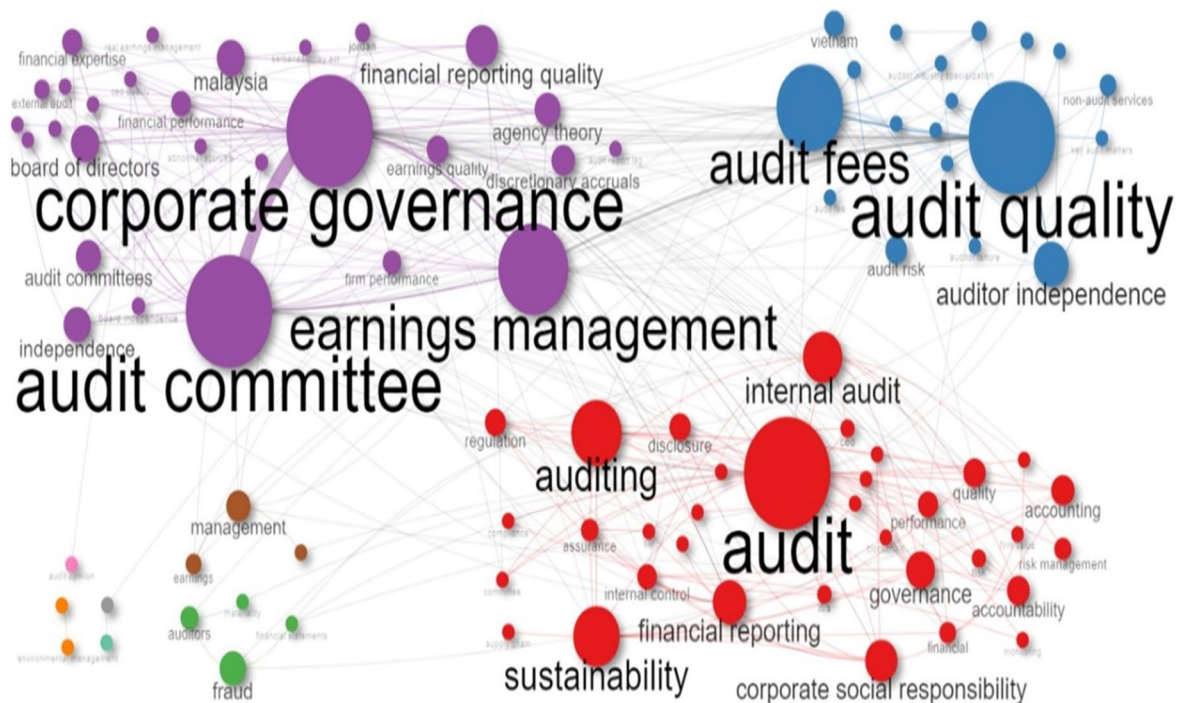


Figure 5. Co-occurrences keywords. *Source:* Authors' elaboration using bibliometrix R-Studio.

corporate social responsibility, accountability, accounting, risk management, disclosure, regulation, assurance, governance, quality, performance and internal control. Audit quality is linked to audit

fees, auditor independence, audit risk and non-audit services. Management is linked to earnings and fraud is clustered with financial reports and auditors. **Figure 6** shows networks of collaboration between authors, and Arnold A has a collaborative network with Delmore J, Martin J, Eastwood I, Boykin C, Harris M and Johnson D. In the second cluster, Kim J formed a cluster with Park S, Kim Y, Zang Y, Choi J and Kim S. In the third cluster, Muller F collaborated with Whittle A and Carter C, whereas Chen H collaborated with Wang Y and Zhang T. **Figure 7** shows the networks of collaboration between institutions (A) and collaborations between countries (B). It's possible to see that

at the collaboration between institutions (a), Newcastle University has collaborated with the University of Exeter, University of Manchester, University of Western Australia, University of Edinburgh, University of Airlangga, Curtin University, Queensland University of Technology, University of Lancaster, Hull University. Queensland University of Technology collaborates with MRT University, which belongs to the Aalto University collaboration network that makes its network with the University of Auckland, Peking University, BI Norwegian Business School, University of Vaasa and the University of Turku. The University of Turku collaborates with Tilburg University, which belongs to the collaboration network of Cardiff University, University of Amsterdam, University of Coll Dublin, University of Bristol, Linkoping University and Heriot-Watt University. The University of Manchester has also collaborated with Lund University, which, in turn, has collaborated with the University of Groningen, Copenhagen University Business School and the University of Hamburg. The University of Exeter collaborates with the University of Antwerp and Stockholm School of Economics, which networks with Texas State University, Maastricht University, Kennesaw State University, Miami University, University of Illinois, Bentley University and Baylor University. Peking University has collaborated with the Singapore Management University network, which Hong Kong Polytechnic University, Nanyang Technology University, Erasmus University and Korea University. When it comes to the collaboration between countries as shows (b) and (c), the cluster that stands out is the United Kingdom with the USA, Australia, China, Canada, Singapore, Korea, Italy, Belgium, Germany, Finland, Thailand, Vietnam, Finland, France and Indonesia. Malaysians networked with the United Kingdom



Figure 6. Authors network. *Source:* Authors' elaboration using bibliometric R-Studio.

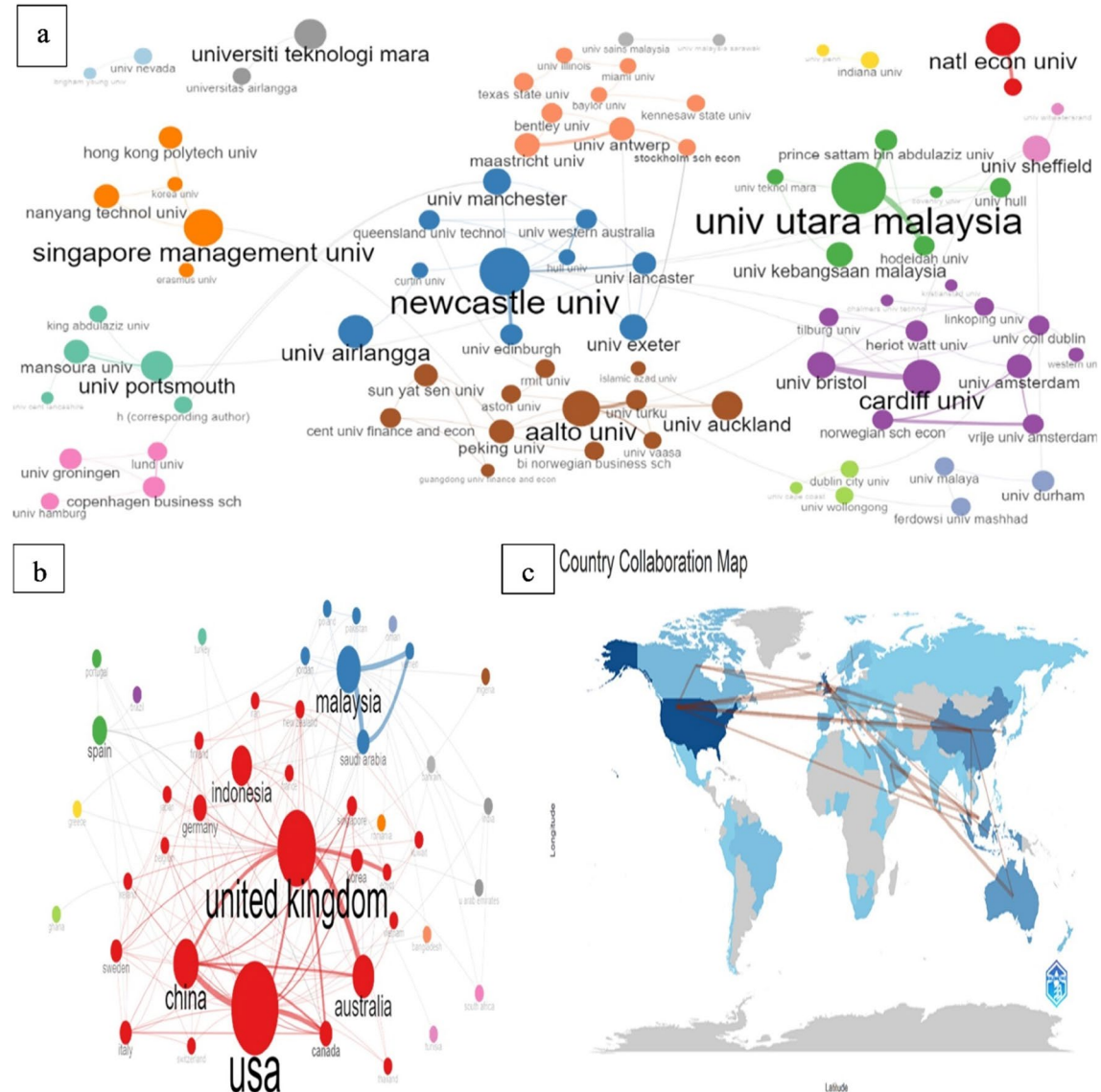


Figure 7. Network by institutions (a) and countries (b) and (c). *Source:* Authors' elaboration using bibliometric R-Studio.

and Indonesia. Vietnam has a link to the Indian collaboration network. Spain collaborated with Portugal and Brazil.

3.4. Evolution of the theme over time

To understand how audit-related topics have evolved over the last 20 years, we made three cuts in 2008, 2013 and 2018, as shown in Figure 8. The larger rectangle, the greater the importance of the theme. From 2003 to 2008, the most investigated topics were corporate governance, audit quality, auditing and audits. From 2009 to 2013, in addition to the themes researched from 2003 to 2008, other academic interests emerged, such as fraud, forest management, auditor change, environmental management and audit fees. From 2014 to 2018, the greatest attention was paid to the quality of the audit and the audit itself, without leaving aside fraud and corporate governance. It should be noted that in this period, there was an interest in academics, such as internal control, incentives, sustainability, Sarbanes-Oxley, corporate social responsibility, disclosure, audit risk, investment, audit effort, accounting standards and audit reports. From 2019 to 2023, auditing, audit quality, audit, corporate governance, institutional theory, certification, audit risk and environment were areas that academic investigation paid the most attention to. Corporate governance, audit quality and audit were the themes that academics maintained an interest in investigating throughout the period (2003 and 2023).

4. Discussion

Our results show that corporate governance, audit quality, audit and audit committee are the words that most drove the academic work of researchers (Figure 2). There has been an exponential growth in the number of publications on auditing since 2012, suggesting that after the financial crisis of 2008 (Figures 3 and 8), where the most investigated topics were corporate governance, audit quality, audit and auditing. This result shows that the crisis of the late 90's and early 2000's created doubts about who was responsible for preventing and stopping fraud in companies as defended by the author (Sulaiman, 2018) and that it was also necessary to pay attention to material errors and irregularities in financial statements as stated by other authors (Rosati et al., 2022). After this crisis, it is noted that academics began to take an interest in the themes involving fraud, forest management, environment management, audit fees and auditor change, in addition to the themes that were being investigated in the period from 2003 to 2008. Suggesting that in this second period not only the quality of the audit was important, but also the need to understand how fraud occurs. In the third period (2014–2018) it is evident the concern of researchers to carry out scientific work that incorporates internal control, which are essential in the prevention of organizational fraud.

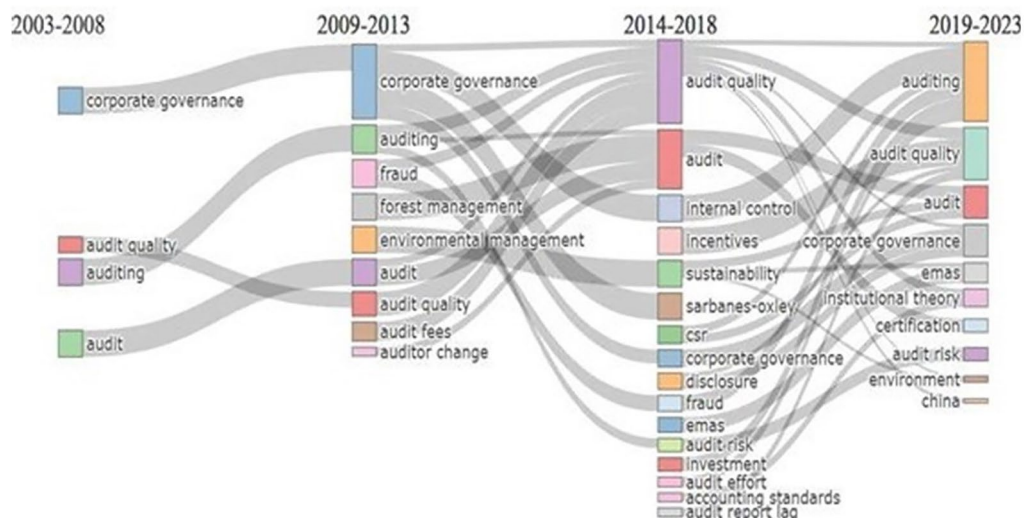


Figure 8. Evolution of audit between 2003 and 2023. Source: Authors' elaboration using bibliometric R-Studio.

Another interesting factor is the emergence of sustainability, corporate social responsibility (CSR), disclosure, audit risk, accounting standards, audit report (Figure 5 and Figure 8), as research topics that emphasize once again the need not only to pay attention to corporate governance, which has a close connection with the audit committee, earning management, agency theory, financial reporting quality, board of directors, independence, which suggest that they are issues related to corporate governance in which agency theory arises to create balance between the owners of organizations and who are responsible for their day-to-day operation and that by not understanding these actors it can generate agency cost (Ismael & Roberts, 2018). For Sulaiman, (2018), quality is an important factor in audit inspection and determines if audit was well or poorly done in terms of methods, evidence, documentations and qualities. And as sys Guo and Chen (2015), quality contributes to reduction of agency costs. In the period from 2019 to 2023 (Figure 8), the emergence of institutional theory, certification, audit risk, environment, shows the importance of certification not only of the audit itself, but mainly of the certification of financial reporting through the opinion of the external auditor to enable the disclosure of these financial statements, taking into account internal audit as an important instrument for verifying the effectiveness and efficiency of control systems taking into account the quality, accountability, performance, assurance, regulation, sustainability, corporate social responsibility (Figure 5 and Figure 8). The fraud, not only interconnects with the auditors but also with the regulations, sustainability, corporate social responsibility, internal audit, financial reporting, thus showing that organizations have to pay attention to the occurrence of frauds that despite being the responsibility of corporate governance, which is supported by the implementation and maintenance of their ICS, Through the Auditor Committee, it can also occur in Financial Reporting, Sustainability Reporting and Corporate Social Responsibility and that sustainability auditors and external auditors should be aware of the possibility of fraud occurring when they are carrying out their work considering the audit risk. The results also show the importance of collaboration between authors (Figure 6), between institutions and countries at a global level (Figure 7), thus making the internationalization of knowledge in general and in audit fields in particular.

5. Agenda for future research

Numerous investigations related to audit has been done, for example what is the relevance of specialization and experience in the hasty signing of contracts between external auditor clients? (Al-Qatamin et al., 2021), the extent to which the stress of the auditor's work can influence the auditor's conservatism (Suhardianto & Leung, 2020), the extent to which industry-specific knowledge influences the outcome of the auditor's work (Cahan et al., 2022). How the auditor's expertise, attributes and characteristics help harmonize accounting standards and regulations (Donatella, 2022), how stress on auditors affects audit quality (Annelin & Svanström, 2022). How audit quality is affected with auditor working hours (Kim & Jeong, 2022), if the characteristics of the Committee of Auditors affect the hours of the audits (Afenya et al., 2022). How local stakeholders understand the credibility of the audit, its standards and the other stakeholders in the audit reports. In this section, we analyze articles for the year 2023 because they are the most recent. It merges five themes related to the audit, as we can see: external audit, internal audit, sustainability audit and forensic audit.

5.1. External audit

Researchers can investigate the best quantity that describes the assets in the Asia-Pacific (Yu & Huang, 2023), analyze how non-Big 4 auditors recognize client hazards, compare Big 4 and non-Big 4 audit risk disclosures and use the interview method to understand how auditors and audit committees identify client risk (Dwyer et al., 2023). How developing a tax plan affects the private sector regarding the option of financial reporting (Chen et al., 2023). To best collect data related to auditor attitudes, it can use information technology (Sujana & Dharmawan, 2023), using the quantitative method, to understand whether the auditors know the audit quality and why they do quality assessments. Future investigation must include the financial sector, must use interviews, self-administrated surveys, use moderate variables like institutional ownership, foreign ownership and managerial ownership as for more understand the audit quality (Hyarat et al., 2023), use a unique type of industry can be done investigation to understand the relationship between reputation of audit and earning of management, the impact of audit fee and

audit rotation in earning management, the measurement of financial disclosure on earning management can be considered as another line of research (Tran & Tran, 2023). It can be used in future investigations on the effect of credit access on audit governance and characteristics, and it can be done with a sample of listed companies (Alduraywish, 2023), see other sectors and countries and compare the use of qualitative characteristics of corporate reputation such as customer satisfaction, employees satisfaction, product quality, emotional appeal, and other studies can be done as corporate reputation across social media and the implication of countries' reputation (Eriqat et al., 2023). External governance in key audit matter disclosure can be a line of investigation (Jaffar et al., 2023), studying the idiosyncratic influence of corporate social responsibility reports, the tendency of greenwashing on corporate social responsibility on audit quality and reporting and understanding the structure of the board of directors as an impact of management activities involved in corporate social responsibilities actions (Lampthey et al., 2023). Using data from another country to better understand the voluntary adoption of audit standards and to explore the voluntary adoption of audit standards for the public sector, but in a large multi-year dataset (Rönkkö et al., 2023), the use of the qualitative method can be completed with the interview of firms to now the effect of sustaining audit impartiality, expanding the period of data (Al Natour et al., 2023).

5.2. Internal audit

Future studies can encompass the period to appreciate how sensitive audit price modification in risk measured over time, the development of the board configuration and audit committee disclosure and characteristics over time can be the other line of investigation, concentrating on the skills and know-how of non-executives and studying if it influences audits pricing decisions it's another line that can be explored (Xue & O'Sullivan, 2023). Future investigations can validate this study by using an ethnographic approach, through interviews and observations (Eklöv Alander, 2023), The use of primary data by mixing the survey and reported data to enhance the result using data from alternative countries and industries and weight on corporate governance measurements are the nines of future studies (Ahmed et al., 2023). Exploring the influence of cultural and contextual factors on whistle-blowing as an internal control, the relationship between whistleblowing and other internal controls and synergies can be done as a line of future analyses (Kagias et al., 2023). In future investigations to indicate the cause-and-effect of factors influencing risk management, the results of this study are the same in other countries (Abu Kwaik et al., 2023), using the same topic, the sample must be taken at a time when the country's GDP is on the rise and economy is improving, using indicators such as cash flow from operating activities, Q ratios, working capital and book value per share to understand the insight of true financial performance (Awad & Ghanem, 2023). Future research should use interviews with the CEO (Musa et al., 2023), and algorithms such as neural networks and support vector machines can be implemented in future research, using different variables related to financial statements and governance to evaluate the quality of financial disclosure effectively for non-audit points can be considered in future investigations (Ngoc Hung et al., 2023). Future studies to determine whether the relationship between committees' audit independence and various economic factors is linear. Investigate the influence of audit reporting lag of financial firms (Alsheikh & Alsheikh, 2023), new studies to understand what efforts management undertakes to develop a relational contract with their internal auditors and how they address the challenges of credibility and clarity (Vafaei et al., 2023). Assessing internal auditors' communication quality by auditees and the recipients of their services (Rydzak et al., 2023), the importance of political control on audit quality, audit committee composition and financial control within mix public service organizations would offer insights into the dynamics of accountability can be doing as a future study (Andrews & Ferry, 2023). Expand the study by introducing companies from developed countries and comparing the results with this study, including the transition between parents and subsidiaries, to evaluate the robustness and reliability of the results (Sari et al., 2023).

5.3. Sustainability audit

Corporate sustainability reports have been given special attention in the field of research, and their information contained in them varies from company to company, since this type of report is voluntary (Bosi

et al., 2022) and concerns about corporate social responsibility and sustainable development have grown in academia and companies (Ye et al., 2020). With the knowledge, competence and values about sustainability and sustainable practices that the members of the corporate sustainability reporting committee have, they can influence that this type of report has the quality and credibility of non-financial information (García-Sánchez et al., 2021). Research on corporate social responsibility as it relates to sustainable development is a new issue (Hou et al., 2019). The 2030 agenda addresses the issue of sustainable development goals (Di Vaio et al., 2022).

Understanding the association of sustainability disclosure among audit committee chair effectiveness and firm performance, inspect the connection between audit committee chair effectiveness, sustainability disclosure and firm performance in mixed situations and variable types of firms (Alodat et al., 2023), can be done as a future research. Research to enhance the study of environmental, social and governance information from an audit perspective, use data from external countries or regions for conducting cross-country research and compare the analysis (X. Wang et al., 2023). To understand the corporate social responsibility disclosure, investigations in non-listed companies could be undertaken (Jahid et al., 2023), conducting comparative research of developed and developing countries, using an individual variable to such content elements, capitals, see the influence of gender, busyness, nationality, remuneration, overseas background and political experience on integrated reporting quality (Qaderi et al., 2023). Use the same theme can be done future research with incrementing other regions, see the relationship by using the financial, environmental and accountability performance, mixed method it's useful see the objectivity and dependability in circumstances evaluation, the relationship between the internal audit function and sustainability audits can be the other line of investigation (Amoako et al., 2023). Matching the green product market with the traditional product market, ponder consumer and government decisions in future research (Yang et al., 2023), see the results of a separate study of agrifood and other sectors, compare countries within Europe and major international firms (Shahzad et al., 2023), using the same theme selecting companies from regions to enhance the data, doing research and considering developing countries, using data for financial firms can be a line of future research and examine the direct relationship between corporate social responsibility reports and corporate financial performance as a future research (Hamad & Cek, 2023).

5.4. Forensic audit

Future research should consider determining if the reality of this study is similar in another country, use private corporations and apply the theoretical models in future research (Alsayani et al., 2023), use of moderate or control variables (Handayani et al., 2023), conduct a systematic literature review in contexts other than internal auditing, including another database such WoS, use of other keywords that were not used in the study, with the same theme using same period, provide quantitative matrices to determine thematic proximity and analyze the patterns of key term occurrence and calculate the coefficient (Hazaea et al., 2023). Future research can conduct a longitudinal study method using several interviews, and the participant can be interviewed more than once in a certain period, use a multiple-case plan and explore how fraud may affect the performance of the employee within the firm (Yaqoub et al., 2023). Using the same theme and the same model, but to test different characteristics of internal auditors in the private sector, other independent variables such as information technology and management support could be added in future research (Lonto et al., 2023).

6. Conclusion

The objective of this research is to verify the transformation of audit in the past 20 years using bibliometric analysis and propose and care out the future research propose for internal audit, sustainability audit, financial audit, forensic audit and corporate governance. Exponential growth can be observed in terms of publications in audits, with the USA, United Kingdom and China being the countries that publish the most in this area. The topic has undergone several transformations over time, with fraud receiving greater attention from academic researchers after the 2008 financial crisis. Sustainability, corporate social reporting, audit risk and

disclosures will become more relevant in scientific work from 2014 onwards. *Sustainability (Switzerland)* with 76 publications and 632 citations, *Cogent Business & Management* with 66 articles and 348 citations and *Current Issues in Auditing* with 60 articles and 198 citations, in the first three places of publications in themes related to the audit. We only consider the article's articles that were in English languages and in open access. Future research can consider the possibility to use documents not only in open access and compare if the results are similar with the results of this study. Investigation on audit can be done using English and other languages. This article makes an important contribution to the current literature on audit through a bibliometric analysis and there are four areas for future research on audit matter. This article is the first on the audit field to show how audit have been transformed from 2003 to 2023 using bibliometric analysis with R-Studio package. This article has implications for academia because we create the clusters to ease identify the four themes for future research to facilitate early researcher who as interesting in investigate themes such: (1) internal audit, (2) sustainability audit, (3) financial audit and (4) forensic audit. For organizations, which should be aware of the possibility of having a good internal control system and good corporate governance, introduction of sustainability reports so that they can efficiently and effectively report what contributions they have made to minimize negative impacts on the environment and how policies to motivate and improve the work of their employees have been applied. It shows the importance that external auditing exerts for organizations and their external surroundings to show good performance. And it has implications for policy makers, so that they create policies that encourage companies to have a stronger, more efficient and effective internal control system, to prevent the occurrence of fraud that has grown a lot. Create policies that encourage companies to adhere and disclose their sustainability reports that can be controlled and improved during the external audits carried out annually on these companies.

Authors contributions

All authors contributed to the study's conception and design. Material preparation, data collection and analysis were performed by all authors. The first draft of the manuscript was written by Diamantina Amélia Parckings Tauro Cumbana and José Biléu Ventura supervised and commented on the previous version. All authors read and approved the final manuscript.

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About the authors

Diamantina Amélia Parckings Tauro Cumbana is a researcher and collaborating member of the Center of Advanced Studies in Management and Economics (CEFAGE) and a PhD student at the University of Évora. She has research interests in internal audits, financial audits, sustainability audits, forensic accounting and audits and ecosystem accounting.

José Biléu Ventura is a member of the Assembly of the School of Social Sciences, an Advisor at the Department of Management Assembly, a Collaborating Member at the Center for Advanced Studies in Management and Economics (CEFAGE), a Deputy of the Department of Management and an Assistant Professor at the University of Évora. His research interests include public management, audits, internal controls and performance indicators.

ORCID

Diamantina Amélia Parckings Tauro Cumbana  <http://orcid.org/0009-0005-0323-2530>
 José Biléu Ventura  <http://orcid.org/0000-0003-2951-2133>

Data availability statement

The data that support the findings of this study are available from the corresponding author, [D.A.P.T.C.], upon reasonable request.

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