THE CONCEPTUAL STRUCTURE OF INTERNAL AUDIT RESEARCH: A BIBLIOMETRIC ANALYSIS DURING 1991–2020

Rosalinda Santonastaso [*], Riccardo Macchioni [**], Claudia Zagaria [**]

* Corresponding author, Department of Economics, University of Campania "Luigi Vanvitelli", Capua, Italy
Contact details: University of Campania "Luigi Vanvitelli", Corso Gran Priorato di Malta, 81043 Capua (CE), Italy
** Department of Economics, University of Campania "Luigi Vanvitelli", Capua, Italy

Abstract

The purpose of this study is to examine the conceptual structure of the field of internal audit (IA) research to provide a comprehensive overview of the academic field. A bibliometric analysis was used to analyse 461 papers from 152 journals between 1991 and 2020 divided into the following two steps. The descriptive statistical analysis highlights the characteristics of the IA research community in terms of publications, productive authors, journals, and countries. Then, the co-word analysis adopting multiple correspondence analysis (MCA) has been performed to analyse the conceptual structure of the IA field. The main results of this study can be summarized as follows. The increase in the number of publications recorded in the past few years highlights a growing academic interest in the IA research. Four main topics are identified by the bibliometric analysis: 1) the oversight governance role of IA; 2) information technology in the IA; 3) internal auditor independence and competence; 4) reliance on the IA. This study contributes to the field by facilitating the identification of research areas and outlining the current state of IA research.

Keywords: Internal Audit, Bibliometric Analysis, Co-Word Analysis, Conceptual Structure

Authors' individual contribution: Conceptualization — R.S. and C.Z.; Methodology — R.S.; Writing — Original Draft — R.S. and C.Z.; Writing — Review & Editing — R.S. and C.Z.; Supervision — R.M.

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1. INTRODUCTION

Internal audit (IA) is a key internal function for high-quality corporate governance (Eulerich et al., 2019), providing objective and independent assurance and consulting services. Furthermore, the last years have been characterized by the rapid growth of technological innovations that have impacted the IA activities (Pizzi et al., 2021). Thus, IA activities have progressively broadened through the inclusion the new areas (digitalization and intelligent automation, cyber risk assessment, and organizational culture auditing) and innovative approaches (advanced audit analytics, advanced machine learning techniques, and dynamic and visual reporting) (KPMG Advisory N.V., 2020). As such, it has been reported significant changes in the role of the IA, which from being a watchdog for corporate management has turned into a more value-adding strategic service (Jiang et al., 2020).

However, following the corporate scandals and the global financial crisis, it has been called into question the added value of IA. The value creation of IA is still often described as obscure and enigmatic (Lenz & Hahn, 2015) and still little is known about the practical value of IA (Christ et al., 2021; Kotb et al., 2020). Thus, many scholars have started questioning about the purpose of the IA and

the methods used to detect and address the key risks in a timely manner, thus avoiding corporate failure (Behrend & Eulerich, 2019).

Moving from these inefficiencies in IA performance, this article is concerned with developing insights into how IA research has addressed these issues over time, while also highlighting how IA research could be further developed in relation to the future prospects that IA can actually play in helping to ensure effective corporate governance.

Attempting to systematically map out the studies on IA, our paper performs a bibliometric analysis with the aim to explore the conceptual structure of the IA field of research. Bibliometric methods increase the objectivity and transparency of literature reviews (Zupic & Čater, 2015), identifying quantitative connections between various studies and enabling the clear interpretation of the conceptual structure of a scientific field (Li et al., 2017; Qasim, 2017).

Bibliometric methods in IA research have been applied only in the study by Behrend and Eulerich (2019), which shows the evolution of the IA literature from a historical perspective and restricts the investigation to five leading accounting journals only. As a result, the exclusion of relevant journals from other disciplines (e.g., management and auditing) could have distorted the findings of their study. Furthermore, their research address issues related to co-citation analysis which is particularly suitable for examining social networks, rather than conceptual structures of research fields (Ding et al., 2001).

In light of these considerations, the aim of the study is to investigate the current state of the art of IA research and identify research gaps that future studies can address to advance IA.

Specifically, two specific research questions guide this article.

RQ1: What are the main research clusters that structure the IA discipline?

RQ2: What are future research topics about IA?

The first research question allows us to explore the conceptual structure of IA which is the spatial representation of concepts and theoretical constructs that are related to IA research and are intertwined to form subgroups (Cobo et al., 2011a), and the second research question helps us set a research agenda for future studies on IA.

To answer these questions, we employ a co-word analysis that represents the most suitable bibliometric technique to investigate the conceptual structure of a field (Ronda-Pupo & Guerras-Martin, 2012). In particular, the co-word analysis relies on the keywords used by scholars in 461 articles published in 152 journals. This analysis explores the period between 1991 and 2020 since academic journals in the pre-1991 period rarely provided keywords for their content.

Our findings provide a comprehensive picture of the IA field of research, by classifying it on the basis of a number of key criteria, namely the trend of annual scientific publications, the citations, the author, and the journal type.

This in-depth analysis of IA literature is a baseline for academics and practitioners. In organizing the current state of knowledge, it may provide useful guidance for researchers who could

evaluate the influence of journals, the scientific impact and observe the specific field evolution at aiming to identify emerging trends in the IA discipline.

The practitioners, instead, might collaborate with the researchers to address underresearched IA topics by simplifying access to data. Indeed, the lack of publicly available information (e.g., on IA quality attributes) prevents a more in-depth examination of what IA actually does in practice (Behrend & Eulerich, 2019).

The remainder of this article is structured as follows. Section 2 reviews the literature. Section 3 explains the research methodology. Section 4 presents the results of the descriptive statistical analysis. Section 5 provides the research findings of the co-word analysis. Section 6 discusses the research results. Section 7 presents the conclusions, limitations, and suggestions for future research.

2. LITERATURE REVIEW

Previous literature reviews on the IA field are fragmented and do not conduct the development of knowledge in a systematic way. Most of these studies focus on an individual topic or on a particular institutional context (Christopher, 2019; Lenz et al., 2018; Al-Akra et al., 2016; Lenz & Hahn, 2015; Nuijten et al., 2015; Bame-Aldred et al., 2013; Lenz & Sarens, 2012; Mihret et al., 2010; Stewart & Subramaniam, 2010; Abdolmohammadi et al., 2006; Allegrini et al., 2006; Cooper et al., 2006; Hass et al., 2006; Gramling et al., 2004), while other studies performed structured literature reviews using a qualitative approach (Kotb et al., 2020; Roussy & Perron, 2018).

The present study, therefore, uses a bibliometric analysis to offer a comprehensive overview of relevant IA research topics based on the exploration of the conceptual structure of the IA field of research. Bibliometric methods adopt a quantitative approach for the statistical analysis of an amount of published research, such as peer-reviewed papers, book chapters, and conference proceedings. Unlike traditional methods (e.g., structured literature reviews and meta-analysis) which can analyse a limited number of studies (Zupic & Čater, 2015), bibliometric methods make it possible to synthesize the results of a wide range of papers and analyse their respective findings (Giupponi & Biscaro, 2015). Furthermore, the review process becomes systematic, transparent, and reproducible through the application of bibliometric methods, removing the subjective bias which characterizes the manual literature review (Li et al., 2017). Bibliometric methods can be applied to author and journal citations and other metadata to investigate the performance and effectiveness of individual researchers, academic journals, and research institutions (Zhao & Strotmann, 2015). Moreover, bibliometric methods can be used to identify the structures and underlying research patterns in the scientific field under investigation (Cobo et al., 2011b). The conceptual structure depicts the conceptual map of the knowledge and reflects the current status of a particular subject area (Yang et al., 2012). The conceptual structure of a research area can be traced using conceptual maps, in which a domain of knowledge is decomposed into distinct

knowledge clusters, in order to derive new insights into the data associated with each cluster.

To explore the conceptual structure of IA, this study employed a co-word analysis (Callon et al., 1983), a method that outlines the knowledge structure of a scientific discipline by examining the relationship between words in various sections of a manuscript, such as a title, the abstract and the keywords (Hu & Zhang, 2015). It is the only method that relies on a concept as the unit of analysis, rather than on an author, or journal; this means that co-word analysis uses the actual content of the manuscripts to construct a similarity measure, while the others connect papers indirectly through citations or co-authorships (Zupic & Čater, 2015). Applying co-word analysis allows us to achieve the identification of a network of themes and their relations that represent the conceptual space of a field. This semantic map helps us to understand its cognitive structure (Börner et al., 2003), identifying key clusters of research. A series of such maps produced for different time periods can trace the changes in this conceptual space (Coulter et al., 1998).
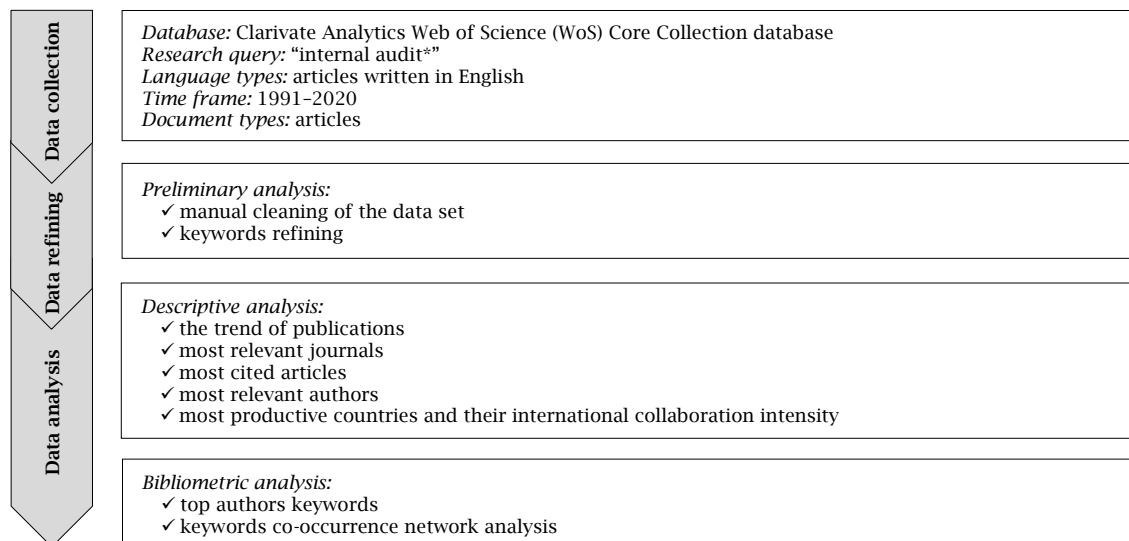
Co-word analysis is based on two main assumptions. According to the first assumption, the keywords represent a list of terms that authors carefully select and represent a substantial description of the content of their papers (Callon et al., 1983). The keywords can be used to identify the conceptual structure of the research field without consulting the full texts of published papers (Romo-Fernández et al., 2013). The second assumption suggests that if two keywords are cited together in the same publication, they have a certain semantic relationship and they express a particular research topic (co-occurrence). The co-occurrence of a pair of words in a set of articles indicates that these two concepts are correlated to each other (Feng et al., 2017; Khasseh et al., 2017; Cho, 2014). The strength of the relationship between two concepts depends on the frequency of co-occurrences. When the frequency between these keywords occurs more recurrently, their relationship is closer (Chen et al., 2016). Therefore, the co-word analysis makes it possible to identify the links between research themes and emerging topics within a scientific field (Ravikumar et al., 2015).

3. RESEARCH METHODOLOGY

In order to ensure a high degree of transparency and reliability in the analysis, we define a research design based on specific criteria (Pizzi et al., 2021), as displayed in Figure 1, which includes three following steps: *data collection, data refining,* and *data analysis.*

Figure 1. Research design

Data collection	*Database:* Clarivate Analytics Web of Science (WoS) Core Collection database *Research query:* "internal audit*" *Language types:* articles written in English *Time frame:* 1991–2020 *Document types:* articles
Data refining	*Preliminary analysis:* ✓ manual cleaning of the data set ✓ keywords refining
Data analysis	*Descriptive analysis:* ✓ the trend of publications ✓ most relevant journals ✓ most cited articles ✓ most relevant authors ✓ most productive countries and their international collaboration intensity
	Bibliometric analysis: ✓ top authors keywords ✓ keywords co-occurrence network analysis

Our research starts with *data collection*, which implies using a database to collect relevant studies. Specifically, a comprehensive search was performed on the database the Clarivate Analytics Web of Science (WoS) Core Collection database, which is considered a reliable source of data for bibliometric and systematic literature review studies and offers extensive coverage for peer-review journals (Köseoglu et al., 2019; Cirillo et al., 2018; Yan et al., 2015; Zupic & Čater, 2015; Kumar & Jan, 2013; Meho & Yang, 2007). Furthermore, many scholars argue that, although WoS shows some similarities with other databases such as Scopus, WoS is considered to be of higher quality than Scopus (Della Corte et al., 2021; Harzing & Alakangas, 2016; Vieira & Gomes, 2009).

In order to identify relevant papers, it has been defined as a research query that is as broad as possible to catch all possible papers. The resulting query "internal audit*" has been used to perform full research in titles, abstracts, and keywords of any papers. The database search generated 660 articles.

Then, we focus on only articles published in English in peer-reviewed international journals because the quality control of search results is ensured by the peer review process (Fink, 2010).

The period covered in the analysis is from 1991 to 2020. It has been fixed in 1991 as the start of the study since the online content for some journals and the introduction of keywords are available from that year onward. As a result, the sample consisted of 631 articles.

Subsequently, the analysis has been limited to IA research published in journals included in the Academic Journal Guide (AJG 2018, published by CABS — Chartered Association of Business Schools, charteredabs.org) to capture the highest quality articles. The 2018 AJG provides a guide to emerging and established scholars working across business and management disciplines. It is based both on some weighted average of journal metrics and on consultation carried out by the Scientific Committee of subject experts with expert peers and scholarly associations. The 2018 AJG list comprises 1582 journals classified into four levels of rating (1 to 4) plus a Journal of Distinction category (4*) which includes leading journals recognised world-wide as exemplars of excellence with the highest impact factor. The journals included in the AJG are considered as the leading research journals based on both citations and impact (Beattie & Goodacre, 2004). This selection returns 468 articles.

Once the data set was built, it was performed the *data refining*, which consist of two steps. First, the data set has been cleaned manually by reading the title, abstract, and keywords of the 468 articles. This form of refinement is necessary to exclude the papers which do not focus on the IA topic exclusively. At the end of this process, the sample was composed of 461 articles. The following step involves the refinement of the keywords used in the articles. The keywords have been standardized (using only a plural or singular form) and synchronized (replacing with a unique word those that have the same meaning). It has been read fully in each article of the data set to verify consistency between the keywords provided by the authors and the topic of the papers (Za et al., 2018).

Table 1 provides a sample list of the most recurring keywords.

Finally, the *data analysis* was implemented, and it was articulated in two steps: 1) the descriptive bibliometric analysis of performance indicators and 2) the bibliometric analysis of the conceptual structure of the data set. To perform the bibliometric analysis, we use the open-source R-package bibliometrix (Aria & Cuccurullo, 2017).

We address more in detail the *data analysis* phase in the following Sections 4 and 5.

Table 1. Overview of refined list of most recurring keywords

Major keywords	Original keywords
Assurance activities	Assurance; Assurance providers; Assurance report; Assurance reviews; Assurance services; Board assurance; Combined assurance; Continuous assurance; Governance assurance; Nonfinancial assurance; Sustainability assurance; Sustainability assurance determinants
Audit	Auditing
Audit committee	Audit committees; Audit committee activity; Audit committee effectiveness; Audit committee independence; Audit committee involvement; Audit committee process; The audit committee; Voluntary audit committee
Audit fees	Audit fee
Corporate governance	Corporate governance maturity; Corporate governance regulation; Corporate governance standards; Corporate governance statements; Corporate governance strength; Good corporate governance
Ethics	Ethical culture; Ethical decision making; Ethical judgment; Ethical leadership; Ethical process thinking model; Ethical reasoning; Ethics assessment; Ethics audit; Ethics in accounting; Ethics program
External audit	External auditing
External auditor	External auditors
Fraud	Fraud detection; Fraud detection techniques; Fraud investigation knowledge; Fraud management; Fraud misappropriation of assets; Fraud prevention; Fraud prevention techniques; Fraud red flags; Fraud risk; Fraud risk assessment; Fraud risk identification; Fraud symptoms; Fraud triangle; Vendor fraud
Information security	Collaborative security specification; Cybersecurity; Information security effectiveness; Information systems security; Security; Security audit; Security behaviours; Security controls; Security metrics; User security specifications; User security training
Information technology	Audit technology; Emerging technology; Information security audit; Information systems; Information systems audit; Information technology audit; Information technology integration; IT audit; IT audit analytics; IT auditing; Marketing information systems; Technology adoption; Technology use
Internal audit	Internal auditing; Internal audits; The internal audit
Internal auditor	Internal auditors
Reliance on internal audit	External auditor reliance; Internal audit reliance; Reliance; Reliance decision; Reliance on Internal audit function; Reliance on internal auditors; Reliance on the internal audit function; Reliance on work of the internal auditor
Risk	Audit risk; Audit risks; Business risk approach; Business risk prediction; Chief risk officer; Credit risk; Cyber risk; Inherent risk; IT risks; Material misstatement risk; Operational risk; Risk committee; Risk and compliance (GRC); Risk assessment; Risk assurance; Risk based internal audit; Risk committee; Risk consulting; Risk culture; Risk evaluation; Risk identification; Risk management assurance; Risk management framework; Risk management practices; Risk managers; Risk managers; Risk-based; Risk-based audit plan; Risk-based auditing; Risk-based internal audit (RBIA); Risks; Risky

4. DESCRIPTIVE BIBLIOMETRIC STATISTICS

4.1. Internal audit research activity

Figure 2 shows publication trends in the IA research. It indicates the number of articles published each year between 1991 and 2020. It shows that the number of articles per year has increased over time, from 4 in 1991 to 67 in 2020. It reveals a growing interest in the scientific community for IA research. In particular, this growth is prominent since the 2000s. During the period from 2005 to 2010, the increase in IA-related publications reflects the growing interest in the consequences of the financial scandals of the early 2000s (e.g., Enron, WorldCom). In particular, with the enactment of the Sarbanes-Oxley Act (SOX), the IA function become a key organizational function and the researchers realize how important to explore the research avenues in IA literature (Roussy & Perron, 2018). However, this spread is followed by a sudden reduction of IA studies after the year 2010 since that probably the financial crisis shifted the attention of scholars toward financial and management accounting issues (Behrend & Eulerich,

2019). Afterward, the number of publications increased again with a peak of 46 papers in 2015, 60 in 2018, and 67 in 2020.

Table 2 presents the twenty most popular journals and highlights where the leading research areas have originated, contributing to the development of IA research. The 461 articles in our data set are published in 152 journals. Journals were classified into two categories: journals that had "audit" in their titles were classified as auditing and journals that did not were categorized as non-auditing (Kotb et al., 2018). The most productive journals are specialist audit journals. In particular, they are the *Managerial Auditing Journal* (*MAJ*) with 45 out of 461 published articles, *Auditing: A Journal*

of Practice & Theory (*AJPT*) with 37 papers, and the *International Journal of Auditing* (*IJA*) with 26 papers. These publications represent 42% of the entire sample and they are ranked respectively 2, 3, and 4 in the ABS (Chartered Association of Business Schools) list Another specialist audit journal with only 5 articles is *Accounting Auditing & Accountability Journal* (*AAAJ*) rated 3 in the ABS list. Instead, the remaining papers (141) were published in generalist journals. In detail, 22 are published in non-auditing journals rated 4*, 8 in a non-auditing journal rated 4, 45 in non-auditing journals rated 3, 37 in non-auditing journals rated 2, and 29 non-auditing journals rated 1.

Figure 2. The trend of annual scientific publications
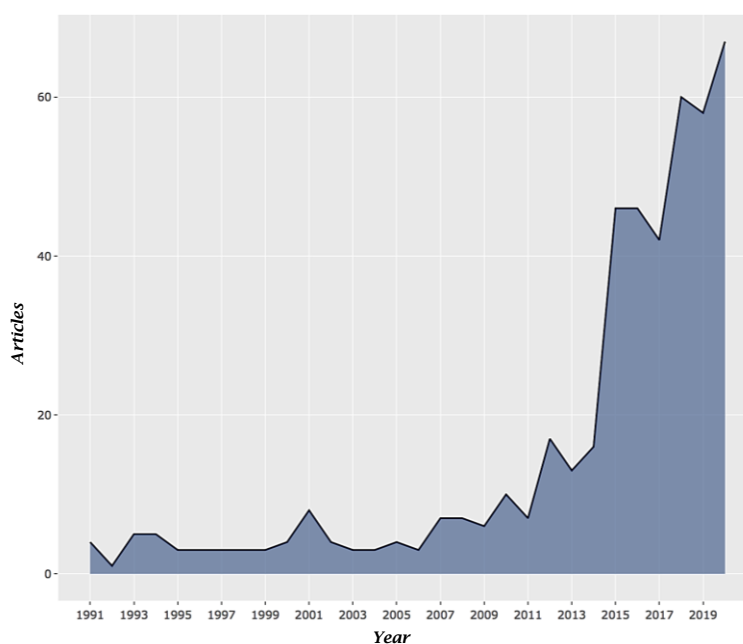
Table 2. Most relevant journals

No.	Journal	No. of papers	AJG raking	Journal type
1	*Managerial Auditing Journal*	45	2	auditing journal
2	*Auditing: A Journal of Practice & Theory*	37	3	auditing journal
3	*International Journal of Auditing*	26	4	auditing journal
4	*Journal of Business Ethics*	16	3	non-auditing journal
5	*Accounting Horizons*	14	3	non-auditing journal
6	*International Journal of Accounting Information Systems*	13	2	non-auditing journal
7	*Accounting Review*	12	4*	non-auditing journal
8	*Accounting Organizations and Society*	10	4*	non-auditing journal
9	*Accounting and Finance*	9	2	non-auditing journal
10	*Critical Perspectives on Accounting*	9	3	non-auditing journal
11	*Contemporary Accounting Research*	8	4	non-auditing journal
12	*Journal of Emerging Technologies in Accounting*	8	1	non-auditing journal
13	*Meditari Accountancy Research*	8	1	non-auditing journal
14	*Journal of Information Systems*	7	1	non-auditing journal
15	*Cogent Business & Management*	6	1	non-auditing journal
16	*Journal of Accounting and Public Policy*	6	3	non-auditing journal
17	*Accounting Auditing & Accountability Journal*	5	3	auditing journal
18	*Australian Accounting Review*	5	2	non-auditing journal
19	*Corporate Governance — The International Journal of Business in Society*	5	2	non-auditing journal
20	*Journal of Applied Accounting Research*	5	2	non-auditing journal

Table 3 shows the top twenty most influential articles ranked by the average number of citations per year (TCpY). This can be an appropriate metric to assess the yearly impact of an article. Specifically, this analysis allows us to normalize citation data by the number of years that have passed since each publication (Dumay & Dai, 2014) by providing a fairer comparison for published papers.

The top twenty articles represent the studies that have offered a major contribution to the development of IA research. In particular, it is interesting to notice that the articles of Prawitt et al. (2009) and Abbott et al. (2016) have the highest impact on the academic IA literature. Considering the average number of citations per year, the first one has received more than 14 citations, while the second one has 11. Both papers focus on the volatile construct of IA quality from different points of view. Prawitt et al. (2009) conducted the archival study in order to demonstrate that IA quality is negatively associated with earnings management. This result is consistent with the structured literature review by Kotb et al. (2020). They argue that the high impact of the work of Prawitt et al. (2009) is correlated to the highly cited accounting journal *The Accounting Review* in which it is published and its relationship to an area with the plethora of earnings management research. Instead, the study of Abbott et al. (2016) explores the determinants of IA quality by emphasise the joint importance of independence and competence.

Table 3. Most cited articles in the sample

No.	Authors	Year	Article	Journal	TCpY	TC
1	Prawitt et al.	2009	Internal audit quality and earnings management	Accounting Review	14,923	194
2	Abbott et al.	2016	Internal audit quality and financial reporting quality: The joint importance of independence and competence	Journal of Accounting Research	10,5	63
3	Goodwin-Stewart and Kent	2006	Relation between external audit fees, audit committee characteristics, and internal audit	Accounting and Finance	9,625	154
4	Lin et al.	2011	The role of the internal audit function in the disclosure of material weaknesses	Accounting Review	9,455	104
5	Lenz and Hahn	2015	A synthesis of empirical internal audit effectiveness literature pointing to new research opportunities	Managerial Auditing Journal	8,571	60
6	Ege	2015	Does internal audit function quality deter management misconduct?	Accounting Review	8	56
7	Coram et al.	2008	Internal audit, alternative internal audit structures and the level of misappropriation of assets fraud	Accounting and Finance	7,5	105
8	Pizzini et al.	2015	The impact of internal audit function quality and contribution on audit delay	Auditing: A Journal of Practice & Theory	7,143	50
9	Felix et al.	2001	The contribution of internal audit as a determinant of external audit fees and factors influencing this contribution	Journal of Accounting Research	6,714	141
10	Messier et al.	2011	The effect of using the internal audit function as a management training ground on the external auditor's reliance decision	Accounting Review	6,636	73
11	Abbott et al.	2010	Serving two masters: The association between audit committee internal audit oversight and internal audit activities	Accounting Horizons	6,5	78
12	Trotman and Trotman	2015	Internal audit's role in GHG emissions and energy reporting: Evidence from audit committees, senior accountants, and internal auditors	Auditing: A Journal of Practice & Theory	6,143	43
13	Prawitt et al.	2012	Internal audit outsourcing and the risk of misleading or fraudulent financial reporting: Did Sarbanes-Oxley get it wrong?	Contemporary Accounting Research	6,100	61
15	Norman et al.	2010	Internal audit reporting lines, fraud risk decomposition, and assessments of fraud risk	Accounting Organizations and Society	5,667	68
16	Carey et al.	2000	Voluntary demand for internal and external auditing by family businesses	Auditing: A Journal of Practice & Theory	5,636	124
17	Abbott et al.	2007	Corporate governance, audit quality, and the Sarbanes-Oxley Act: Evidence from internal audit outsourcing	Accounting Review	5,467	82
18	Chang et al.	2019	The impact of internal audit attributes on the effectiveness of internal control over operations and compliance	Journal of Contemporary Accounting & Economics	5,333	16
19	Glover et al.	2008	Internal audit sourcing arrangement and the external auditor's reliance decision	Contemporary Accounting Research	5,214	73
20	Abbott et al.	2012	Internal audit assistance and external audit timeliness	Auditing: A Journal of Practice & Theory	5,2	52

4.2. Characteristics of internal audit community

The 461 articles in our data set have been written by 947 different authors. In particular, the authors of single-authored papers are 62 while the authors of multi-authored papers are 885. Looking at the frequency of scientific productivity of authors (see Table 4), it is possible to highlight that 809 authors (85,4%) have written just one article and 87 authors (9,2%) have published 2 articles. They are regarded as occasional authors. Instead, the core authors — who have published at least 4 articles — are 20. Among these 20 authors: 5 authors (0,5%) have written 5 articles; 3 authors (0,3%) have written 6 articles; 1 author (0,1%) has written 7 articles; 2 authors (0,2%) have written 8 articles, 1 author (0,1%) has written 10 articles and 1 author (0,1%) has written 14 articles.

Table 4. The frequency distribution of author productivity

Articles written	No. of authors	Proportion of authors
1	809	0,854
2	87	0,092
3	31	0,033
4	7	0,007
5	5	0,005
6	3	0,003
7	1	0,001
8	2	0,002
10	1	0,001
14	1	0,001

Figure 3 shows the production of these core authors over time. The red line represents the timeline of authors, the dot size is proportional to the number of published articles, and the color intensity refers to the total citations per year. In terms of the number of articles, the authors who published more are Wood and Alzeban contributing, respectively, 14 and 10 articles between the period 2008–2020, followed by Eulerich and Peters both with 8 publications, and Parker with 7 articles. Furthermore, the growing scholarly production over time confirms that the interest in IA research is increased.

The international scientific collaboration is a rapidly expanding phenomenon because of increasingly complex research issues and the growing specialization of scientific competencies (Bush & Hattery, 1956). Therefore, Table 5 shows the level of international collaboration of the first 20 countries by the number of published papers. The Multiple Countries Publication (MCP) indicates the number of papers in which there is at least one co-author from a different country while the Single Country Publication (SCP) indicates the number of papers in which the co-authors come from the same country. The countries with high international collaboration are China and Germany while Korea, Uganda, Sweden, and the USA have a low international collaboration intensity. Therefore, the low international scientific collaboration that characterizes the IA community supports the "geographical concentration" point highlighted by Lukka and Kasanen (1996) that defines the accounting research area and, arguably, IA as "a rather local discipline by nature" (Kotb et al., 2020).

Table 5. The international collaboration intensity of IA community

No.	Country	Articles	Freq.	SCP	MCP	MCP_Ratio
1	USA	160	0,35398	140	20	0,125
2	Australia	39	0,08628	27	12	0,308
3	Saudi Arabia	17	0,03761	11	6	0,353
4	South Africa	16	0,0354	14	2	0,125
5	Canada	15	0,03319	10	5	0,333
6	Malaysia	15	0,03319	10	5	0,333
7	United Kingdom	15	0,03319	9	6	0,4
8	Italy	14	0,03097	9	5	0,357
9	Greece	10	0,02212	9	1	0,1
10	Indonesia	10	0,02212	7	3	0,3
11	China	9	0,01991	4	5	0,556
12	Germany	9	0,01991	4	5	0,556
13	Israel	8	0,0177	7	1	0,125
14	Belgium	7	0,01549	4	3	0,429
15	Tunisia	7	0,01549	6	1	0,143
16	Finland	6	0,01327	3	3	0,5
17	Korea	6	0,01327	6	0	0
18	Uganda	6	0,01327	6	0	0
19	Sweden	5	0,01106	5	0	0
20	Brazil	4	0,00885	2	2	0,5

Figure 3. Top authors' production over the time
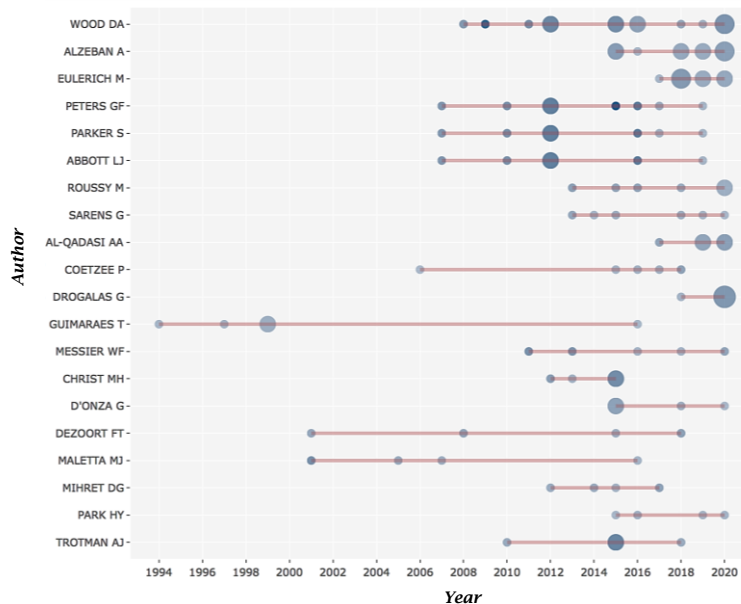
Source: Bibliometrix.

5. RESEARCH RESULTS

In order to explore the most relevant topic and the main issues discussed in IA research, we performed an analysis of the most frequent keywords used in the 461 papers of our data set. In particular, the analysis is articulated in two parts: 1) the trend of the most frequently cited keywords; 2) the co-word analysis of the author's keywords.

5.1. Top 30 most cited keywords

To observe the changes in the conceptual structure of the IA discipline, the exploration started with the distribution of the 30 most used keywords over three subperiods (1991–2000; 2001–2010; 2011–2020). Table 6 shows that, while the internal audit is the most frequent keyword in the second and the third periods, it falls behind the audit in the first period. In detail, audit, internal audit, internal auditor, performance, and audit fees are the only cited keywords in the articles because authors in the pre-2000 period rarely provided keywords in their papers. Across the periods, corporate governance, risk, internal control, audit committee, internal auditors, and ethics are the most dominant keywords in the articles. Corporate governance, audit committee, and ethics are among the frequently studied themes in the second period because after the financial scandals of the early 2000s (e.g., Enron and WorldCom), the scholars focused on the analysis of IA as an internal monitoring mechanism in enhancing good governance. Developing countries, fraud, internal audit function and information technology are emerging themes in the third period.

Table 6. Top 30 most frequently cited keywords across the analysis subperiods

1991–2000		*2001–2010*		*2011–2020*		*All periods*	
Audit	3	Internal audit	13	Internal audit	154	Internal audit	169
Internal audit	2	Corporate governance	8	Corporate governance	66	Corporate governance	74
Internal auditor	2	Internal audit outsourcing	7	Risk	50	Risk	56
Performance	2	Risk	6	Developing countries	46	Internal control	51
Audit fees	1	Internal control	6	Internal control	45	Developing countries	47
Corporate governance	0	Audit	6	Audit committee	39	Audit	45
Risk	0	Audit committee	5	Audit	36	Audit committee	44
Internal control	0	Ethics	4	Fraud	29	Internal auditor	32
Developing countries	0	Internal auditor	3	Internal audit function	29	Fraud	31
Audit committee	0	Board	3	Internal auditor	27	Internal audit function	31
Fraud	0	Reliance on internal audit	3	Performance	22	Audit fees	24
Internal audit function	0	Fraud	2	Audit fees	21	Performance	24
Ethics	0	Internal audit function	2	Reporting	21	Ethics	23
Assurance activities	0	Audit fees	2	Assurance activities	20	Assurance activities	22
Reporting	0	Assurance activities	2	Ethics	19	Reporting	22
Information technology	0	Independence	2	Information technology	19	Information technology	20
Internal audit outsourcing	0	Developing countries	1	Public sector	18	Internal audit outsourcing	19
Board	0	Reporting	1	Continuous auditing	17	Board	18
Public sector	0	Information technology	1	Governance	16	Public sector	18
Continuous auditing	0	Information security	1	ISO principles	16	Continuous auditing	17
Independence	0	Internal audit quality	1	Board	15	Independence	17
Governance	0	Audit quality	1	Independence	15	Governance	16
Information security	0	Internal audit competences	1	Information security	15	Information security	16
ISO principles	0	Performance	0	Internal audit quality	13	ISO principles	16
Internal audit quality	0	Public sector	0	Accountability	13	Internal audit quality	14
Reliance on internal audit	0	Continuous auditing	0	Internal audit outsourcing	12	Reliance on internal audit	14
Accountability	0	Governance	0	Audit quality	12	Accountability	13
Audit quality	0	ISO principles	0	Internal audit competences	12	Audit quality	13
Internal audit competences	0	Accountability	0	Reliance on internal audit	11	Internal audit competences	13
Compliance	0	Compliance	0	Compliance	11	Compliance	11

5.2. Authors' keywords co-word analysis

The co-word analysis was implemented by carrying out multiple correspondence analysis (MCA). MCA is an exploratory multivariate technique that evaluates associations among multivariate categorical variables (e.g., the keywords) (Greenacre, 2016) and graphically maps the main poles of structure of the academic field along which the papers are distributed (Cirillo et al., 2018). Additionally, unlike the meta-analysis, the MCA examines both qualitative and quantitative studies (Aria & Cuccurullo, 2017; Furrer et al., 2008).

Through this technique, the keywords were presented in two following kinds of mapping: a) the conceptual structure map (see Figure A.1 in Appendix); b) the factorial map of the articles with the highest contributes (see Figure A.2).

In Figure A.1, the relations among keywords in the 461 papers of our data set has shown.

Each keyword is reported on the two-dimensional space and four clusters are identified. The following four clusters contain keywords that explain a similar topic.

In detail, the red cluster includes the following fourteen keywords: internal audit function, corporate governance, internal audit quality, internal auditor, accountability, ethics, performance, developing countries, internal control, public sector, fraud, audit, internal audit, audit fee; the purple cluster includes the following five keywords: continuous auditing, information technology, risk, governance and assurance activities; the green cluster includes the following five keywords: independence, internal audit competences, reporting, audit committee, and board; the blue cluster includes the following four keywords: reliance on internal audit, external audit, audit quality, and internal audit outsourcing.

In Figure A.2, the factorial map of the articles with the highest contributions allows to identify for each cluster of the conceptual structure map of the main papers using specific keywords. In detail, the factorial map reveals the existence of four clusters that can be considered as four "themes" of the IA research field.

This finding allows us to answer the first research question (*RQ1*).

Research Area 1: The *red cluster* includes papers that explore the growing relevance of the internal audit function (IAF) as an oversight governance mechanism (Roussy & Perron, 2018). Specifically, the study of Abdullah et al. (2018) explores the relationship between internal audit quality and the number and nature of recommendations made by the IA teams to improve the various dimensions of corporate governance. Their results suggest that high performance in IA is associated with more recommendations from IA teams to improve corporate governance dimensions. Al-Jaifi et al. (2019) emphasize the importance of internal governance mechanisms by documenting a positive association between internal governance mechanisms (internal audit function and audit committee effectiveness) and institutional ownership. Therefore, it is important to enhance internal governance mechanisms to attract institutional investors. Arnold et al. (2015) identifies the chief audit executives (CAEs) as the target participants of their study in order to develop and test a theory of the impact of enterprise risk management (ERM) on two aspects of organizational performance: the strategic flexibility and the supply chain performance. Indeed, the CAEs have a deep knowledge of internal operational efficiency and effectiveness on one side, whereas on the other side they play a lead role in ERM deployment. However, Oussii and Taktak (2018) argue that the usefulness of the internal audit function as an oversight governance element resides mainly in its ability to deliver timely audited financial information to the capital market. Furthermore, the study of Glover et al. (2008) contributes to an improved understanding of the role of the internal audit function as an important component of corporate governance by focusing on the interactions between internal and external auditors.

Research Area 2: The *purple cluster* includes papers that explore the impact of information technology on internal auditors, with a focus on information security risks. Gonzalez et al. (2012) explore the antecedents of internal auditors' intentions to use continuous auditing technology through the use of UTAUT framework. Their study suggests that key perceptions that pushes internal auditors to use continuous auditing are the effort expectancy and the social influence. Vasarhelyi et al. (2012) study the continuous auditing technology adoption in 9 leading IA organizations through interviews with 22 IA managers and 16 IA staff members. They develop an audit maturity model which classifies the companies between the "traditional audit stage" and the "emerging stage" observing that no company has yet reached the "continuous audit stage". D'Onza et al. (2015) underline the IA's evolving role in the information technology audit activities of banks. They carried out 22 interviews with senior managers and information technology auditors of seven Italian

banks, comprising large and small financial institutions. They found that internal auditors support managers in the improvement of information technology management processes and mitigate information technology risks. In addition, they found that senior management expects more effort from internal auditors to assess the whole information technology risk management system and especially information technology security. In order to meet these expectations, internal auditors would have to improve their technical and non-technical skills because these skills will allow them to be more proactive and take on effective roles in information technology governance processes. Other studies of the cluster highlight the important role internal auditors play in managing information security risk. Steinbart et al. (2018) demonstrate that the relationship between the IA and the information security functions has a positive effect on the number of reported internal control weaknesses and incidents of noncompliance. Lois et al. (2020) investigates the role of continuous auditing in an effective digital auditing system, from an internal perspective, by focusing on audit firm employees. Specifically, they sent a questionnaire to internal auditors employed in some of the largest audit institutions in Greece. The results of their investigation highlight that the avoidance of cyber-attacks, the protection of personal data, and the development of employees' specialized skills are major goals of an effective digital auditing system.

Research Area 3: The *green cluster* encompasses papers that concentrate on a variety of topics related to the characteristics and competencies of the internal auditor. Abbott et al. (2007) explore how non-audit services affect the auditor independence investigating on IA outsourcing to the external auditor. They demonstrate that outsourcing routine IA activities are more likely to lead to economic bonding, potentially threatening internal auditor independence. Brandon (2010) also indicates that the external auditor evaluations of outsourced internal auditors' independence are lower when an outsourced internal auditor provides non-audit services. Nevertheless, Mubako and Muzorewa (2019) have focused on the influence that the competence and independence of internal auditors generate on the relationship between internal and external auditors. Abbott et al. (2016) show also that the joint presence of the independent and the competence of internal auditors have a positive influence on the financial reporting quality (FRQ). However, Alzeban (2018) suggested that the advantages gained by competence and independence of internal auditors in terms of improved FRQ diminish when there is the chief executive officer (CEO)'s involvement in the appointment of the CAE, since management could manipulate the selection process of the CAE. Indeed, various standard-setting bodies emphasize that the appointment of the CAE should receive the approval of the audit committee (AC), since it is the more appropriate body to do this.

Research Area 4: Papers embraced in the *blue cluster* examine the factors that influence external auditors' reliance on the work of the internal audit function. This is possible thanks to the issuance of auditing standard No. 5 (AS5) by the Public Company Accounting Oversight Board that allows external auditors to rely on internal audit activities when

the latter satisfies certain criteria (PCAOB, 2007). Quick and Henrizi (2019) found that German external auditors' reliance decisions are affected by environmental factors, the effectiveness of the internal control system, and quality of the corporate governance. Al-Sukker et al. (2018) identify other factors that have a strong influence on the external auditors' decision to rely on the work of the internal audit function as objectivity, competence, and work performance of internal auditors. Moreover, Bame-Aldred et al. (2013) suggest a review of the extant literature on the external auditors' reliance on IA function focusing on factors that influence the reliance decisions. Their review underlines a scarcity of research concerning the effects that reliance decisions determine in terms of audit quality. The study by Argento et al. (2018), indeed, highlights the dilemma faced by external auditors that use the work of internal auditors to gain efficiency in performing their work on the one hand, while on the other hand, the closer involvement with internal auditors could compromise their independence and professionalism leading to uncritical use of the reports prepared by internal auditors.

6. DISCUSSION OF THE RESULTS

As for the discussion of the results, we based our study on conceptual structure analyses.

Our research allows us to systematize the scientific knowledge about internal audit, as it reveals four independent research areas: *Research Area 1* (the red cluster), *Research Area 2* (the purple cluster), *Research Area 3* (the green cluster) and *Research Area 4* (the blue cluster), as resulted from the factorial map of the articles (see Figure A.2).

It is also interesting to observe that the results of our study show the existence of a similarity between the research themes discussed in the clusters. The paper by Brandon (2010) and the paper by Al-Sukker et al. (2018) belong to two different clusters: the first paper belongs to the blue cluster and the second one paper to the green cluster. At the same time, these papers are placed one close to the other as both articles focus on external auditor evaluations. The difference is represented by analysing the same topic from different perspectives. Brandon (2010) considers external auditor evaluations, focusing more on the outsourcing of internal audit activities while Al-Sukker et al. (2018) examine the individual characteristic of internal auditors such as competence and work performance.

The bibliometric analysis allowed us to identify underdeveloped research areas that could represent future research directions for scholars. Therefore, we address the second research question (*RQ2*).

Research Area 1 (the red cluster) addresses the issues of IA as a key corporate governance mechanism (Al-Jaifi et al., 2019) and it has been argued that high performance in internal auditing is associated with more recommendations to improve corporate governance dimensions (Abdullah et al., 2018). Within the corporate governance dimensions, internal auditors should distinguish the risks of the several events to which the organizational unit is exposed, evaluate these events and locate the level of their impact on achieving the purposes (Teoh

et al., 2017), ameliorate the flow of information in the organizational unit and improving oversight procedures, report on the procedures of the different departments of the organizational unit, and understand the internal environment of the organizational unit (Bogazi & Malika, 2018). In other words, IA is get involved in the formation of views and ideas for improved integrated management of risks, also called ERM. Therefore, future studies in this area could investigate in more detail the interdependencies between IA and ERM.

Research Area 2 (the purple cluster) discusses the changes IA in the digital age as well as the techniques that could be utilized for its implementation. Notwithstanding the growing emphasis on this topic, studies exploring internal auditors' intention to use (or not to use) digital technologies in their activities are scarce. Future studies in this area could focus on the above-mentioned issues, by tapping into the factors affecting IA motivation. In addition, the research could be addressed to elucidate the ethical implications related to the digitalization of activities that have been historically characterized by the central role of internal auditors.

Research Area 3 (the green cluster) highlights the importance of competencies and independence of internal auditors as a factor associated with IA effectiveness, thus increasing business performance and reporting. Consequently, it would seem to be imperative for IA to be endowed with such competence and independence (Alzeban, 2018). Future research could deepen understanding of how to achieve the required competencies, examining the different approaches to the definition and interpretation of professional competence, including the consideration of the factors which underpin it and the role therein played by knowledge and education.

Research Area 4 (the blue cluster) emphasizes that external auditors often rely on clients' internal auditors to provide their judgment. This stream of research elaborates on the main topic of the International Standard on Auditing (ISA) 610 using the work of internal auditors was revised and published in 2013. This standard focuses on whether the external auditor can use the work of the internal audit function for purposes of audit, and the revised version of the standard clarified whether the internal auditors could be used to provide direct assistance to the external auditor (International Auditing and Assurance Standards Board [IAASB], 2013).

Further research on this area needs to be performed, deepening understanding of how external auditors relies on internal auditors' work, using qualitative research methods (i.e., semi-structured interviews with open-ended questions) able to provide a practical description of best practices in a different context; it could also be of interest looking at the coordination decision of internal and external audit work to determine the optimum value for the organization.

7. CONCLUSION

This paper has performed an analysis of the IA literature. Specifically, a bibliometric analysis was used to analyse 461 papers from 152 journals between 1991 and 2020 divided into two stages.

The first stage is a descriptive statistical analysis and the second is represented by a co-word analysis.

The main findings of this study can be summarized as follows.

First, a growing interest in IA research is highlighted by a progressive increase in the number of publications in the past few years. In terms of bibliometric variables, the *Managerial Auditing Journal* is one of the most interesting journals followed by the *Auditing-A Journal of Practice & Theory* and the *International Journal of Auditing*. Thus, the analysis of the sources reveals that a higher number of relevant publications are published in specialist audit journals. Additionally, it is interesting to notice that most of these publications have conducted descriptive studies which have been carried out through the use of surveys/questionnaires and content analysis. In terms of authors, Wood and Alzeban are the leading authors with, respectively, 14 and 10 articles between the period 2008–2020. Finally, considering countries' interests and collaboration, China has the highest level of collaboration globally, followed by Germany.

Second, the co-word analysis employed in this study has shown that IA research has been focused on four main research themes. The first research theme investigates the role of IA as an element of the corporate governance framework. The second research theme explores the benefits and challenges associated with the spread of information technology and analyses also how IA could enhance information security through different technologies. The third research theme examines how the dual role of IA as a provider of audit and non-audit services and outsourcing of IA activities could affect the competencies and independence of internal auditors. The last research theme investigates the relationships between internal and external auditors. Indeed, in the corporate governance mosaic, IA serves as a resource to the external auditor, the audit committee, and the board (Cohen et al., 2004). However, it is also interesting to observe that the results of our study show the existence of a similarity between the research themes discussed in different clusters.

To the best of our knowledge, this study is the first to examine the conceptual structure of IA research within the accounting and auditing area using a co-word analysis based on keywords. Therefore, our contribution is an addition to the paper by Behrend and Eulerich (2019) that uses network analysis to investigate the relevance of IA only within the boundaries of accounting research.

This study also has some limitations that provide the basis for future research.

The paper suffers from the intrinsic limitations of co-word analysis based on the use of keywords solely, and more specifically from the so-called indexer effect — where the validity of the map is dependent on whether the indexers captured all relevant aspects of the text. It would be interesting to develop the research into deeply investigated full texts, making sure to avoid the introduction of noise into the data, by limiting the fact that the algorithms have difficulty distinguishing the importance of words in large corpuses of text. Moreover, this study relies on the papers published in journals indexed in WoS only. This means that to enrich our data set, future studies could use data from multiple databases such as Scopus or Google Scholar. However, it is relevant to consider that an analysis based on Google Scholar would probably provide a different picture, but subsequently, it would be more difficult to distinguish between high and low-quality papers. Furthermore, it could represent a limit to the exclusion of the conference proceedings from the bibliometric analysis because conference proceedings could present new emerging themes that have not been addressed in the selected papers. Therefore, future research can be addressed to fill this gap by taking into consideration the contribution provided by international scholars within scientific conferences. Finally, we encourage future research to further enrich and update our results by looking at the contribution provided by scholars within journals not included in our data set.

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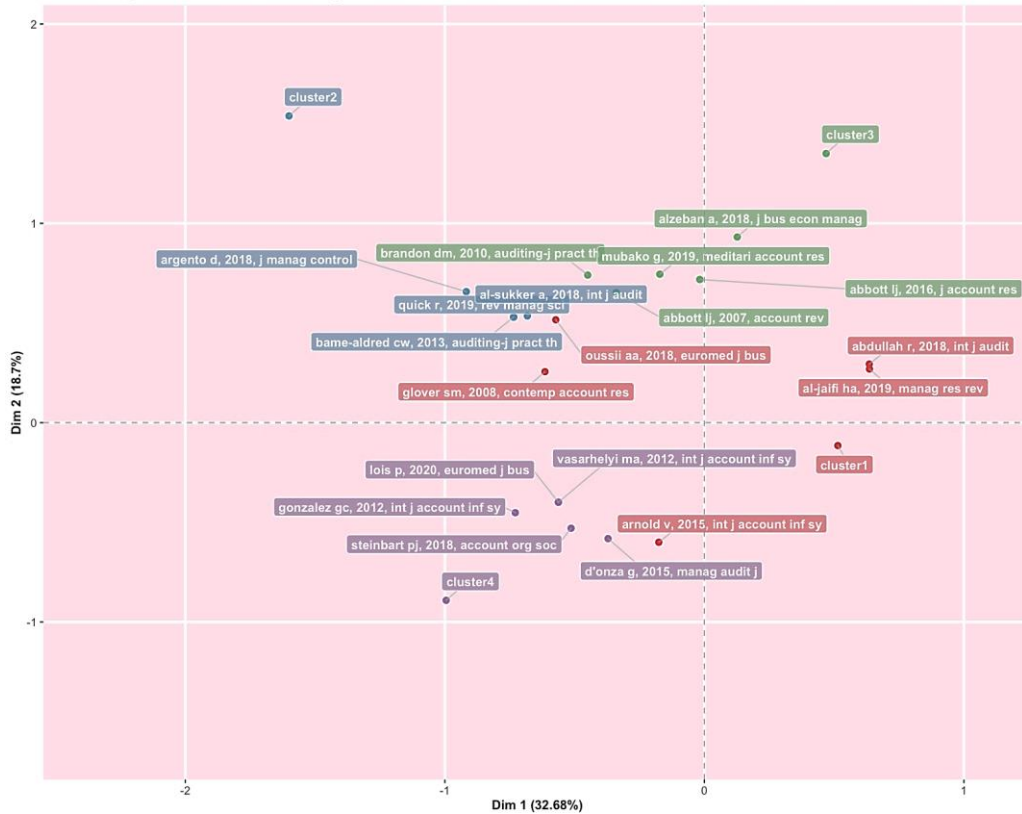98. Zupic, I., & Čater, T. (2015). Bibliometric methods in management and organization. *Organizational Research Methods, 18*(3), 429–472. https://doi.org/10.1177/1094428114562629

APPENDIX

Figure A.1. Conceptual structure map
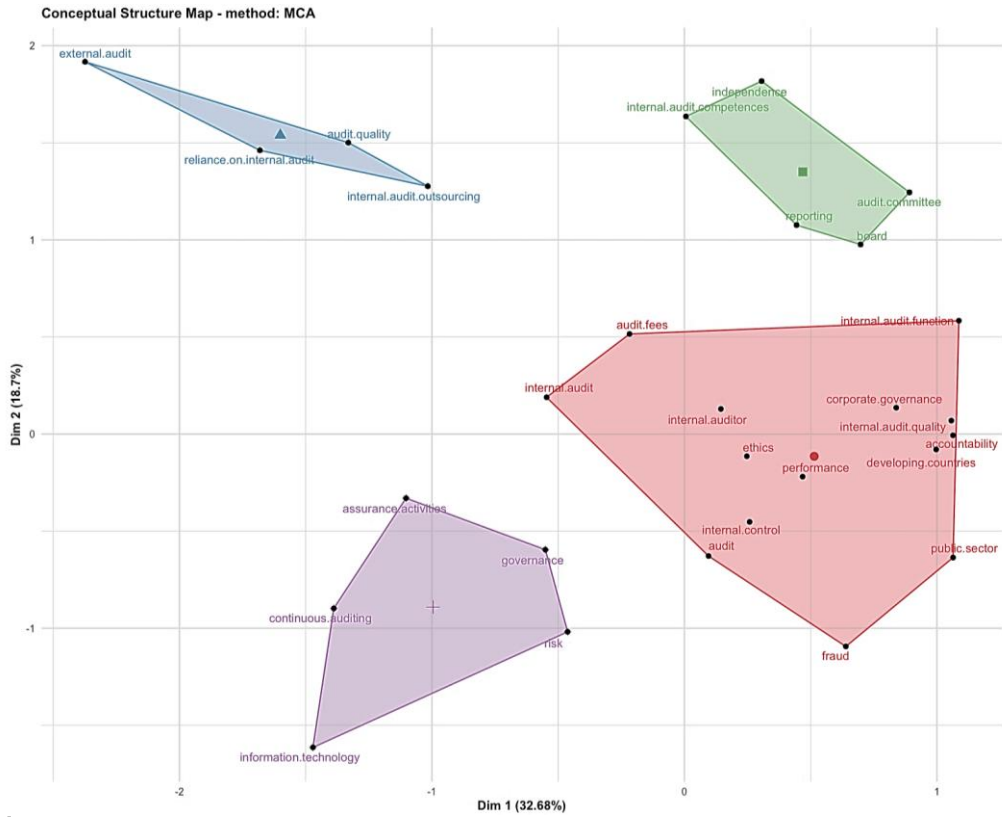
Source: Bibliometrix.

Figure A.2. Factorial map of the articles with the highest contributes

Source: Bibliometrix.