

Mapping out Internal Audit Research: A Bibliometric Analysis

Zhang Chi, Sabarina Mohammed Shah, Lau Yeng Wai, Siti Manisah Ngalim
Universiti Putra Malaysia, Selangor, Malaysia

This paper aims to map out the development of internal audit (IA) research worldwide by using a bibliometric analysis method to statistic the publications in the Scopus database. There are new challenges, especially during the COVID-19 pandemic, bringing out remote auditing with new technologies; hence there are new risks that must be addressed. The bibliometric analysis was carried out from 1978 until September 2024. And this research used the VOSviewer visualisation technique to present co-relations with authorship, countries, and affiliations to show a research network base on the data sources, the Scopus database. This study's findings show that internal audit research publications were growing steadily within 15 years, and most publications are from the United States, Malaysia, and the United Kingdom. With analyses of the author's keywords, China becomes the focus research nation on IA research from 2019 to 2024, and in the recent five years, IA research has developed fast. The IA is essential in corporate governance and internal control and provides assurance and consultant functions to prevent fraud and reduce risk. Also, visualising keywords, titles, and publication abstracts leads to discovering new research areas, such as the relationship between internal audit and fraud, risk assessment and corporate governance, respectively. This study builds a macroscopic pattern and a better network to understand global internal auditing research. In addition, it performs network analysis on keywords and titles, which leads to the development of the cluster field, and maps the authorship, sources, and citations.

Keywords: bibliometric analysis, VOSviewer, internal audit, visualisation, co-relations

Introduction

Internal audit (IA) has garnered a lot of interest from researchers and practitioners (Ali, Ahmi, & Ahmad, 2018; Behrend & Eulerich, 2019; Pizzi, Venturelli, Variale, & Macario, 2021; Cetina & Ivan, 2021), from merely being “a dumping ground”, “unnecessary evil” to being recognised as an effective internal mechanism of corporate governance (Burton, Starliper, Summers, & Wood, 2015). Internal audit is the third line of defense and adds value to organisation in achieving their goals (The Institute Internal Auditors, 2018; Ali et al., 2018). However, the COVID-19 pandemic had caused organisations to adjust their business model especially due to restriction movement order which is now considered the new normal and eventually affecting the internal audit functions. Moreover, new technologies, such as blockchain, artificial intelligence (AI), deep learning, and big data have opened new opportunities as well as create new risks (Dyball & Seethamraju, 2021).

Prior literature on internal audit research considered the internal audit monitoring function in the governance framework and the effectiveness of internal audit (Gramling, Maletta, Schneider, & Church, 2004; Lenz & Hahn,

Zhang Chi, Ph.D. Candidate, School of Business and Economics, Universiti Putra Malaysia, Selangor, Malaysia.

*Corresponding author, Sabarina Mohammed Shah, Ph.D. (senior lecturer), School of Business and Economics, Universiti Putra Malaysia, Selangor, Malaysia.

Lau Yeng Wai, Ph.D. (senior lecturer), School of Business and Economics, Universiti Putra Malaysia, Selangor, Malaysia.

Siti Manisah Ngalim, Ph.D. (senior lecturer), School of Business and Economics, Universiti Putra Malaysia, Selangor, Malaysia.

2015); thus there is an inadequate comprehensive understanding of the overview of internal audit research. There is a need to discuss the core issues affecting internal audit research which requires a thorough overview background which dated from the very beginning until to date. Therefore, bibliometric analysis is one of the best ways to provide a comprehensive understanding. However, most of these publications on internal audit focus on the Web of Science (WoS) database, a scarcity research on the Scopus database and do not provide a visualisation network analysis. This study offers a standard bibliometric indicator to overview internal audit research using the Scopus database to identify the relevant research in the domain that categorized and network analysis by title, keyword, type of documents, authors, growth of publications, research productivity, and countries. This study attempts to fill the gap in the bibliometric analysis of internal audit literature based on the Scopus database and map out the development research direction in internal audit.

The bibliometric analysis was performed based on the Scopus database from the beginning of the database until September 2024. This study provides a research map of internal audit by extracting the 1,135 publications in the Scopus database. And this study used VOSviewer, Excel, and other tools to provide an intuitive and overall view to understand the development of internal audit study. This study's findings show that the IA research publications were growing fast in the last five years and have more focus on the IA's corporate governance and internal control functions. Throughout the visualisation of the publications' keywords, titles, and abstracts, this study discovered some new research areas, such as the relationship between internal audit, preventing fraud and reduced risk.

This paper is divided into six sections, including literature review, methods, results, discussion, and conclusion. This study aims to advance the understanding of internal auditing, especially in its new frontier. This study will also help researchers have a better direction in future research in internal audit research.

Literature Review

Bibliometric Analysis

Bibliometric analysis is a quantitative research method to review the literature for statistical information with an appropriate search strategy in journals or databases where the researchers can analyse previously published documents to measure specific research fields (Ellegaard & Wallin, 2015). Donthu et al. (2021) emphasised that bibliometric analysis enables researchers to uncover the process or state of diverging in a given subject area while illuminating emerging research fields by analysing scientific data. In addition, Verma and Gustafsson (2020) deemed secondary data collected from online databases such as Scopus and Web of Science (WoS) are evaluated quantitatively and objectively. Hence, using a bibliometric analysis is more reliable and valid as its review process is more systematic as opposed to a manual process (Dalpé, 2002; Linnenluecke, Marrone, & Singh, 2020).

The bibliometric analysis tools can be divided into two kinds: performance analysis and science mapping (Donthu et al., 2021). The performance analysis accounts for research components' contributions to a particular field, like authors, institutions, countries, publication sources, and publication citations (Ramos-Rodríguez & Ruiz-Navarro, 2004). The publication citations present its influence and research value in the research area. The science mapping analyses the co-relations between basic statistic information, such as the relationship with authorship, institutions' cooperation, countries' connection and development, and also co-citation, and co-words (Baker, Kumar, & Pandey, 2020). Due to the present network analysis, generally, three enrichment pathways are predicated in the form of network metrics, clustering, and visualisation.

Previous Studies

Recently, bibliometric analysis has been prevalent in every subject, and so does on the research topic of internal audit research. To understand the differences in the bibliometric analysis of internal audit research, we summarised Table 1 with details. For instance, Behrend and Eulerich (2019) who analysed 170 articles obtained from five prestigious accounting journals between 1926-2016 focused on network analysis and co-citation of publications. Their research focuses on specific journals, and they contain the search term “internal control” as a part of internal audit research. Based on the authors and their content, this paper summarizes the central theme of each cluster through an in-depth literature review. Although this study includes bibliometric analysis, it is mainly an article-length systematic literature review on internal audit (IA) research. Therefore, this study lacks bibliometric statistics. Pizzi et al. (2021) evaluated the impact of digital transformation on IA research from the Scopus database and cross-validated with the WoS and EBSCO databases. Based on citation analysis, the top journals and their research fields are presented through keyword network analysis, including continuous auditing, automation, Extensible Business Reporting Language (XBRL), data analytics, and blockchain.

Öztürk and Yılmaz (2019) analysed 1,693 articles obtained from WoS between 1970-2018 to focus the internal control and its self-assessment, and also internal audit, while the results show a multiple facets relationship between internal control and IA. Ali et al. (2018) presented the bibliometric analysis of the 557 internal audit research papers from the Scopus database, in terms of overall document and source type, growth trend, subject area, keywords, countries of publications, and number of authors per document basic statistics in internal audit. They conclude that the IA publications were dominated by multi-authored related to business, management, and accounting area, and the United States ranked first in productivity. Another latest study by Cetina and Ivan (2021) used the VOSviewer technique to analyse 189 articles on IA in the public sector that they collected from the Core Collection in the WoS database. In their research, the main emerging research topics in IA research were an emphasis on the audit performance in the public sector, the effectiveness of internal audit determined by the independence and relations with audit committees, and also the assessment of internal control, risk management quality, and internal audit efficiency. Meanwhile, there is a bibliometric research on internal audit; however, it is in Arabic language and focusing on public sector from 1993 to 2023 based on the Scopus database, and it analysed 141 research papers (Mashayekhi, Samavat, & Jahangard, 2023).

Table 1

Summary of Previous Studies

Author	Domain/search strategy	Data source & scope	TDE	Period	Bibliometric attributes examined
Joel Behrend and Marc Eulerichb (2019)	Internal audit(ing), internal audit function, or internal control	Five journals: Accounting, Organizations and Society (AOS), Contemporary Accounting Research (CAR), Journal of Accounting and Economics (JAE), Journal of Accounting Research (JAR), and The Accounting Review (TAR)	170	1926-2016	Co-citation analysis Co-authorship Most influential authors
Simone Pizzi, Andrea Venturelli, Michele Variale, and Giuseppe Pio Macario (2021)	Audit* and digit*	Scopus, Web of Science, and EBSCO	105	1985-2020	Source analysis Keywords analysis

Table 1 to be continued

Seyhan Öztürk and Cihan Yilmaz (2019)	Internal control or internal auditing or control self-assessment	Web of Science	1693	1970-2018	Type of publications Countries Citation analysis Keywords analysis
Azharudin Ali, Aidi Ahmi, and Wan Norhayati Wan Ahmad (2018)	Title (“internal audit” and “internal auditing”)	Scopus	557	-2018.1	Document and source types Year of publications Subject area Keywords analysis Countries of publications Number of author
Marius Ionel Cetina and Oana Raluca Ivan (2021)	“Public sector internal audit” in Topic or “internal audit in public sector” in Topic or “internal auditing” + “public sector” in Topic or “internal auditing” + “local governments” in Topic or “internal auditing” + “central governments”	Web of Science Core Collection	189	-2021.11	Document types Years Research area Countries map Publishers Keywords Co-countries
Mashayekhi, Samavat, and Jahangard (2023)	“Internal audit” and (“public sector” or “public service” or “government” or “not for profit” or “not-for profit”)	Scopus, Google Scholar, and Web of Science	141	1993- 2023	Trend of publications Keywords Hot topic The most cited articles Co-authorship Co-countries

The summary of the bibliometric analysis on IA shows that most of the articles were collected from the WoS database or selected specific journals and only one article extracted the literature from the Scopus database. While this article used the Scopus database with the search term “internal audit”, they had not shown a visualisation of network analysis, just the statistical frequency of IA research. As awareness, IA research needs to be further understood with network analysis in the Scopus database to provide future research themes.

Methods

Firstly, based on the objectives of this study, there is a need to define the topic and scope before conducting a bibliometric analysis. The Scopus database was chosen because it enjoys the “largest single abstract and indexing database ever built” (Burnham, 2006) and the most extensive literature search list of abstracts and citations (Ahmi & Mohd Nasir, 2019; Falagas, Pitsouni, Malietzis, & Pappas, 2008). After determining the target database and research topic, selecting the data set that will eventually be analysed according to the retrieval strategy is necessary.

On March 2023, a search strategy was performed to extract IA relevance literature from Scopus database with all types of languages and documents. Due to the publications’ title more conclusive of its topic and avoiding an extend of search results (Zakaria, Ahmi, Ahmad, & Othman, 2021), we use a title-only search strategy. However, in medical area the announce of “internal audit” has different definitions that we limited the subject area to business and economic. Figure 1 shows the process of selecting publications and details of strategies; at last we got an initial sample of 1,135 publications.

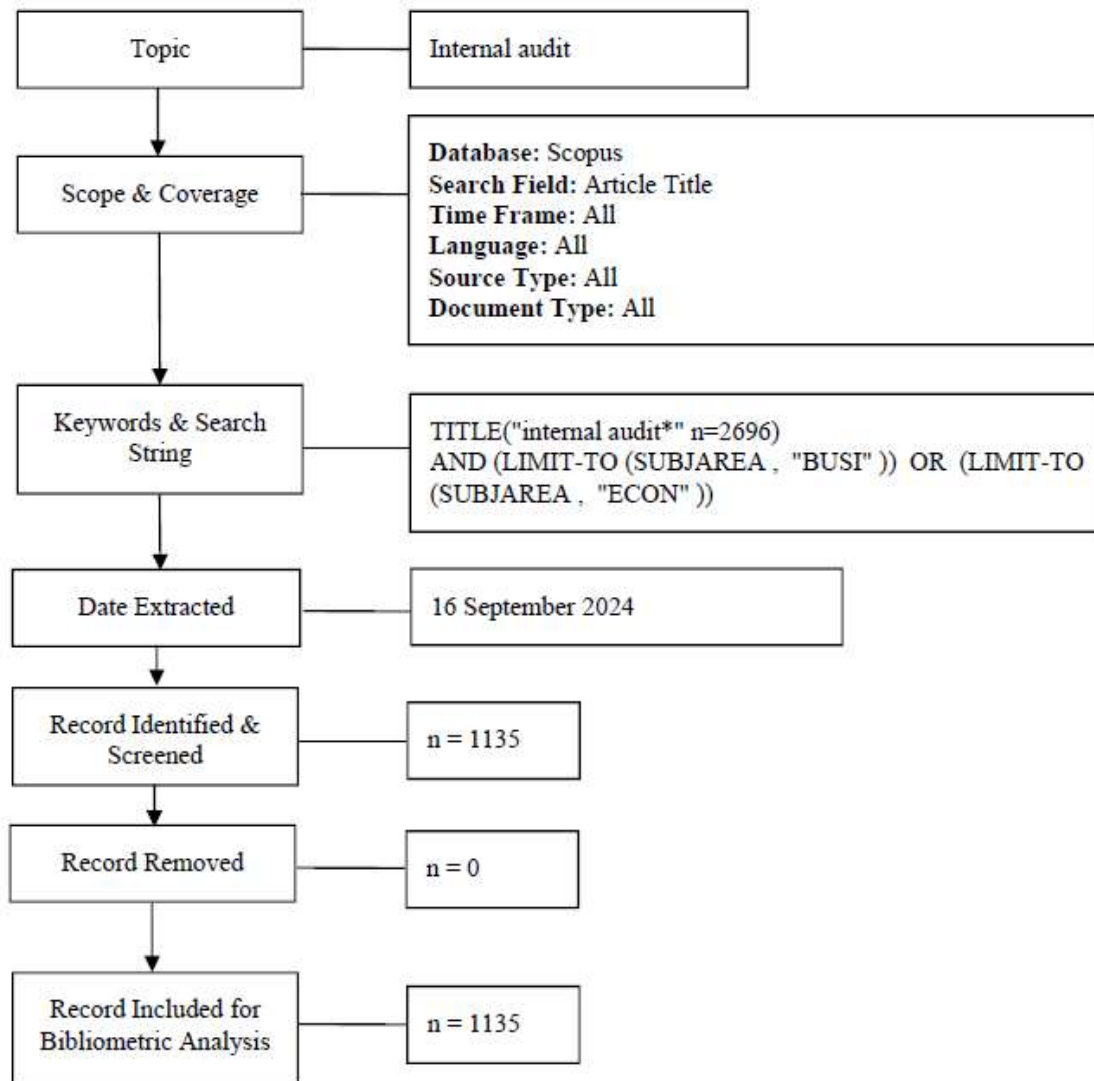


Figure 1. Flow diagram of the search strategy. Source: Zakaria et al. (2020), Moher et al. (2009).

Then, the data set of the 1,135 publications' information records to clean and harmonise the key elements to make sure the statistical data are reliable. Hence, Openrefine and VOSviewer techniques were utilized so that the data exported from the Scopus database should be comma-separated values (.csv) format files. And to clean and harmonise phases of keywords, countries, affiliations, and institutions are separated into two researchers parallel to clean the data set to avoid faults. Attention must be carried out to one publication that has multiple affiliations with multiple countries. This research used bibliometric analysis techniques which are as follows:

- Microsoft Excel 2016 was used to compute the frequency and percentage of each publication and to create appropriate graphical representations;
- Openrefine 3.7.1 to clean and harmonise the author's keywords;
- Pixel Map Generator was used to create a world map to show the worldwide development of IA research;
- VOSviewer (1.6.19) to create and visualise the bibliometric networks; and
- Ciyuntu software 1.8 to create the author's keywords cloud image.

Results

All of the data including articles and documents obtained through the Scopus database on the 16th of September 2024 have been accessed and analysed by the type of document, source type, publication trend, subject area, authors, affiliations, authors' keywords, geographical network, and co-words analysis of keywords, abstract and titles. To better present the statistical results, we use the tables to show the frequency and percentage and use the figures to show their network and relationships.

Documents Profiles

Data acquired are firstly analysed with their basic characteristics, such as document types, source types, languages, and subject area. Document types generally fall into the following categories, articles, reviews, chapters, conference papers, notes, and so on. And source types are the carrier that readers can get the documents, such as journals, book series, books, and proceedings. Documents type and source type are generally one-on-one, while conference papers are usually published as a part of conference proceedings or a book chapter. Table 2 shows the document types of IA studies. This study discovered eight types of documents that have been published related to IA; more than two-thirds of the total publications are derived from articles representing 897 (79.03%) documents, followed by book chapter 75 (6.61%), review 72 (6.34%), and conference paper 58 (5.11%). The other type of document represents less than 5% of the total publication.

Table 2

Document Type

Document type	Total publications (TP)	Percentage (%)
Article	897	79.03%
Book chapter	75	6.61%
Review	72	6.34%
Conference paper	58	5.11%
Note	13	1.15%
Book	11	0.97%
Editorial	4	0.35%
Retracted	3	0.26%
Total	1135	100.00%

Whereas under source type, (see Table 3) there are five types of sources, and journal was found to be the highest type of source 996 (87.75%) followed by book series 53 (4.67%). Conference proceeding, book, and trade journal represent less than 4% of the total publication on IA study.

Table 3

Source Type

Source type	Total publications (TP)	Percentage (%)
Journal	996	87.75%
Book series	53	4.67%
Conference proceeding	43	3.79%
Book	42	3.70%
Trade journal	1	0.09%
Total	1,135	100.00%

Table 4 shows the languages that the publications were used; the most common language is English, for there is more than 98.59% of publications. Meanwhile, publications in non-English language that were used are Ukrainian, Spanish, French, German, and Portuguese, or the documents have been published in dual languages, i.e. in English and Russian and another articles in English and Spanish only account for less than 2%.

Table 4

Languages

Language	Total publications (TP)*	Percentage (%)
English	1,119	98.59%
Ukrainian	7	0.62%
Spanish	4	0.35%
French	3	0.26%
German	2	0.18%
Portuguese	2	0.18%
Russian	2	0.18%
Bulgarian	1	0.09%
Czech	1	0.09%
Korean	1	0.09%
Total	1,142	100.62%

Note. * one document has been prepared in dual languages.

Even though the subject area is limited to business and economic, there will be articles that are interdisciplinary. In relation to publication subject area, the majority of retrieved documents were published in the area of business, management, and accounting indicating 92.78% (1,053) of the total articles followed by economics, econometrics, and finance representing 65.90% (748). Table 5 below exhibits details about subject area of IA study.

Table 5

Subject Area

Subject area	Total publications (TP)	Percentage (%)
Business, management, and accounting	1,053	92.78%
Economics, econometrics, and finance	748	65.90%
Decision sciences	165	14.54%
Social sciences	146	12.86%
Computer science	56	4.93%
Engineering	46	4.05%
Arts and humanities	34	3.00%
Mathematics	13	1.15%
Environmental science	6	0.53%
Psychology	5	0.44%
Energy	4	0.35%
Medicine	4	0.35%
Agricultural and biological sciences	3	0.26%
Earth and planetary sciences	2	0.18%
Materials science	2	0.18%
Pharmacology, toxicology, and pharmaceuticals	2	0.18%
Biochemistry, genetics, and molecular biology	1	0.09%

Publication Trends

By analysing the documents according to the year in which they were published, the researcher is better able to track the changing popularity of the study topic over the course of their investigation (Ahmi & Mohd Nasir, 2019). Table 6 shows a detail statistic about the trend of IA publications and citations. The observation of the highest productivity year is 2023 with a total of 92 publications. Due to the 45 years period on IA research that had passed since publications, the number of citations per publication was highest for papers released in 2003 (81.50 citations per publication), and the lowest for those published in 1987 (0 citations per publication). And the total of citations was highest for documents published in 2015 (871 citations), while the lowest was also in 1987 (0 citations).

Table 6

Year of Publication

Year	TP	NCP	TC	C/P	C/CP	h	g
1978	1	1	4	4.00	4.00	1	1
1980	3	2	3	1.00	1.50	1	1
1984	1	1	18	18.00	18.00	1	1
1985	1	1	10	10.00	10.00	1	1
1986	5	1	4	0.80	4.00	1	2
1987	3	0	0	0.00	0.00	0	0
1988	10	7	71	7.10	10.14	3	8
1989	9	7	40	4.44	5.71	3	6
1990	6	4	9	1.50	2.25	2	2
1991	10	8	88	8.80	11.00	4	9
1992	7	6	36	5.14	6.00	4	6
1993	11	11	120	10.91	10.91	4	10
1994	16	13	222	13.88	17.08	8	14
1995	12	10	96	8.00	9.60	7	9
1996	14	12	124	8.86	10.33	5	11
1997	27	25	227	8.41	9.08	8	14
1998	6	4	129	21.50	32.25	3	6
1999	6	6	152	25.33	25.33	5	6
2000	13	9	236	18.15	26.22	7	13
2001	12	12	677	56.42	56.42	9	12
2002	4	4	111	27.75	27.75	3	4
2003	6	6	489	81.50	81.50	6	6
2004	12	11	319	26.58	29.00	9	12
2005	9	9	444	49.33	49.33	8	9
2006	19	17	755	39.74	44.41	12	19
2007	17	17	588	34.59	34.59	10	17
2008	15	13	447	29.80	34.38	10	15
2009	24	20	797	33.21	39.85	12	24
2010	29	24	774	26.69	32.25	15	27
2011	39	32	807	20.69	25.22	13	28
2012	34	27	796	23.41	29.48	14	28

Table 6 to be continued

2013	30	23	535	17.83	23.26	12	23
2014	34	29	560	16.47	19.31	13	23
2015	50	42	871	17.42	20.74	15	28
2016	45	34	433	9.62	12.74	11	19
2017	50	39	318	6.36	8.15	11	15
2018	72	61	700	9.72	11.48	15	22
2019	60	46	452	7.53	9.83	11	18
2020	84	52	341	4.06	6.56	10	14
2021	74	49	196	2.65	4.00	7	10
2022	82	32	121	1.48	3.78	5	9
2023	92	88	-	-	-	-	-
2024	71	70	-	-	-	-	-
Total	1,135						

Notes. TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

Figure 2 shows a clear trend of years of publications and citations. The growth of the IA-related publication was a little bit slow until 2009, except for a one-year short peak in 1997. Since then, the average publication per year has been recorded more than 25 documents yearly. And the total citations fluctuate upwards. On the whole, the number of publications on IA research has remained at a relatively high level in the past five years, and it is predicted that there will be an even higher number in 2024.

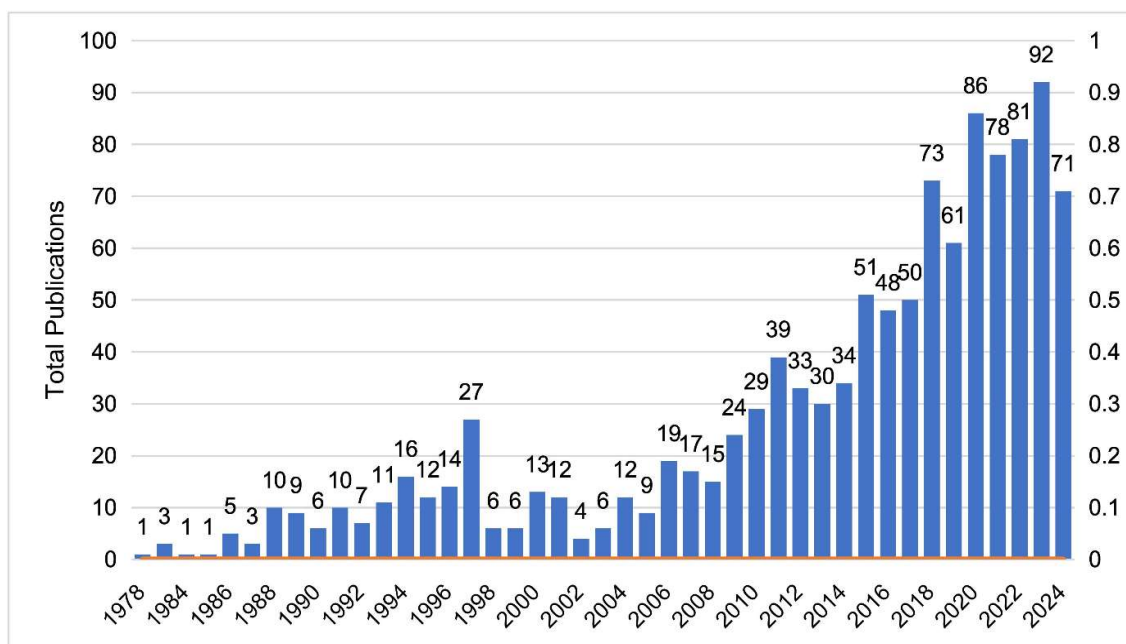


Figure 2. Total publications by year.

Publications by Authors

Authors help to shape a study field with their contribution to scientific publications. Table 7 shows the top authors that have more than five publications that received at least one citation. From this table, G. Sarens, D. A.

Wood, and P. Nedyalkova are the top three authors that contributed more than 15 publications to the internal audit studies. This table also shows the impact of the publications based on the total citation, h-index, and g-index. D. A. Wood received the highest total citations so far with 829 citations, followed by G. Sarens received a total number of 787 citations. In terms of h-index and g-index, G. Sarens ranked in the top where 14 of his articles received at least 14 citations each (based on h-index), and P. Nedyalkova ranked in the top where three of his articles received at least a total of 45 citations (based on g-index).

Table 7

Most Productive Authors

Author's name	Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g
G. Sarens	University of Antwerp	Belgium	24	24	787	32.79	32.79	14	1
D. A. Wood	Brigham Young University	United States	18	17	829	46.06	48.76	12	1
P. Nedyalkova	University of Economics Varna	Bulgaria	15	2	2	0.13	1.00	1	3
A. Alzeban	King Abdulaziz University	Saudi Arabia	14	12	255	18.21	21.25	8	2
M. Eulerich	University of Duisburg-Essen	Germany	13	13	126	9.69	9.69	7	1
A. Schneider	Georgia Institute of Technology	United States	12	9	144	12.00	16.00	6	2
M. J. Abdolmohammadi	Bentley University	Belgium	9	9	294	32.67	32.67	8	0
T. A. Gavin	University of Tennessee	United States	8	6	20	2.50	3.33	3	2
G. Drogalas	Chattanooga University of Macedonia	Greece	8	7	71	8.88	10.14	4	1
B. J. Cooper	RMIT University	Australia	8	6	114	14.25	19.00	5	1
S. Parker	Santa Clara University	United States	8	7	494	61.75	70.57	6	1
S. Hass	Simmons College	United States	7	7	136	19.43	19.43	5	0
P. Leung	Deakin University	Australia	7	6	200	28.57	33.33	6	1
N. Subramaniam	Deakin University	Australia	7	7	385	55.00	55.00	7	0
J. Stewart	Griffith University	Australia	7	7	240	34.29	34.29	6	0
A. A. Gramling	Georgia State University	United States	7	7	319	45.57	45.57	6	1
Z. Rezaee	Middle Tennessee State University	United States	6	5	28	4.67	5.60	2	2
P. Coetzee	University of Pretoria	South Africa	6	5	78	13.00	15.60	4	1
M. Allegrini	University of Pisa	Italy	6	5	123	20.50	24.60	5	1
M. Roussy	Université Laval	Canada	6	5	153	25.50	30.60	5	1
M. Dittenhofer	Florida International University	United States	6	5	97	16.17	19.40	3	1
D. E. Ziegenfuss	Old Dominion University	United States	6	6	168	28.00	28.00	4	1
G. F. Peters	University of Arkansas	United States	6	6	500	83.33	83.33	6	0
L. J. Abbott	University of Wisconsin- Milwaukee	United States	6	6	485	80.83	80.83	5	1

Notes. TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

This article uses VOSviewer to analyze the author relationships and author collaborations of the literature. The strength of the author's link is shown by the colour of the linking line, the size of the circle, the font size, and the thickness of the font. Figure 3 shows the connection of authors that clustered in the same colour. G. Sarens is main cluster in the central of this graph, then derived other relationships of authors' clusters.

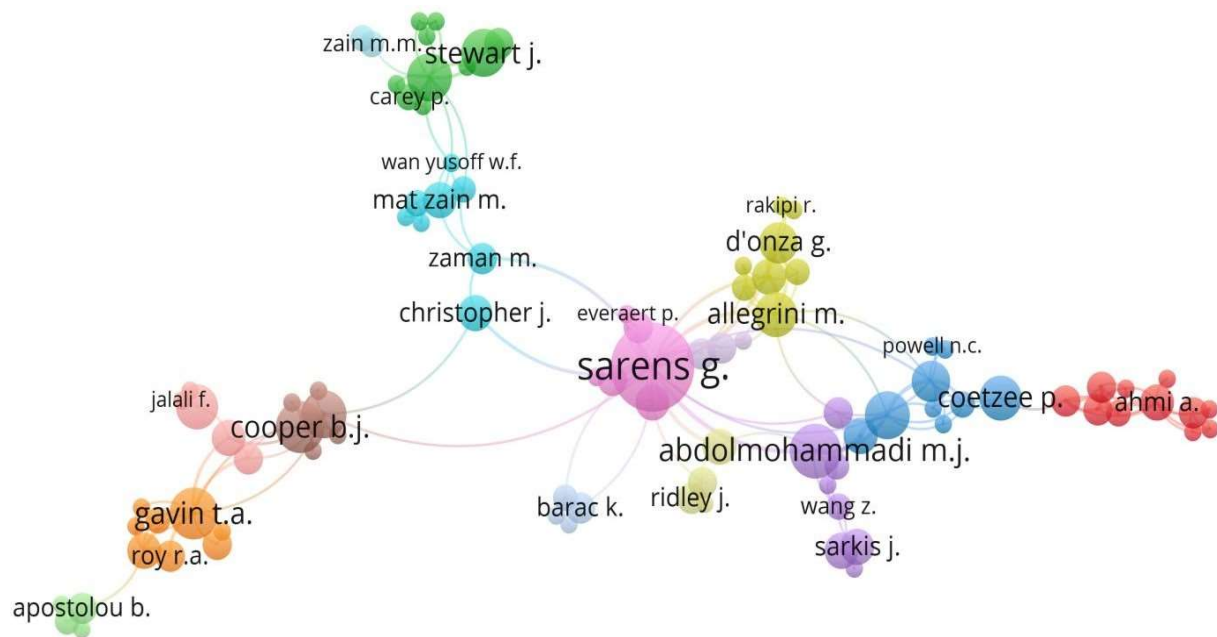


Figure 3. Network visualisation map of the co-authorship by authors.

Publications by Institutions

Table 8 shows the topmost productive institutions that published at least eight documents related to IA study. The top institution is Brigham Young University from United States with 18 number of documents, followed by Université Catholique de Louvain from Belgium with 16 documents, and University of Economics Varna from Bulgaria and Universiti Utara Malaysia from Malaysia similar with 15 documents.

Table 8

Most Productive Institutions with Minimum of Eight Publications

Affiliation	Country	TP	NCP	TC	C/P	C/CP	h	g
Brigham Young University	United States	18	829	17	46.06	48.76	12	1
Université Catholique de Louvain	Belgium	16	464	16	29.00	29.00	10	1
University of Economics Varna	Bulgaria	15	2	2	0.13	1.00	1	3
Universiti Utara Malaysia	Malaysia	15	157	14	10.47	11.21	7	2
Griffith University	Australia	14	708	14	50.57	50.57	11	0
Multimedia University	Malaysia	14	184	11	13.14	16.73	6	2
King Abdulaziz University	Saudi Arabia	14	255	12	18.21	21.25	8	2
Florida International University	United States	13	456	12	35.08	38.00	8	2
Deakin University	Australia	12	478	12	39.83	39.83	11	0
Bentley College	United States	11	359	10	32.64	35.90	7	1
Bentley University	United States	11	252	10	22.91	25.20	8	1
Middle Tennessee State University	United States	10	130	10	13.00	13.00	5	2
California State University	United States	10	355	8	35.50	44.38	8	1
University of Pisa	Italy	10	142	9	14.20	15.78	6	1
University of Malaya	Malaysia	9	113	6	12.56	18.83	5	2
Universiti Teknologi MARA	Malaysia	9	62	7	6.89	8.86	4	2
University of Duisburg-Essen	Germany	8	83	8	10.38	10.38	5	0
Université Laval	Canada	8	221	7	27.63	31.57	7	1

Table 8 to be continued

Santa Clara University	United States	8	494	7	61.75	70.57	6	1
Georgia Institute of Technology	United States	8	115	6	14.38	19.17	4	2
University of Tennessee	United States	8	180	6	22.50	30.00	4	1
University of Macedonia	Greece	8	71	7	8.88	10.14	4	1
Queensland University of Technology	Australia	8	248	8	31.00	31.00	7	0
Northeastern University	United States	8	446	8	55.75	55.75	7	0
University of Nevada	United States	8	559	8	69.88	69.88	8	0

Notes. TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

This result also shows that the most active institutions that published the document on IA are from United States (Brigham Young University, Florida International University, Bentley College, and Bentley University), Malaysia (Universiti Utara Malaysia, Multimedia University, University of Malaya, and Universiti Teknologi MARA), and Australia (Griffith University, Deakin University, and Queensland University of Technology). Figure 4 shows the co-authorship network map among the organisations.

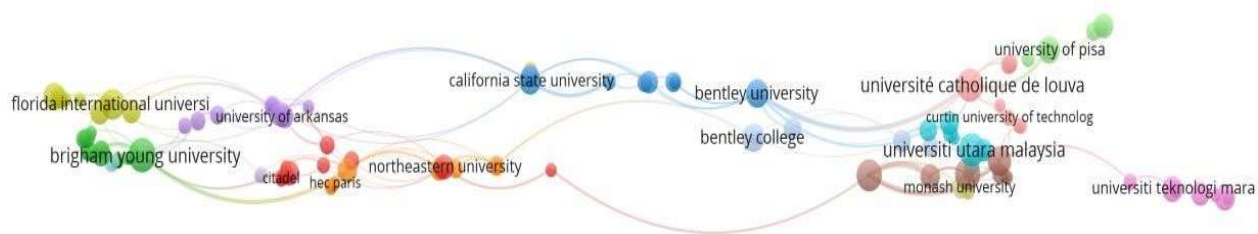


Figure 4. Network visualisation map of the co-authorship by organisations.

Publications by Countries

Based on the authors' affiliations, the documents published were contributed from 74 countries worldwide. The United States is the country with the most scientific papers published on IA (292 documents), followed by Malaysia (80), the United Kingdom (72), Australia (67), and Indonesia (46) (see Table 9). The top 20 most countries in terms of IA research productivity are listed in Table 9.

Table 9

Top 20 Countries Contributed to the Publications

Country	TP	TC	NCP	C/P	C/CP	h	g
United States	292	5,323	246	18.23	21.64	42	14
Malaysia	80	875	63	10.94	13.89	16	7
United Kingdom	72	1,748	61	24.28	28.66	20	5
Australia	67	1,991	60	29.72	33.18	26	3
Indonesia	46	94	24	2.04	3.92	6	6
Saudi Arabia	35	543	29	15.51	18.72	12	3
China	30	154	23	5.13	6.70	6	4
Italy	28	323	22	11.54	14.68	11	3
Belgium	26	895	26	34.42	34.42	15	1
Jordan	24	128	17	5.33	7.53	5	4
South Africa	23	161	19	7.00	8.47	8	3
Germany	23	264	21	11.48	12.57	8	2

Table 9 to be continued

Canada	22	577	20	26.23	28.85	14	1
Greece	21	151	17	7.19	8.88	7	3
Turkey	19	32	5	1.68	6.40	3	4
Bulgaria	17	2	2	0.12	1.00	1	4
Romania	17	20	10	1.18	2.00	2	4
Ukraine	13	16	5	1.23	3.20	3	3
New Zealand	13	288	11	22.15	26.18	8	2
Iraq	12	1	1	0.08	1.00	1	3

Notes. TP = total number of publications; NCP = number of cited publications; TC = total citations; C/P = average citations per publication; C/CP = average citations per cited publication; h = h-index; and g = g-index.

This figure depicts the global topography of IA scientific research production as seen in Figure 5 of the world map. The highlighted areas shown in the map are the top 20 countries that have published internal audit research literature. There are mainly concentrated in Western countries, mainly the United States and the United Kingdom, and Asian countries.

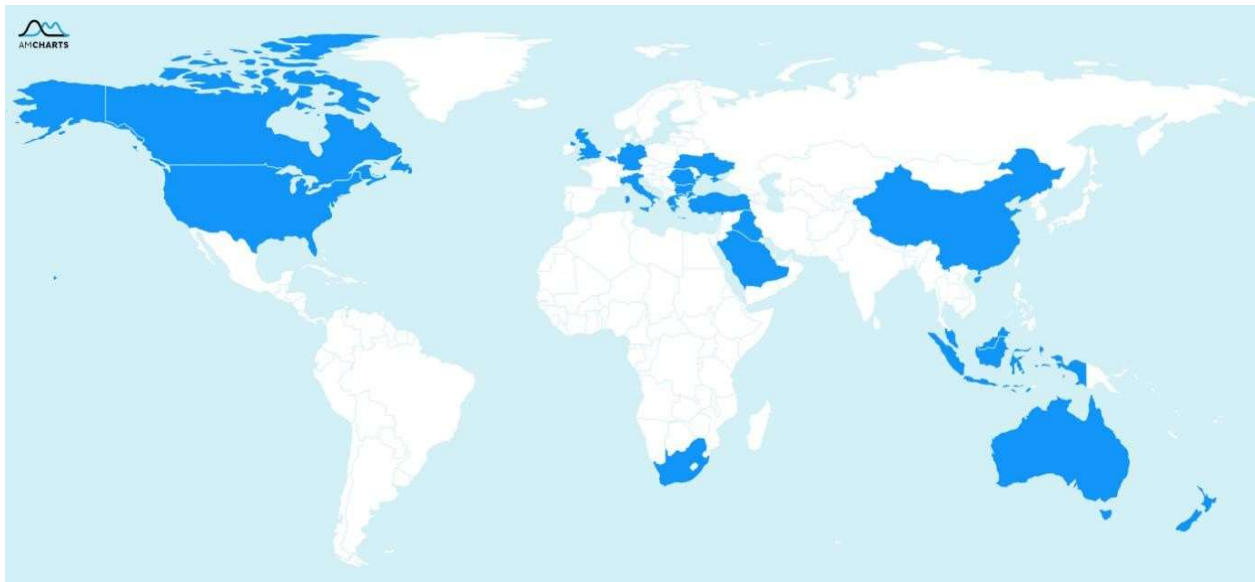


Figure 5. Worldwide scientific production indexed by Scopus on internal audit.

The network visualization of the authors' nation or area is shown in Figure 6. Only nations that have referenced several articles are examined. According to the results of the score-counting approach, Malaysia, the United States, and the United Kingdom, all contribute significantly to international collaboration on IA research. The United States works closely with New Zealand and Australia. Belgium and Italy are strongly partnered with the United Kingdom. Malaysia works closely with China, South Africa, and Saudi Arabia.

Figure 7 shows the overlay visualisation of the authors' country/region. Linking to the United Kingdom, Australia, China, and New Zealand, the United States was most active in the early phase (2010-2012) and began in 2010. Midterms (2016-2018), authors have collaborated with Malaysia, South Africa, and Saudi Arabia. Recently, (2020 onward), authors have collaborated with Indonesia, United Arab Emirates, and Jordan. Collaborative relationships between authors, showing multi-national as a network, and more IA research developments are increasingly shifting to emerging economies and developing countries.

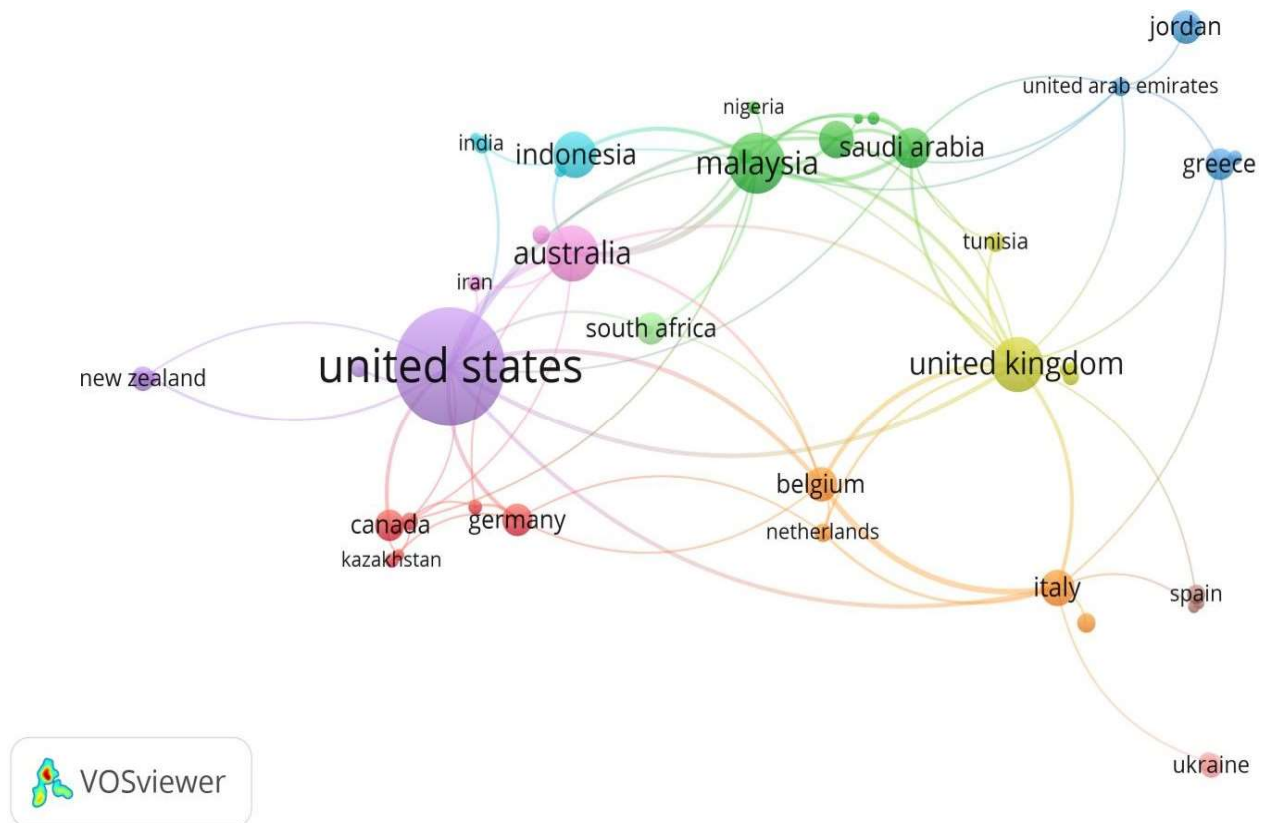


Figure 6. Network visualisation map of the co-authorship by countries.

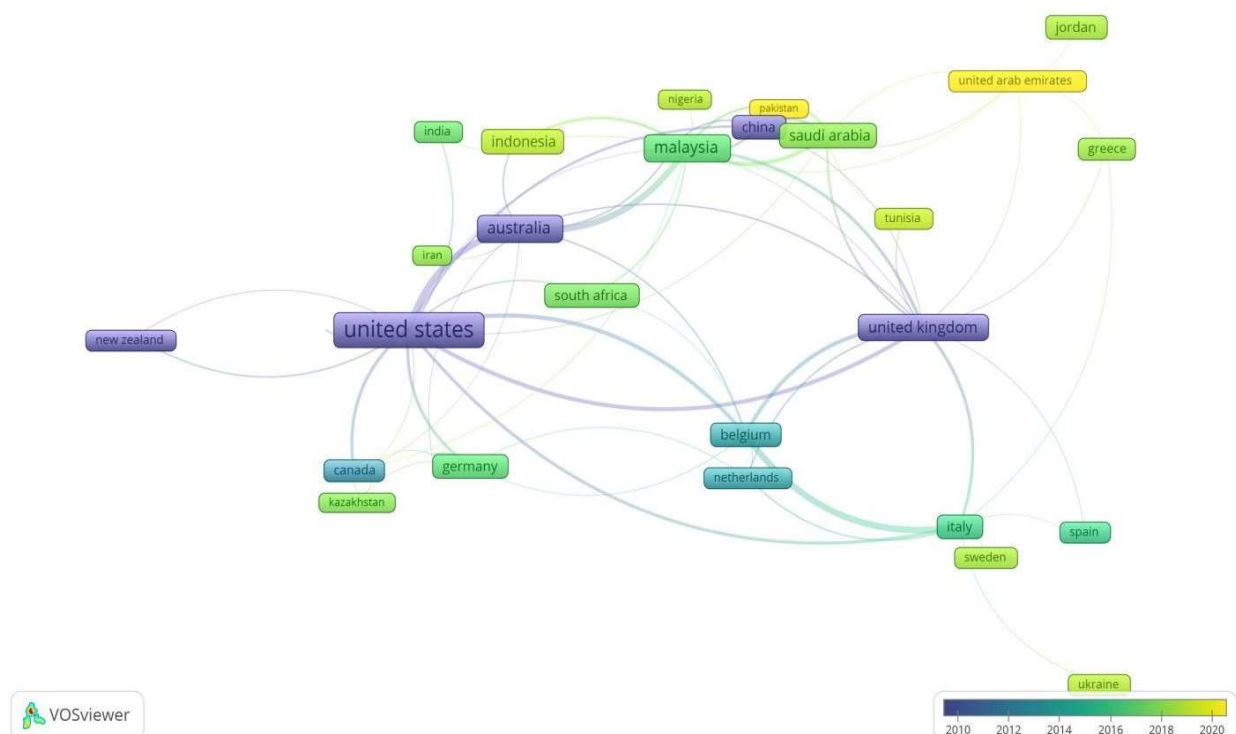


Figure 7. Overlay visualisation map of the co-authorship by countries.

Publications by Source Titles

Table 10 lists journals which at least published five articles on IA study. As can be seen from the table, Managerial Auditing Journal ranked first with 208 documents, followed by the Quality-Access to Success at second place (17 documents). The highest cite score journal is Journal of Business Ethics with 10 publications.

Table 10

Most Active Source Titles

Source title	TP	TC	Publisher	Cite score	SJR 2021	SNIP 2021
Managerial Auditing Journal	208	3,435	Emerald Publishing	3.5	0.449	1.052
Quality-Access to Success	17	9	SRAC—Societatea Romana Pentru Asigurarea Calitatii	1.8	0.211	0.370
Academy of Accounting and Financial Studies Journal	17	58	Allied Business Academies	1.4	0.200	0.529
Contributions to Management Science	16	2	Springer Nature	0.7	0.130	0.000
Accounting Horizons	16	819	American Accounting Association	3.4	1.454	1.700
Journal of Corporate Accounting and Finance	15	57	Wiley-Blackwell	1.2	0.353	0.368
International Journal of Accounting Information Systems	13	355	Elsevier	8.8	1.516	2.504
Contemporary Accounting Research	13	639	Wiley-Blackwell	5.2	3.017	2.621
Journal of Business Ethics	10	258	Springer Nature	10.8	2.438	2.863
Corporate Ownership and Control	10	51	Virtus Interpress	0.2	0.148	0.216
Meditari Accountancy Research	9	81	Emerald	3.8	0.606	1.022
Journal of Management and Governance	9	150	Springer Nature	3.3	0.579	1.120
Cogent Business and Management	9	64	Cogent OA	2.9	0.409	0.948
Journal of Applied Accounting Research	8	94	Emerald Publishing	3.2	0.436	0.855
International Journal of Applied Business and Economic Research	8	5	Serials Publications	0.1	0.143	0.401
Journal of Information Systems	7	112	American Accounting Association	2.8	1.183	1.112
Accounting, Organizations and Society	7	311	Elsevier	6.4	2.204	2.505
Accounting Review	7	783	American Accounting Association	6.6	4.674	3.662
Accounting and Finance	7	447	Wiley-Blackwell	3.5	0.669	1.388
Accounting and Business Research	7	70	Taylor & Francis	4.4	0.857	1.473
International Journal of Business Research	6	3	International Academy of Business and Economics	0.1	0.112	0.335
International Journal of Accounting, Auditing and Performance Evaluation	6	34	Inderscience Publishers	0.9	0.130	0.245
Critical Perspectives on Accounting	6	268	Elsevier	6.5	1.381	2.340
Australian Accounting Review	6	142	Wiley-Blackwell	4.6	0.513	1.118
Accounting, Auditing and Accountability Journal	6	244	Emerald Publishing	6.8	1.465	1.980
Accounting, Finance, Sustainability, Governance and Fraud	5	1	Springer Nature	0.5	N/A	N/A
Journal of Financial Reporting and Accounting	5	47	Emerald	2.5	0.337	0.813
Quality Progress	5	19	American Society for Quality Control	0.3	0.115	0.087
Proceedings of the International Conference on Industrial Engineering and Operations Management	5	2	IEOM	N/A	N/A	N/A
Journal of Accounting and Organizational Change	5	20	Emerald Publishing	2.3	0.455	1.008

Notes. TP = total number of publications; TC = total citations; Cite Score = average citations received per document published in the source title; SJR = SCImago Journal Rank measures weighted citations received by the source title; SNIP = source normalised impact per paper measures actual citations received relative to citations expected for the source title's subject field.

Highly Cited Documents

Table 11 listed the 20 most highly cited publications on IA research. Prawitt, Smith, and Wood (2009) investigated the relationship between internal audit quality and earnings management, and Spira and Page (2003) developed risk management that had an association with internal control and internal audit. These two publications are the top frequently cited articles that have very important contributions to IA research. Studies that bring up concerns about audit committees (Raghunandan, Rama, & Read, 2001), audit fees (Goodwin-Stewart & Kent, 2006; Felix, Gramling, & Maletta, 2001), internal audit effectiveness (Mihret & Yismaw, 2007; Soh & Martinov-Bennie, 2011), and internal audit quality (Abbott, Daugherty, Parker, & Peters, 2016) are other articles that receive a lot of citations.

Table 11

Top 20 Highly Cited Articles

No.	Authors	Title	Cites	Cites per year
1	D. F. Prawitt; J. L. Smith; D. A. Wood (2009)	Internal audit quality and earnings management	271	18.07
2	L. F. Spira; M. Page (2003)	Risk management: The reinvention of internal control and the changing role of internal audit	251	11.95
3	K. Raghunandan; W. J. Read; D. V. Rama (2001)	Audit committee composition, "gray directors," and interaction with internal auditing	198	8.61
4	J. Goodwin-Stewart; P. Kent (2006)	Relation between external audit fees, audit committee characteristics and internal audit	187	10.39
5	W. L. Felix, Jr.; A. A. Gramling; M. J. Maletta (2001)	The contribution of internal audit as a determinant of external audit fees and factors influencing this contribution	183	7.96
6	S. Lin; M. Pizzini; M. Vargus; I. R. Bardhan (2011)	The role of the internal audit function in the disclosure of material weaknesses	145	11.15
7	J. V. Carcello; D. R. Hermanson; K. Raghunandan (2005)	Factors associated with U.S. public companies' investment in internal auditing	143	7.53
8	P. Coram; C. Ferguson; R. Moroney (2008)	Internal audit, alternative internal audit structures and the level of misappropriation of assets fraud	139	8.69
9	D. G. Mihret; A. W. Yismaw (2007)	Internal audit effectiveness: An Ethiopian public sector case study	131	7.71
10	D. S. B. Soh; N. Martinov-Bennie (2011)	The internal audit function: Perceptions of internal audit roles, effectiveness and evaluation internal audit quality and financial reporting	124	9.54
11	L. J. Abbott; B. Daugherty; S. Parker; G. F. Peters (2016)	Quality: The joint importance of independence and competence	119	14.88
12	L. J. Abbott; S. Parker; G. F. Peters; D. V. Rama (2007)	Corporate governance, audit quality, and the sarbanes-oxley act: Evidence from internal audit outsourcing	115	6.76
13	M. B. Adams (1994)	Agency theory and the internal audit	115	3.83
14	D. P. Scarbrough; D. V. Rama; K. Raghunandan (1998)	Audit committee composition and interaction with internal auditing: Canadian evidence	114	4.38
15	J. Goodwin-Stewart; P. Kent (2006)	The use of internal audit by Australian companies	112	6.22
16	J. A. Brierley; D. R. Gwilliam (2003)	The development of internal audit in Saudi Arabia: An institutional theory perspective	111	5.29
17	L. J. Abbott; S. Parker; G. F. Peters (2010)	Serving two masters: The association between audit committee internal audit oversight and internal audit activities	105	7.50
18	G. Sarens; I. De Beelde; P. Everaert (2009)	Internal audit: A comfort provider to the audit committee	103	6.87
19	G. Sarens; I. De Beelde (2006)	Internal auditors' perception about their role in risk management: A comparison between US and Belgian companies	100	5.56
20	F. H. Fadzil; H. Haron; M. Jantan (2005)	Internal auditing practices and internal control system	100	5.26

Top Keywords

The authors' keywords essentially measured the research's main topic and elements (Wen & Huang, 2012). However, analysing the frequency and network of the authors' keywords with the Scopus data set should be cleaned. We use the Openrefine 3.7.1 technique to combine keywords, such as by case, singular and plural, or synonyms. After cleaning the data set, the analysis shows (see Table 12) which author keywords were used the most. As our research surrounding IA research, inevitably the top keywords have the terms of "internal audit" and "internal auditing".

Table 12

Top Author's Keywords

Author keywords	Total publications (TP)	Percentage (%)
Internal audit*	278	28.57%
Internal auditing*	120	12.33%
Corporate governance	94	9.66%
Internal audit function	62	6.37%
Audit committee	57	5.86%
Risk management	52	5.34%
Internal auditor	40	4.11%
Internal control	33	3.39%
Public sector	27	2.77%
Internal audit quality	22	2.26%
External audit	20	2.06%
Outsourcing	20	2.06%
Malaysia	19	1.95%
Governance	18	1.85%
Auditing	17	1.75%
Internal audit effectiveness	17	1.75%
Objectivity	14	1.44%
Financial reporting quality	14	1.44%
Effectiveness	14	1.44%
Fraud	13	1.34%
Local government	13	1.34%
Risk assessment	10	1.03%
Ethics	10	1.03%

Note. * search terms, excluded from co-occurrence analysis.

Simple frequency statistics cannot show co-occurrences between the keywords, so we mapped a visualization network by using VOSviewer techniques (see Figure 8 to Figure 10). We performed a co-occurrence analysis for keywords that appeared more than five times. Based on this criteria, 64 keywords were discovered (except "internal audit" and "internal auditing"). Figure 8 shows a network of authors' keywords; we can see that audit committee, internal audit effectiveness, independence, and local government are clustered into purple colour, then derived with internal audit quality, risk assessment, internal control, and management system are closely into green colour, and it also usually occurs outsourcing, fraud, internal auditor, competence, and financial reporting quality grouped into dark blue colour. The clustering keywords represented by other colours are all extended from the above three colours.

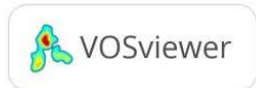


Figure 8. Network visualisation of the author’s keywords.

Different from the visualization of the relationship network, the coverage analysis pays more attention to the evolution relationship of the keywords in the time-changing process, and it presents the visualization of the superimposed time evolution of the authors' keywords. There are five clusters that will represent years in this visualisation map. After 2014, IA research has paid more attention to the relationship with external audit quality, internal audit outsourcing, risk assessment, auditing standards, and assurance services.

Density analysis, different from network and overlap visualisation analysis, which assesses centrality of topics through a heatmap that does not consider interlinkages and temporal dynamics, was performed to understand the central debate about internal audit research. Figure 10 shows clear themes with corporate governance, internal control, risk management, internal audit effectiveness, and internal audit quality that researchers mostly focus.

To further understand the development of IA research, a cloud image of the author's keywords is presented to show the recent five years, from 2018 to 2023, because of the IA trends research significant development (Figure 11). As this figure shows, in the recent five years, researchers focused on the role of IA in corporate governance, internal control, risk management, and the relationship with the audit committee. And also, China is becoming popular in IA research.

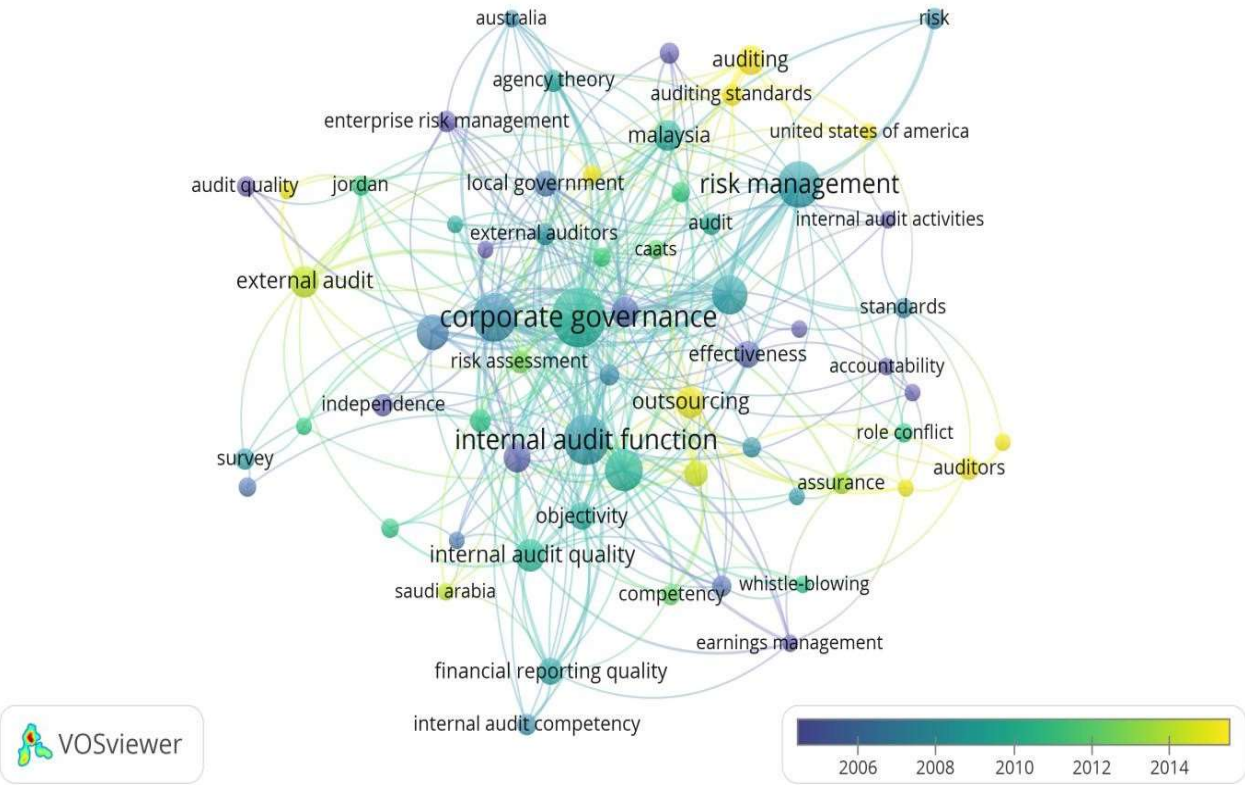


Figure 9. Overlay visualisation of the author’s keywords.

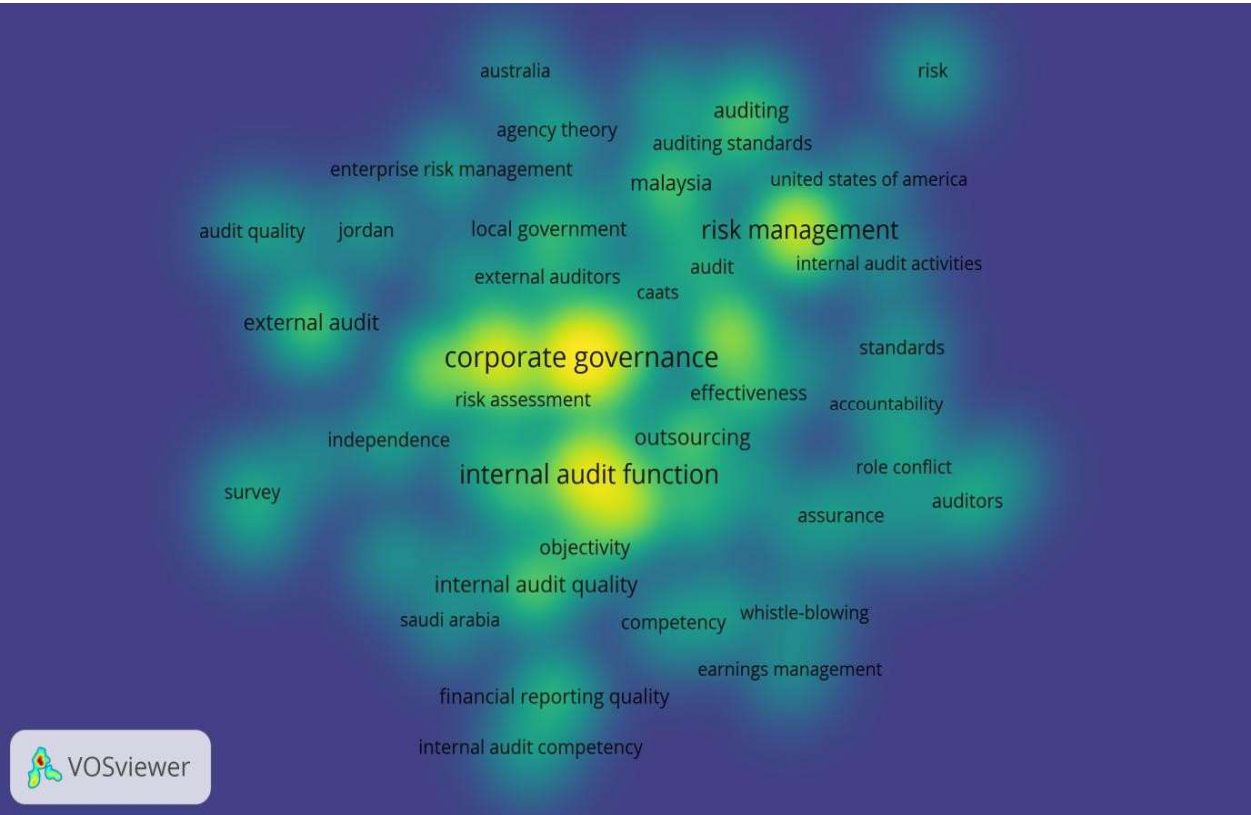
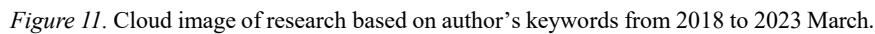
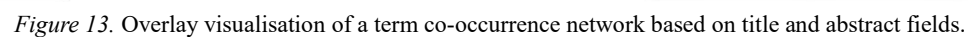
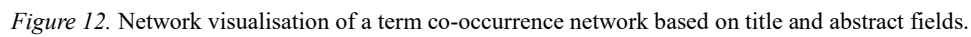


Figure 10. Themes of research based on author’s keywords.

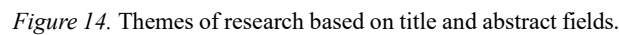


In addition to the analysis of keywords, a co-occurrence analysis on titles and abstracts using the content analysis method in VOSviewer software was conducted. Similarly, co-occurrence for more than three repetitions was carried out. It is not possible to clean all the words in the title and abstract; therefore, 60% of the highly relevant words are selected, a total of 194 words, according to the correlation relationship that comes with the software (see Figure 12). Within this visualization map, there are five clusters that together will represent seven different topics. These clusters may be organized into the following themes: audit practise (red, 63 items), methodologicals (green, 47 items), practicals (blue, 41 items), assessment of IA effectiveness and quality (yellow, 27 items), and sectors (purple, 16 items). The first topic is audit practise, the second is methodologicals (green, 47 items), and the third is practicals (blue, 41 items).

From overlay visualisation based on the title and abstract, there are five clusters representing the evolution of terms over the years. Around the year 2020, the terms merged as “SEM, management support, competency, moderator and moderating effect” that researchers more popular focus on using Structural Equation Model to investigate the moderating relationships into factors.



In order to observe the key points of the research more clearly, a heatmap was created to analyse the density of titles and abstracts. Figure 14 shows clear themes with research methods, research factors, and research topics.



The IIA (2009) considered that internal auditing plays an assurance role in corporate governance mechanisms and adds value to the organisations' objectives. And internal auditors should follow the IIA standards that can be a governance consultant (Moeller, Witt, & Brink, 1999; Al-Twajjry, Brierley, & Gwilliam, 2003). Therefore, it is the responsibility of the internal audit function to analyse risk management, control, and governance, and to contribute to their improvement (Al-Twajjry et al., 2003).

A co-citation analysis was undertaken, which sought to identify the most prolific authors on IA research. The most prolific authors on IA are G. Sarens and D. A. Wood, followed by P. Nedyalkova. There are 13 clusters of IA research authors by analysis co-citation. The first cluster includes 11 authors, such as A. Abdullah, A. C. Ahmad, A. Ahmi, N. A. Ismail, D. Lubbe, D. S. Lubbe, A. Madawaki, S. Z. Saidin, L. Smidt, L. Steenkamp, and D. P. Van der Nest. The second cluster includes nine authors, such as P. Carey, K. C. M. Ching, B. Cooper, I. De Zwaan, S. K. Johl, S. Kaur Johl, C. Ng, J. Stewart, and N. Subramaniam. It is interesting to note that B. Cooper and N. Subramaniam are some of the most prolific researchers on IA research. Finally, cluster 9th is led by G. Sarens, the author with the highest total link strength, and the most productive author on internal auditing.

Meanwhile, the most productive institutions with a minimum of eight publications, Brigham Young University (18, 1.85%) from the United States let the top, followed by Université Catholique de Louvain (16, 1.64%) from Belgium, University of Economics Varna (15, 1.54%) from Bulgaria and Universiti Utara Malaysia (15, 1.54%) from Malaysia. As the most productive authors, D. A. Wood is from Brigham Young University and P. Nedyalkova is from the University of Economics Varna. And the top productive journals on IA studies are the *Managerial Auditing Journal*, the *Quality-Access to Success*, the *Academy of Accounting and Financial Studies Journal*, and the *Contributions to Management Science*. And the most cited article is “internal audit quality and earnings management” written by Prawitt et al. in 2009.

In terms of regional cooperation and countries of publications, the top three nations are the United States (30%), Malaysia (8.22%), and the United Kingdom (7.4%). According to the network visualisation of the authors' nations analysis, Malaysia, the United States, and the United Kingdom, all contribute significantly to international collaboration on IA research. The United States works closely with New Zealand and Australia. Belgium and Italy are strongly partnered with the United Kingdom. Malaysia works closely with China, South Africa, and Saudi Arabia. In the phases of development of the research nations on IA research, linking to the United Kingdom, Australia, China, and New Zealand, the United States was most active in the early phase (2010-2012) and began in 2010. Midterms (2016-2018), authors have collaborated with Malaysia, South Africa, and Saudi Arabia. Recently, (2020 onward), authors have collaborated with Indonesia, United Arab Emirates, and Jordan. Collaborative relationships between authors, showing multi-national as a network, and more IA research developments are increasingly shifting to emerging economies and developing countries.

Finally, this study analyses the authors' keywords, titles, and abstracts to further understand IA research. The terms “corporate governance”, “internal audit function”, “audit committee”, “risk management”, “internal control”, “internal audit quality”, and “internal audit effectiveness” are most frequently in IA publications that the researchers not only pay attention to the role of internal audit in corporate governance but also pay more attention to the quality and effectiveness of internal audit itself. From the overlay visualisation map of the keywords, after 2014, IA research paid more attention to the relationship with external audit quality, internal audit outsourcing, risk assessment, auditing standards, and assurance services. Around the year 2020, the terms merged as “SEM, management support, competency, moderator and moderating effect” that researchers more popular focus on using Structural Equation Model to investigate the moderating relationships into factors. To further understand the development of IA research, a cloud image of the author's keywords was presented to show the recent five years; from 2019 to 2024, researchers focused on the role of IA in corporate governance, internal control, risk management, and the relationship with the audit committee. And also, China is becoming popular in IA research.

The findings of this paper map out trends in IA research and contribute to understanding the evolution of IA through a database-wide analysis of the Scopus database, examining the most prolific and published journals on internal audit. At the same time, through the co-occurrence analysis of the authors' keywords, titles, and abstracts, it provides new ideas and contributions to the study of IA, making up for the research on the common relationship in the other IA literature review articles. However, this study also has several limitations. This study limited with the search terms of “internal audit*” within titles and limited subject. In addition, the purpose of this study is to measure statistics of past studies, without descriptive analysis, as a means of expanding research to provide theme and direction guidance for future research. Further descriptive analysis can be carried out on this basis in the future.

Conclusion

Bibliometric analysis was performed based on the Scopus database from the beginning until September 2024 to provide a comprehensive overview of IA research from 1978 until September 2024. The final 1,135 publications in the Scopus database were selected. The findings show that internal audit research publications grew steadily over 15 years. In the last five years, internal audits have grown fast, especially in developing countries, and China emerged in IA research. In the early phases of internal auditing research, most publications are from the United States and the United Kingdom. Authors and affiliations show strong cooperation, such as Prawitt, Smith, and Wood wrote “internal audit quality and earning management” in 2009. The most cited articles are from the United States but from different universities. The top 20 cited publications show the most popular themes of IA’s roles in governance, internal control, and even the monitoring relationship with audit committees and the effects of external audit fees. And how to evaluate IA’s effectiveness and quality is also popular research themes. Meanwhile, theories have been used in the field of IA, such as agency theory, institutional theory, stakeholder theory, etc. The second active publications country is Malaysia which represents the developing country on this research topic. Throughout the visualisation of keywords, titles, and abstracts of the publications, this study discovered some new areas of research, such as the relationship between internal audit and fraud, risk assessment and corporate governance, which could be studied further.

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