

KNOWLEDGE AUDIT: A BIBLIOMETRICS ANALYSIS

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Article history

Received date : 15-6-2023

Revised date : 16-6-2023

Accepted date : 28-7-2023

Published date : 13-9-2023

To cite this document:

Sapiai, N. S., Awang, N., Mohd Ghazali, S. A., Abd Aziz, N. E., Mat Rusok, N. H., & Mat Nawi, H. (2023). Knowledge audit: A bibliometrics analysis. *International Journal of Accounting, Finance and Business (IJAFB)*, 8(50), 1 - 12.

Abstract: *A knowledge audit is a crucial building block for developing a thorough management strategy. This study aims at finding out the trend of publications with primary concentration on the topic of knowledge audit which was found yet to be conducted by any study to this day. This study employed the bibliometric analysis to analyse 166 indexed research from Scopus database from the year 1994 until 2023 based on defined search terms relating to knowledge audit. VOSviewer was employed to examine and generate a keyword map showing the connection between the topic and the co-occurrence network generated by keyword data. The study utilized Microsoft Excel 2016 to summarize the bibliometric data based on the parameters which include number of publications, subject areas and country contributions. The findings revealed that that researches on knowledge audit have been productively conducted throughout the years; 1994 to 2023 based on the bibliometric data of the defined parameters. The numbers of publication fluctuated throughout the period with 2018 witnessing the highest number of publication with 18 documents. In terms of the author, Gourova E. published the most numbers of article with 9 publications, and Lee W.B was the most cited authors with 120 citations recorded. As for document by affiliation, the University of St. Sofia Kliment Ohridski was ranked first with 9 published documents, while in terms of country, the United Kingdom was found to produce 25 knowledge audit documents. The United Kingdom again came first in terms of most numbers of citations and link strength with 25 and 337 respectively. For types of document, articles recorded the highest percentage compared to others with 48.0% or 73 documents. In terms of subject area, the highest percentage were recorded by computer science*

with 65 documents, and in terms of funding sponsors, Hong Kong Polytechnic University has the most documentation with 2 documents. The study has widened the area of study in knowledge audit despite being considerably broad in the study areas under the general keyword of knowledge audit.

Keywords: *Knowledge audit; Knowledge management; Bibliometric analysis.*

Introduction

Generally, an audit is understood as the process of evaluating a particular person, organization (business or non-business), projects, products or even work processes by the appointed independent third-party who possess no direct or conflict of interest with the audited party (Serrat, 2008). Though the name and concept of audit sound contemporary, the practice of this management tool can be traced to ancient civilizations in which history has evidently proven that great empires of Egypt, Greece, Rome and India during the medieval times performed audit for the purpose of identifying and avoiding financial errors and frauds (Kulkarni & Joshi, 2022). As time progresses, the objective of audit also changes from solely detecting financial errors to distinctly proving truthfulness and transparency of an account (Kulkarni & Joshi, 2022). This does not only demonstrate the accuracy of the financial flow of an organization, but such disclosure entails confidence and trust among the stakeholders and public in general towards an organization. Looking at such significances, auditing has been made compulsory for organizations in many countries worldwide. In Malaysia, for instance, it is compulsory for all public listed, private limited as well as branch offices to audit their account as legally prescribed by the Company Act 2016 (Yee, 2019).

In the world of audit, the term financial audit is a much more familiar term that is commonly heard compared to knowledge audit, in which this kind of audit deals with the assessment of a financial statement of an organization (Serrat, 2008). Notwithstanding, it takes more than being financially sound to consistently succeed and survive in the ever changing as well as continuously competitive world of business in the modern days. Therefore, adoption of tactful measures and strategies is significantly essential. And to be able to do that, it requires the possession of substantial knowledge in management as well as innovativeness in the execution (Perez-Soltero, Barcelo-Valenzuela, Sanchez-Schmitz, Martin-Rubio & Palm-Mendez, 2006). This where knowledge audit has been evidently proven to be essentially significant for an organization, particularly business organization.

To comprehend knowledge audit, there are few definitions put forward by various researchers. Interestingly, despite being differently termed by different scholars, all the proposed definitions share a mutual conceptualization of knowledge audit, which is assessing the knowledge resource of an organization. From the perspective of Debehm & Clark (1994, as cited in Ayinde, Orekoya, Adepeju, & Shomoye 2021), knowledge audit is viewed as hiding and unhiding resource used by an organization to obtain competitive edge. As for Hylton (2002, as cited in Yip, Lee & Tsui, 2015), knowledge audit can be understood as a systematic assessment of company's both explicit and implicit knowledge resources, which include identifying kinds of knowledge that exist, the sources of the knowledge, as well as the processes involved in the creation of the knowledge. Bergeron (2003, as cited in Gourova, Antonova & Goleminova, 2009) defined knowledge audit simply as method used to measure the value of organization's intellectual asset and knowledge health.

Knowledge audit is truly significant as such initiative allows an organization to exactly identify the existing knowledge in the organization and the missing knowledge required by organization in which such essential information will be significantly important in realizing the organization's goals, as well as recognising the necessary improvements to be undertaken (Gourova, Antonova & Goleminova, 2009). Serrat (2008) asserted that it is through knowledge audit that enables an organization to precisely pinpoint the strengths, weaknesses, opportunities and threats in the light on an organization's knowledge. With such revealing insights, business organization can effectively strategize effective measures to tactfully align and maximally capitalize the intellectual asset of the company for the betterment of the organization.

Looking at its importance and significance, numerous of researches have been done throughout the years on knowledge audit in which these researches have contributed significantly to the understanding and expansion of knowledge on the matter of knowledge audit. Interestingly, of all the issues and areas explored in the light of knowledge audit, it is to the researcher's knowledge that there is absence of bibliometric study specifically on knowledge audit. The bibliometric analysis, which has been gaining attention in other fields of study due to its substantial significance, also has made its way into the field of audit with abundance of studies conducted highlighting the bibliometric analysis conducted throughout the years (e.g.: Mohamed, Elaid, Mahmoudi & Benziane, 2022; Ciger, 2020; Safta, Sabau & Muntean, 2021; Taqi, Sabarudinsah & Rusydiana, 2022), but again, none were found to solely concentrate on knowledge audit. In general, bibliometric analysis includes the use of quantitative measures to statistically analyse scientific outputs which include articles, publications, patents, keywords, ideas and other elements in the research components (Okubo, 1997).

Therefore, it is necessary to conduct a bibliometric study specifically focusing on knowledge audit as such study will surely add to the variety of focus in the field of knowledge audit. As such, clearer insights and wider research areas can be identified on the topic of knowledge audit from the bibliometric data, which will be substantially advantageous for future researchers to conduct more significant studies. Also, this will surely enrich the literature in the discussion of knowledge audit which can be advantageously tapped in by businesses and organizations in their continuous strives to emerge triumphant in today's world. As for this study, the researchers aim at exploring and describing statistically bibliometric data of knowledge audit documents in terms of the numbers, authors, countries, types, subject matters, and funding sponsors. The following section of this paper will extensively discuss the methodology used in conducting this study, followed by results from the bibliometric analysis, and the final section, will conclude the findings, as well as describe the limitations, and recommendation for future research related to bibliometric analysis of knowledge audit.

Method & Material

This study carried out a bibliometric analysis approach, which emerged as one of the most widely used methods to assess the quality, credibility, and impact of the work (Ellegaard & Wallin, 2015). According to Wallin (2005), a bibliometric technique served as a valuable tool to identify potential under-researched areas in a discipline. The SCOPUS database was examined between 1994 and 2023, according to the findings. TITLE-ABSKEY (knowledge audit). A CSV file was created using the information extracted from the documents, which included the author, year of publication, language of publishing, journal, title, affiliation, keywords, and kind of document. Study of bibliographic coupling, coauthorship, co-occurrence, citations and co citations was carried out with the aid of the software VosViewer.

Results

This section presents the results of bibliometric analysis. The section is categorised into three major subsections based on the above-mentioned research questions:

1. Knowledge audit research's evolution and dissemination
2. Key areas in knowledge audit research
3. Major players in knowledge audit research

Findings

Keyword Analysis

This study mapped the author's keywords using VOSviewer software. VOSviewer were used for constructing and visualising bibliometric networks. This software visualises the authors' keywords and presents the association of a keyword with the other keywords through font size, square size, colour, or the thickness of connecting lines.

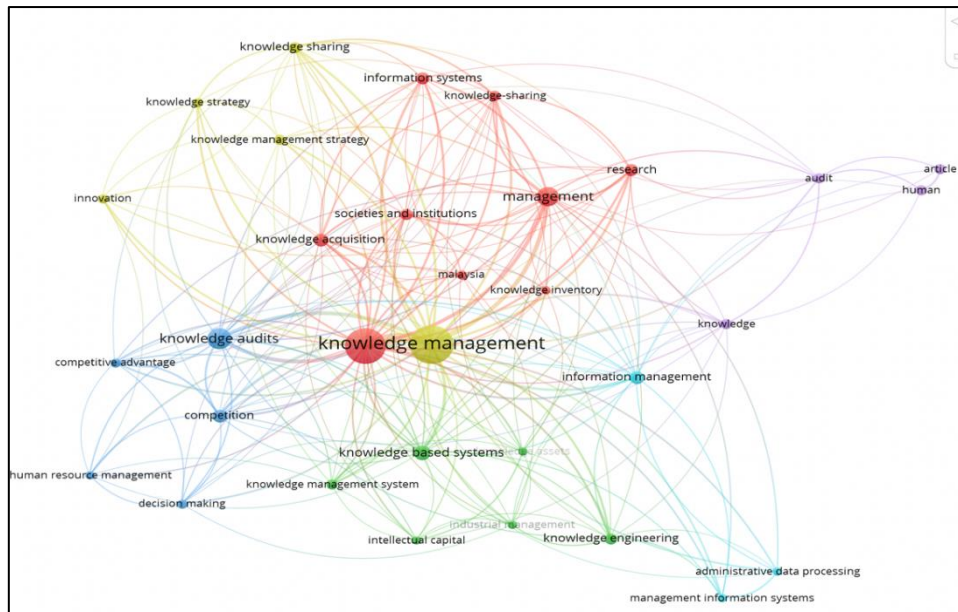


Figure 1: Keyword map for the study on Knowledge Audit

Figure 1 presents the keyword map or a network visualization of the author's keywords. For instance, knowledge management, knowledge audits, knowledge-based systems, competition, information management, knowledge acquisition and the others inclusion featured a similar colour suggesting that these keywords exhibited a close relationship that co- occurred together.

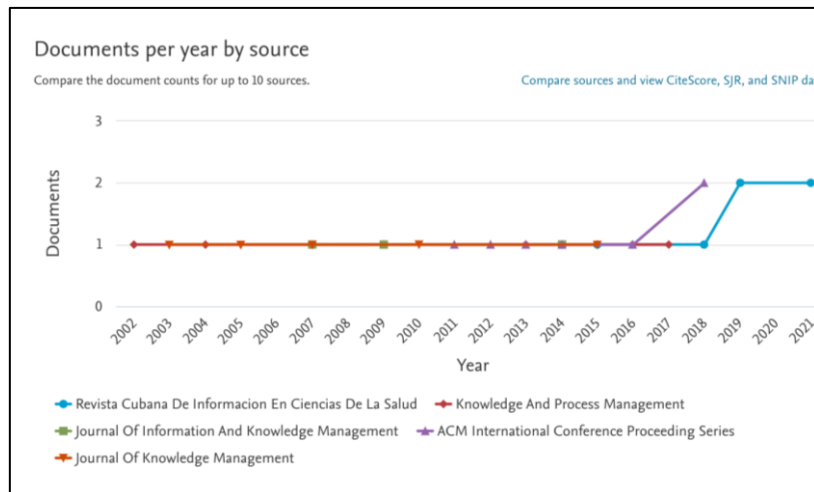


Figure 2: Documents by source

Based on figure 2, the line shows a risen line from year 2002 to 2021. The highest demand come from two different sources rise at 2018 and 2019 while the other three sources stayed the same until 2021 where the document counts up to 1 source only. Journal of Knowledge Management started their document sources at 1 where they stayed for six years before upgrading at 2017 and reached the peak of the graph on 2018. The second achievement reached by Revista Cubana De Informacion En Ciencias De Lad Salud, right after the joined the comparison on 2018. They maintained their achievement for three years, 2019, 2020 and 2020. However, the rest of sources could not achieve any improvement as the other two and stayed at one document sources.

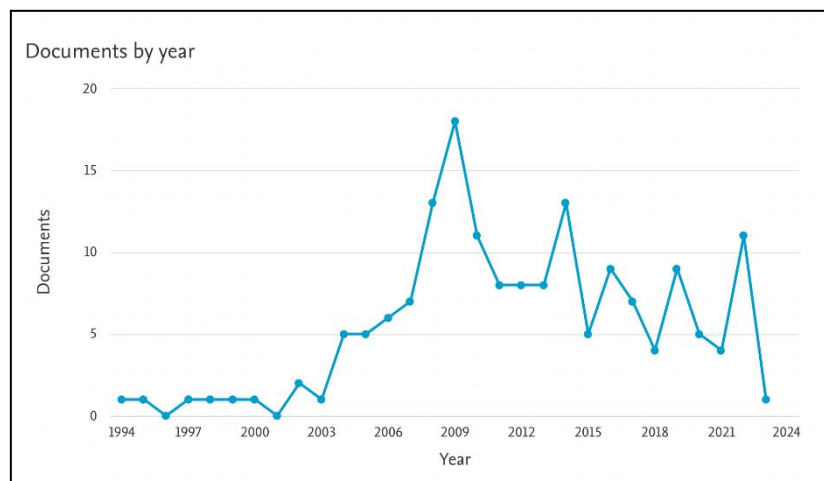


Figure 3: Documents by year

Figure 3 shows the comparison of document based on the year and quantity. The unstable graph displays rises and fall of documents through the year 1994 until 2023. The graph climbs up in 2009 before it falls in 2010 and started a unstabilized line until 2022. They started in a straight line from the year 1994 to 2000 with a little fall on 1996. The highest number of documents came from the year 2009 where they reach the quantity of 18. In 2014, they reached their second highest quantity at 14, followed by 2022 at 11. The difference between these two highest achievements was 4 documents. However, there are two years where they received 0, which in 1996 and 2001.

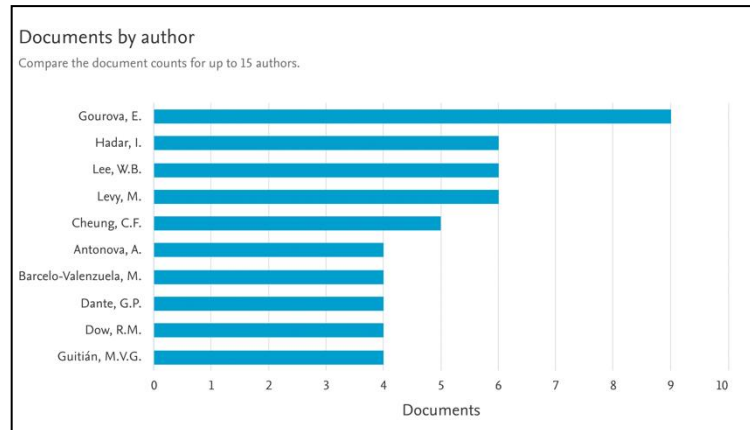


Figure 4: Documents by author

Figure 4 illustrates the results of the documents counts for up to 15 authors. It can be seen that Gourova, E.’s author was recorded to have the highest number of documents which was 9 documents while the lowest number of documents goes to Guitian, M.V.G.’s author which only has 4 documents. The difference between the highest and the lowest number of documents for two authors is 5 documents. Then, there are three authors that have the same number of documents which were Hadar, Lee, W.B and Levy, M. authors with 6 documents. Followed by Cheung, C.F as the fifth author with 5 documents behind Hadar, Lee, and Levy by having 1 less document than them. Furthermore, Antonova, A., Barcelo-Valenzuela,M., Dante, G.P, Dow, R.M and Guitian, M.V.G. ranked bottom four as they have only 2 documents compared to Gourova, E which ranked the highest. In conclusion, the importance of knowledge audit has led to a rise in the number of documents counts by each author, especially Gourova, E, authors.

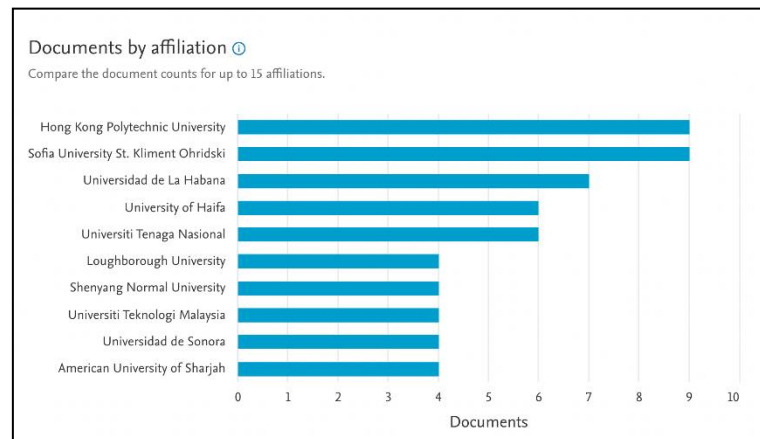


Figure 5: Documents by affiliation

Figure 5 depicts the results of documents counts involving up to 15 affiliations. From the figure, Hong Kong Polytechnic University and Sofia University St. Kliment Ohridski were recorded as the affiliations with the highest number of documents which have 9 documents each. The lowest number of documents recorded goes to four affiliations which are Loughborough University, Shenyang Normal University, Universiti Teknologi Malaysia, Universidad de Sonora and American University of Sharjah with 4 documents each. The differences between the highest and the lowest documents is 5 documents. Furthermore, the second place with the highest rank is Universidad de La Habana with 7 documents. Followed by University of Haifa and University Tenaga Nasional with both recorded 6 documents each. Overall, the differences

of documents count between all the affiliations are not so wide and many of them share the same amount of documents counts.

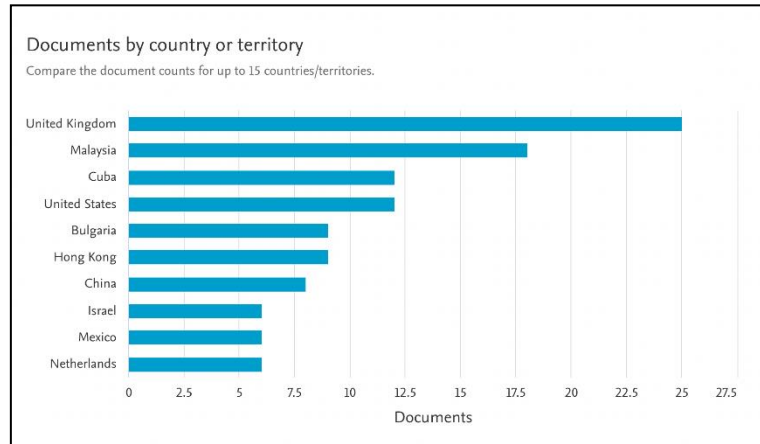


Figure 6: Documents by country or territory

Figure 6 shows the results of documents by country up to 15 countries. In this result can be seen that United Kingdom recorded the highest number document which was 25 meanwhile for the lowest number have three countries which was Israel, Mexico and Netherlands with 6 documents. The difference between the highest and the lowest was 19. Furthermore, Malaysia is the second highest behind United Kingdom with 18 documents. Then, followed by Cuba and United States have the same number of documents which was 12 and for the next rank also share same number of documents which was Bulgaria and Hong Kong with 9 documents. Lastly, the bottom 2 is China with 8 documents because the three countries after China share same number of documents.

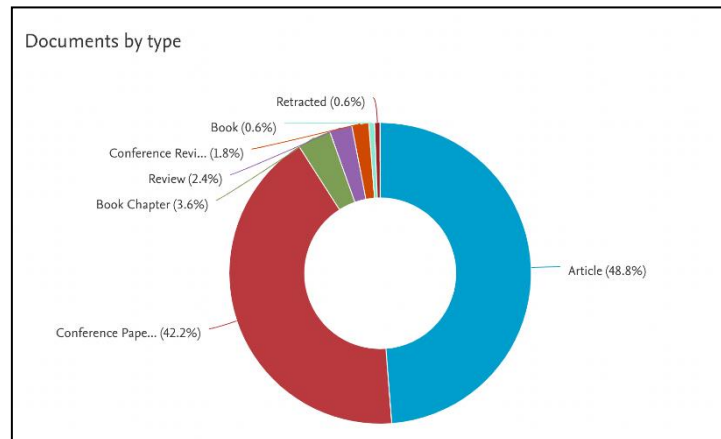


Figure 7: Documents by type

In term of documents by type, Figure 7 shows Article have highest percentage (48.8%) with 81 documents compared to the Retracted and Book that have same lowest percentage (0.6%) with 1 document only. The difference between the highest and the lowest in percentage is 47.9% with 79 documents. The second rank goes to Conference Paper (42.2%) with 70 documents and followed by Book Chapter (3.6%) with 6 documents in third rank and have a big gap with the second rank. Then, also followed by Review (2.4%) with 4 documents at fourth rank, Conference Review (1.8%) with 3 documents at fifth rank.

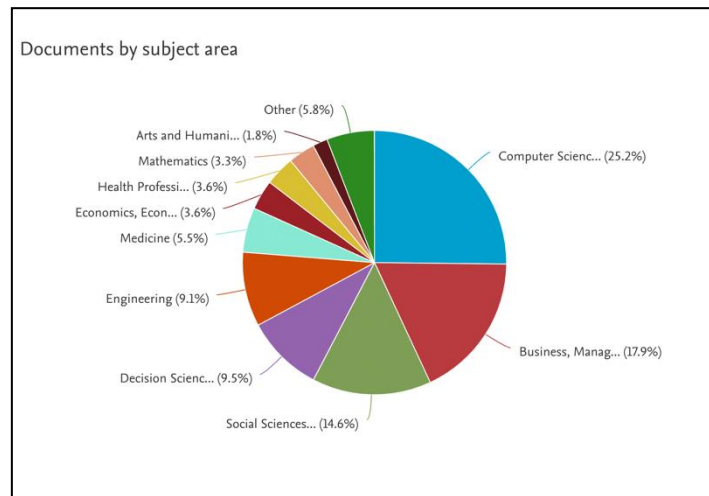


Figure 8: Documents by subject area

Figure 8 shows the chart of documents by subject area. The results shows that Computer Science was the highest percentage which is 25.4% or 69 documents compare to other subjects. The second highest percentage goes to Business, Management and Accounting which is 18.0% or 49 documents followed by Social Sciences 14.7% with 40 documents that more than 9.2% or 25 documents compare to Medicine which is 5.5% or 15 documents. Next, Economics, Econometrics and Finance and Health Professions was both 3.7% or 10 documents. The difference between the lowest percentage for documents by subject area was Arts and Humanities which is 1.5% or 4 documents that 23.9% or 65 documents less than the highest document. To conclude, documents by computer science was the highest documents by subject area than the others.

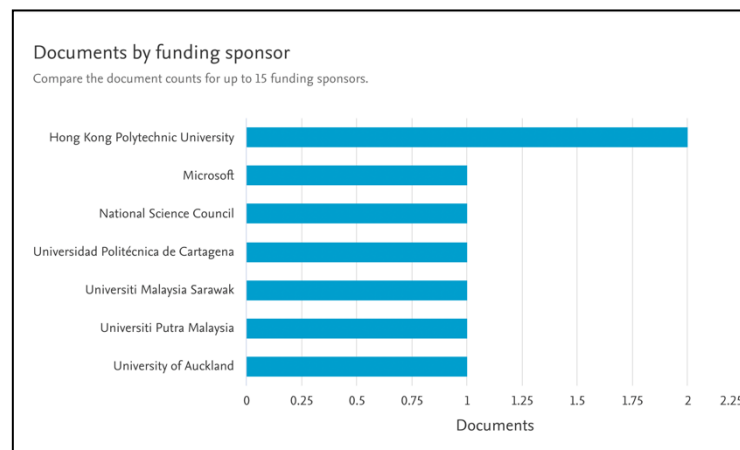


Figure 9: Documents by funding sponsor

Figure 9 presents bar chart of documents by funding sponsor. The highest document by funding sponsor is Hong Kong Polytechnic University, which is 2 documents compare to others such as Microsoft, National Science Council, Universided Politecnica de Cartagena, Universiti Malaysia Sarawak, Universiti Putra Malaysia, and Universiti of Auckland which is only 1 document. The difference between the highest and lowest is 1 document. So, in conclusion, Hong Kong Polytechnic University is the highest documents by funding sponsor than the other documents.

Citation Analysis

The citation metric for the data was determined using Harzing's Publish or Perish software. As of April 12, 2023 Table 1 shows the citation metric for all documents gathered. The citation metric table reveals that 1402 citations were referenced for 166 published papers over 29 years (1994-2023), with an average of 48.34 citations each year. The authors manually calculated the average citation per year using Google Scholar citations, as shown in Table 2.

Table 1: Citation metrics

Reference date	12 April 2023
Publication years	1994-2023
Citation years	29 (1994-2023)
Total number of papers	166
Total citations	1402
Cites/year	48.34
Cites/paper	8.45
Authors/paper	2.81
Hirsch h-index	19
Egghe g-index	32
PoP hI,norm	10
PoP hI,annual	0.34

The top 19 h-index referenced articles on the topic of knowledge audit are listed in Table 2. The table summarises the number of times each document was cited in both the Scopus and Google Scholar databases. The table shows that the paper written by M. Lemon, P.S. Sahota (2004) received the highest citation. The title of the article is “Organizational culture as a knowledge repository for increased innovative capacity”. According to the Scopus database, the articles has been cited 187 times, with an average of 9.84 citations every year. In addition, based on the computation of Google Scholar as of 23 May 2022, the articles also received the highest number of citations (541 times)

Table 2: Top 19 h-index cited articles on ‘Knowledge Audit

No.	Document Title	Authors	Year	Source	Cited by	Cites per year	GS cites	GS sites per year
1	Organizational culture as a knowledge repository for increased innovative capacity	M.Lemon	2004	Technovation	187	9.84	541	28.47
2	Linking social network analysis with the analytic hierarchy process for knowledge mapping in organizations	J. Liebowitz	2005	Journal of Knowledge Management	151	8.39	295	16.39
3	Knowledge auditing and mapping: A pragmatic approach	S.Burnett	2004	Knowledge & Process Management	65	3.42	163	8.58
4	A systematic approach for knowledge auditing: A case study in transportation sector	C.F Cheung	2007	Journal of Knowledge Management	55	3.44	114	7.13

5	A systematic approach for knowledge audit analysis: Integration of knowledge inventory, mapping and knowledge flow analysis	S. Y Choy	2004	Journal of Universal Computer Science	43	2.26	120	6.32
6	KM implementation in Malaysian telecommunication industry: An empirical analysis	C.C Wei	2006	Industrial Management & Data System	42	2.47	112	6.59
7	Knowledge management - if only you knew what you knew	Y. Butler	2000	Australian Library Journal	39	1.70	106	4.61
8	The knowledge audit	J. Debenhem	1994	Robotics and Computer Integrated Manufacturing	38	1.31	113	3.90
9	Knowledge audit methodology with emphasis on core processes	Perez-Soltero	2006	3rd European and Mediterranean Conference on Information Systems	35	2.06	77	4.53
10	The role of knowledge management supporters in software development companies	P. FehÃ©r	2006	Software Process Improvement and Practice 11	32	1.88	57	3.35
11	Knowledge audit concepts, processes and practice	E. Gouova	2009	WSEAS Transactions on Business and Economics	31	2.21	68	4.86
12	Finding KM solutions for a volunteer-based non-profit organization	J. Huck	2011	VINE	25	2.08	63	5.25
13	Uncovering cultural perceptions and barriers during knowledge audit	M. Levy	2010	Journal of Knowledge Management	25	1.92	69	5.31
14	Knowledge audit as a key tool for business research in the information society	L.V. Kashirskaya	2020	Entrepreneurship and Sustainability Issues	22	7.33	42	14
15	Pursuing excellence in firm core knowledge through intelligent group decision support system	C.Lin	2008	Industrial Management & Data Systems	22	1.47	36	2.4
16	Black and Decker® towards a knowledge-centric organization	J.D. Pemberton	2002	Knowledge and Process Management	21	1.00	63	3
17	Knowledge management strategy for small and medium enterprises	E. Gouova	2010	International Conference on Applied Computer Science, AC	20	1.54	48	3.69

18	Developing a reference method for knowledge auditing	T. Levantakis	2008	7th International Conference on Practical Aspects of Knowledge Management, PAKM	20	1.33	52	3.47
19	Knowledge audit: Tools of the trade transmitted to tools for tradition	M.A. Mearns	2008	International Journal of Information Management 2	20	1.33	51	3.4

Conclusion

A knowledge audit distinguishes itself by putting people at the centre of its concerns: it seeks to discover what people know and what they do with the knowledge they have. It can be defined as an investigation of an organization's knowledge needs and the interdependence of leadership, organisation, technology, and learning in meeting these needs. A knowledge audit, in other words, is an investigation into the strengths and weaknesses of an organization's knowledge, as well as the opportunities and threats that it faces. This will in turn keeps things better aligned by producing a shared view of the knowledge across the organization. All the figures discussed above clearly illustrate the importance of knowledge audit.

The results of this study revealed that knowledge audit is an important basic ingredient for most organizations that want to define knowledge management programs. Over the past 15 years, the number of documents has fluctuated from year to year. The highest achievement in increasing the number of documents was obtained from 2007 to 2009, with 7 documents to 18 documents. Starting in 2002 until 2017, Knowledge and Process Management is a productive source of documents where there are 7 documents produced throughout the year. For the determination of the best author was given to Gourova E. with 9 documents compared to other authors.

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