Qualitative and Quantitative Methods in Libraries (QQML) 12,2:251-264, 2023

Research Trends in Information Literacy: A Bibliometric Analysis and Network Visualisation

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Abstract The present paper seeks to quantify the scholarly literature on Information Literacy (IL) during the last two decades by collecting data from the Scopus database from 2002 to 2021. The overall output includes 8769 records and 73181 citations. The average citation per paper is 10.81. *"Communication in Computer and Information Science"* was the most influential source among the titles for publishing research, with 386 papers. With 59 articles, Maria Pinto, affiliated with Granada University, has been named the most productive author. Lloyd has the most citations as well as the highest *h*-index. Purdue University and the University of Granada have been the most notable affiliations in institutional research production. The United States accounted for 42.70 percent of research production in total publications.

Keywords: Bibliometric analysis; Scopus; Information literacy; VOSviewer

Received: 10.1.2023 Accepted: 6.6.2023 ISSN 2241-1925

Introduction

Education elevates an individual from obscurity and encourages them with the knowledge, competencies, and attitudes needed to contribute to human progress across boundaries. That's why every country prioritises education in order to raise its residents' consciousness to the next level (Singh & Begum, 2012). The information society requires all individuals to become information literate. This means they must recognise when information is needed and identify, locate, assess, and successfully use it for decision-making or achieving various goals. In his paper from 1974, Paul Zurkowksi developed the concept of '*information literacy*.' Several scholars and stakeholders have defined and investigated information literacy (Park & Kim, 2011). SCONUL's *"Seven Pillars of Information Literacy: Core Model for Higher Education"* and ACRL's *"Framework for Information Literacy in Higher Education"* models are examples of information literacy advances in academic libraries (Seifi et al., 2020). This is a key aspect of lifelong education. Information literacy has increased in popularity among academic librarians as they have recognized the importance of teaching students how to effectively locate, evaluate, and use information in their academic work. Librarians have developed and implemented information literacy instruction programs, created online guides and tutorials, and collaborated with faculty to integrate information literacy into the curriculum. The growth of digital resources and the proliferation of fake news have also emphasized the need for information literacy skills. According to the AASL Standards, an information literate is one individual who obtains information in an efficient and active manner and appraises it decisively.

In the current study, the author employed the bibliometric method to examine the concepts of literature on IL from 2002 to 2021, intending to offer a better insight into studies of IL, whereas several researchers (Majid et al., 2015; Pinto, 2015; Bhardwaj, 2017; Kolle, 2017; Verma & Shukla, 2019; Bapte, 2020; Karisiddappa et al., 2020; Onyancha, 2020; Bapte, 2021) have already attempted studies to identify research trends, despite the fact that the current study differs from their study objectives, time frame, and method used as it covers two decades.

Literature Review

Majid et al. (2015) examined academic research trends in information literacy. Between 2003 and 2012, the researchers obtained 1989 records from Scopus to analyze yearly growth, preferred sources, most productive authors, top nations, and distribution by subject. During the previous decade, there was exponential growth in the literature on information literacy. According to the data, researchers from the United States and the United Kingdom wrote the most records. Pinto (2015) evaluated information literacy in university education and intended to conduct an in-depth analysis by gathering data from LISA, ERIC, and Web of Science databases. The study's findings suggest two zones of varying degrees and five knots related to the following factors: evaluation-

education, learning-research, student efficacy, assessment, and library. Bhardwaj (2017) utilised Scopus from 2001-2012 to study information literacy in the humanities and social sciences. The survey included 1990 papers from 79 different countries. The most preferred source by authors for publishing was *Reference Service Review*. Maria Pinto was a prolific author, and Annemaree Lloyd got the highest *h*-index score. Kolle (2017) sought to investigate the information literacy literature and publication trends from 2005 to 2014 using the Web of Science database. According to the survey findings, there was an increase in publications from 2005 to 2014. The most prolific author and affiliations were Maria Pinto and Granada University. The popular source among authors was the *Journal of Academic Librarianship*, while the United States was the top contributing country.

Verma & Shukla (2019) examined the annual dispersals, growth rates, and most prolific writers in the information literacy works during a ten-year period by gathering data from 9496 records using Scopus from 2008 to 2017. They discovered that 2016 was the most productive year. Wolf, M.S. has contributed the most papers of any author. Bapte (2020) assessed the global research output in the field of IL. The author used Scopus to gather 7070 bibliographic records from 1975 to 2019. The average number of citations per paper was 7.15, while Pinto M. was identified as the most productive author. Karisiddappa et al. (2020) studied information literacy research articles worldwide from 2000 to 2019 using the Scopus database. The study found that Purdue University and the Queensland University of Technology were the most productive institutions. *Reference Services Review* was the most popular scholarly communication source. Onyancha (2020) visualised the literature by obtaining data from Scopus from 1975 to 2018 and plotting trends in information literacy over forty years. The study findings show that this interdisciplinary area is spread throughout all Scopus domains. Many additional definitions of literacy evolved after the twentieth century, including digital literacy, meta literacy, health literacy, media literacy, financial literacy, and so on. Bapte (2021) used the Web of Science to undertake a scientometric survey of media literacy worldwide research output from 1989 to 2020. The trend in media literacy studies has been multiple co-authorship. The most prolific author was Primack and *Communicar*, the most popular journal.

The key feature of bibliometrics is that it allows for predictive research and strategic forecasting. Although these quantitative studies on Information Literacy reflect the field's development in various contexts, the present research is a bibliometric study on Information literacy. An attempt is made to study the research productivity and growth of literature in Information Literacy and network analysis.

Objectives

The main purpose of this study is to provide a comprehensive review of the IL literature as reflected in the Scopus. The research was carried out with the following goals in mind:

1. To quantify worldwide research outcomes on Information Literacy.
2. To perform an overview of authorship and the most prominent authors.
3. To identify the preferred sources for publishing.
4. To determine the nation-wise research distribution.
5. To discover the most cited papers.
6. To visualise the co-authorship networks and term co-occurrence.

Research Methodology

The data for this research paper was obtained using Scopus by performing a keyword search on the phrase *'Information Literacy.'* Scopus and Web of Science are the most widely used academic databases for searching and tracking research articles, conference papers, and other scholarly publications. Both databases have unique features and advantages, and the selection between them depends on the certain needs and requirements of the user. Scopus covers more journals and conference proceedings than Web of Science, providing access to a broader range of research in various disciplines. Scopus provides more in-depth metrics and analysis tools, including the *h*-index and other measures of a researcher's impact, which can be helpful for evaluation and assessment purposes.

The search was restricted to the last two decades, from 2002 to 2021. 8769 records were published throughout the research period. The time frame is limited based on the research objective's scope, available resources, or the length of the study. It's important to note that the decision to restrict the search from a specific time frame should be justified to help readers understand the rationale for the chosen time frame. Out of the 8769 records, 2726 are open access, with a large number of records falling into the green, gold, and bronze access categories. We analysed all published source types (e.g., journal articles, conference papers, review papers, etc.).
This search was carried out in May 2022. The obtained records were processed using '*bibliometrix*' for the R package (Aria & Cuccurullo, 2017), and the graphs of networks were drawn through the VOSviewer program (van Eck & Waltman, 2010). To acquire the bibliographic information, the below search string was used:
TITLE-ABS-KEY ("Information Literacy") AND (LIMIT-TO (PUBYEAR, 2002-2021)).

Results

Annual Research Growth

During the last two decades, 8769 records on IL have been published and cited 73181 times. There are 6035 articles, 1285 conference papers, 626 reviews, 503 book chapters, 95 notes, 88 books, 80 editorials, and 57 miscellaneous items

among these works. However, 762 documents produced in 2021 with 414 citations show that an item receives more citations as it ages. In 2011, the highest citation counts of 6792 and 40 h-index accounted for 450 records. An average citation rate of 10.81 per paper is estimated during the study period. As seen in Table 1, The literature has grown progressively and differed over the research period.

Table 1. Annual growth of literature

Year	Documents	Citations	AC_{100}	AC_{50}	Cites per item
2002	116	2026	3	11	17.47
2003	127	2519	4	15	19.83
2004	152	2733	6	14	17.98
2005	212	3400	5	9	16.04
2006	226	3685	6	19	16.31
2007	262	4390	5	18	16.76
2008	289	3442	1	11	11.91
2009	346	4168	4	16	12.05
2010	397	5029	4	20	12.67
2011	450	6792	7	28	15.09
2012	445	5094	3	21	11.45
2013	577	4409	4	13	7.64
2014	584	5552	7	17	9.51
2015	607	4747	1	9	7.82
2016	660	4293	-	10	6.50
2017	601	3678	1	9	6.12
2018	644	3135	2	6	4.87
2019	663	2091	2	4	3.15
2020	649	1584	2	4	2.44
2021	762	414	-	1	0.54
Total	**8769**	**73181**			**10.81**

Authorship Preview and Most Productive Authors

13684 authors produced the total share of research throughout the study period. Out of them, 3279 publications were single-authored. Despite the fact that many of them have featured more than one, the co-authored records were published by 11315 researchers. The author-per-article rate is 1.56, whereas the record per author rate is 0.641. The collaboration index is 2.06, with an average of 2.27 co-authors per manuscript.

Table 2 shows the fifteen most prolific authors who have contributed documents to Information Literacy literature. Maria Pinto led with 59 papers, 736 citations, and 17 *h*-index, followed by Annemaree Lloyd (42 papers; 20 *h*-index), Heidi Julien (35 papers; 17 *h*-index), Michael Fosmire (28 papers; 7 *h*-index), Christine Bruce (27 papers; 12 *h*-index). Shaheen Majid, Dora Sales, and Sirje

Virkus have published 25 articles each. Annemaree Lloyd obtained the most citations (1658) despite publishing fewer papers than the top author, scoring first in terms of h and g indices.

Table 2. Most productive authors

Name	Papers	Citations	*h*-index	*g*-index	AC_{50}	PY Start
Maria Pinto	59	736	17	24	2	2007
Annemaree Lloyd	42	1658	20	40	11	2003
Heidi Julien	35	862	17	29	5	2002
Michael Fosmire	28	231	7	14	1	2005
Christine Bruce	27	447	12	20	1	2002
Alison Hicks	26	155	7	11	-	2010
Shaheen Majid	25	498	11	22	1	2006
Dora Sales	25	256	10	15	-	2007
Sirje Virkus	25	210	6	14	1	2003
Schubert Foo	22	469	10	21	-	2007
Clarence Maybee	22	298	10	17	-	2006
Tibor Koltay	21	442	9	19	-	2009
Sonja Špiranec	21	167	7	12	-	2005
William Badke	21	195	8	13	-	2007
Anna M. Johnson	20	146	8	10	-	2002

Most Preferred Sources

Table 3 lists the top fifteen sources preferred by the researchers. With 386 documents, "*Communications in Computer and Information Science*" was the most popular source among authors. It has received 808 citations and 11 *h*-index. *Reference Services Review* (*N*=321, *C*=3634, *h*=28) comes in second, followed by *Library Philosophy and Practice* (*N*=252, *C*=579, *h*=12), *Journal of Academic Librarianship* (*N*=248, *C*=4545, *h*=36), *Communications in Information Literacy* (*N*=171, *C*=1424, *h*=17) and *College and Undergraduate Libraries* (*N*=151, *C*=1078, *h*=16). The *Journal of Academic Librarianship* published twenty-two papers with more than fifty citations.

Table 3. Most preferred sources by authors

Source Title	NP	TC	*h*-index	*g*-index	Cite Score$_{2021}$	AC$_{50}$
Communications in Computer and Information Science	386	808	11	14	0.9	---
Reference Services Review	321	3634	28	38	1.9	8
Library Philosophy and Practice	252	579	12	16	---	
Journal of Academic Librarianship	248	4545	36	55	2.9	22
Communications in Information Literacy	171	1424	17	30	1.5	3
College and Undergraduate Libraries	151	1078	16	21	1.6	---
Journal of Information Literacy	149	596	13	17	1.7	---
Portal	126	2035	24	39	1.9	10
ASEE Annual Conference and Exposition Conference Proceedings	118	318	9	12	---	---
Evidence Based Library and Information Practice	112	361	9	16	0.7	1
College and Research Libraries	103	2378	28	45	3.9	16
Journal of Lib. & Infor. Services in Distance Learning	100	614	14	17	1.7	-
Journal of Library Administration	97	1010	17	25	1.6	1
Journal of Librarianship & Information Science	96	1416	21	34	4.1	6
Journal of Documentation	95	2276	29	47	3.1	17

Bradford's law categorizes influential sources into three main groups based on the frequency with which they are published. Figure 1 depicts the core zone, which contains the sources with the highest publication frequency; zone 2 includes the sources with the second-highest publication rate; and zone 3 contains the journals with the fewest records published.

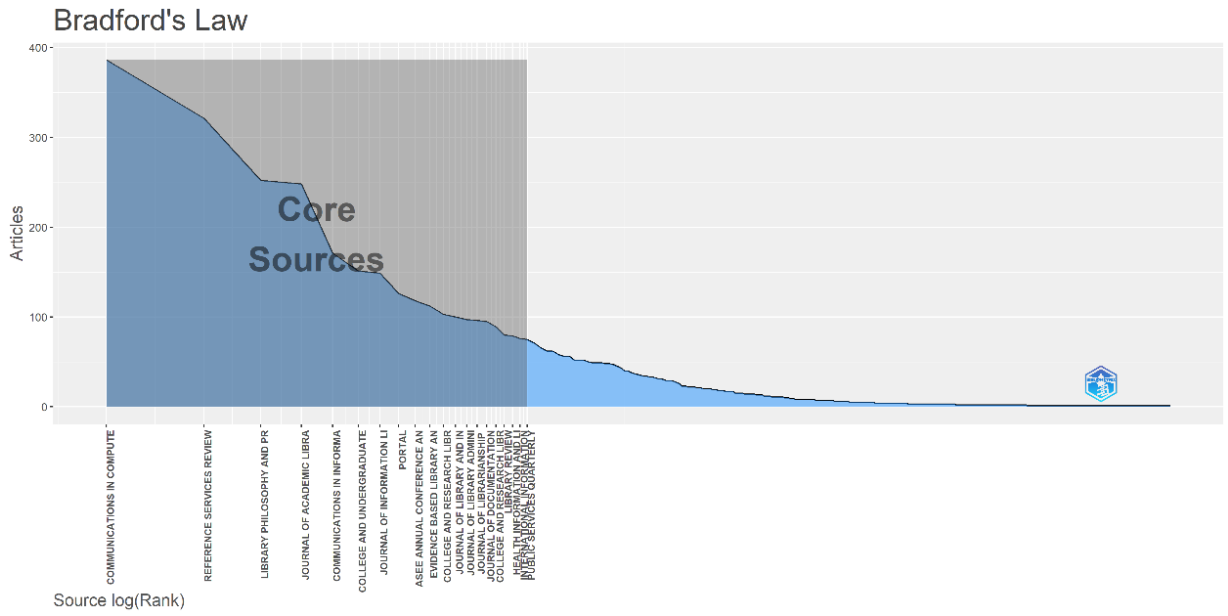

Figure 1. Impactful sources according to Bradford's law

Country-wise Distribution

Table 4 specifies the top ten nations regarding research efficiency, total citations received, citations per document, and *h*-index. The survey found that the majority of publications (42.70%) came from the United States, with 38406 citations obtained, and the citation share was close to half of the overall share. Australia had the highest citation rate per item (13.24%), followed by the United Kingdom (11.15%), the United States, Canada, and Germany. The highest *h*-index (69) was noted for documents produced by authors in the United States, followed by the United Kingdom and Australia (*h*=39).

Table 4. Most productive nations

Country Name	Papers	Citations	CPP	*h*-index	AC_{100}
United States	3745	38406	10.26	69	33
United Kingdom	599	6679	11.15	39	9
Australia	394	5216	13.24	39	5
Canada	390	3865	9.91	31	4
China	374	657	1.76	13	-
Spain	282	1944	6.89	22	2
Germany	169	1254	7.42	18	1
India	163	883	5.42	12	2
Nigeria	156	602	3.86	13	-
Taiwan	141	973	6.90	18	-

Highly Cited Publications

Table 5 shows the top ten most cited publications in Information Literacy. Only two out of the 8769 research publications have acquired more than 500 citations. Nine of the most cited works are journal articles, while one is a conference paper. The most citations (630) were given to a journal article authored by Metzger in the "*Journal of the American Society for Information Science and Technology*." At the same time, Holman et al. obtained 558 citations for their review of work published in *JAMA Pediatrics*.

Table 5. Highly cited publications

Author	DOIs	TC	TCpY
Metzger MJ, 2007	10.1002/asi.20672	630	39.38
Holman DM, 2014	10.1001/jamapediatrics.2013.2752	558	62
Berg JS, 2011	10.1097/gim.0b013e318220aaba	390	32.5
Sheikh K, 2011	10.1371/journal.pmed.1001073	342	28.5
Elmborg J, 2006	10.1016/j.acalib.2005.12.004	258	15.18
Scheufele DA, 2019	10.1073/pnas.1805871115	248	62
Kong SC, 2014	10.1016/j.compedu.2014.05.009	228	25.33
Koltay T, 2011	10.1177/0163443710393382	226	18.83
Brand-Gruwel S, 2005	10.1016/j.chb.2004.10.005	225	12.5
Mackey TP, 2011	10.5860/crl-76r1	216	18

Network Visualisation

Co-authorship between Authors

Co-citation is a degree of citation relations that indicates the alliance between the cited and citing research articles for investigating the document, institutions, authorship patterns, and regional networks. It is pretty normal for authors to collaborate when producing any research project. Collaboration with at least two authors is referred to as co-authorship. Figure 2 portrays a collaborative map using bibliographical data presented by the visualisation application. The authors with at least five records were selected. 392 authors out of 13662 matched the criteria, and strong connection strengths were chosen. Pinto, Lloyd, Julien, and Fosmire are prolific researchers with the most collaborative papers.

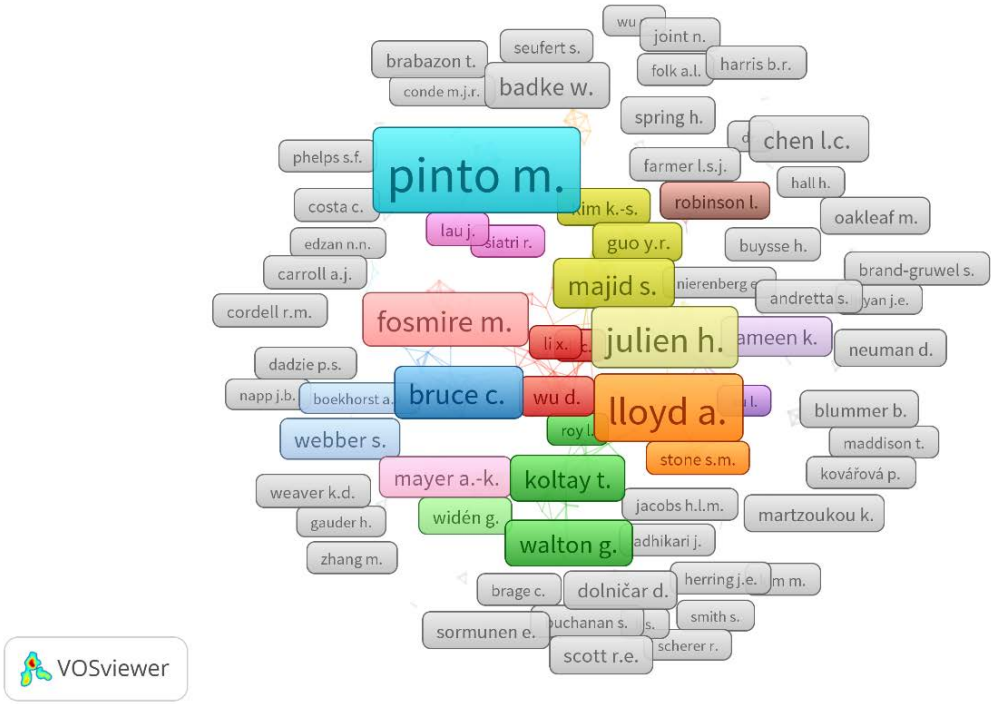

Figure 2. Co-authorship network

Co-authorship Map of Countries

Figure 3 illustrates the co-authorship map of nations with at least five papers, identifying fifty countries dotted throughout 13 coloured clusters, with eight minimum and maximum total link strengths of 292. The most significant contributors to information literacy literature were the United States, the United Kingdom, and Australia, with a substantial association between Spain, Canada, Germany, China, and others.

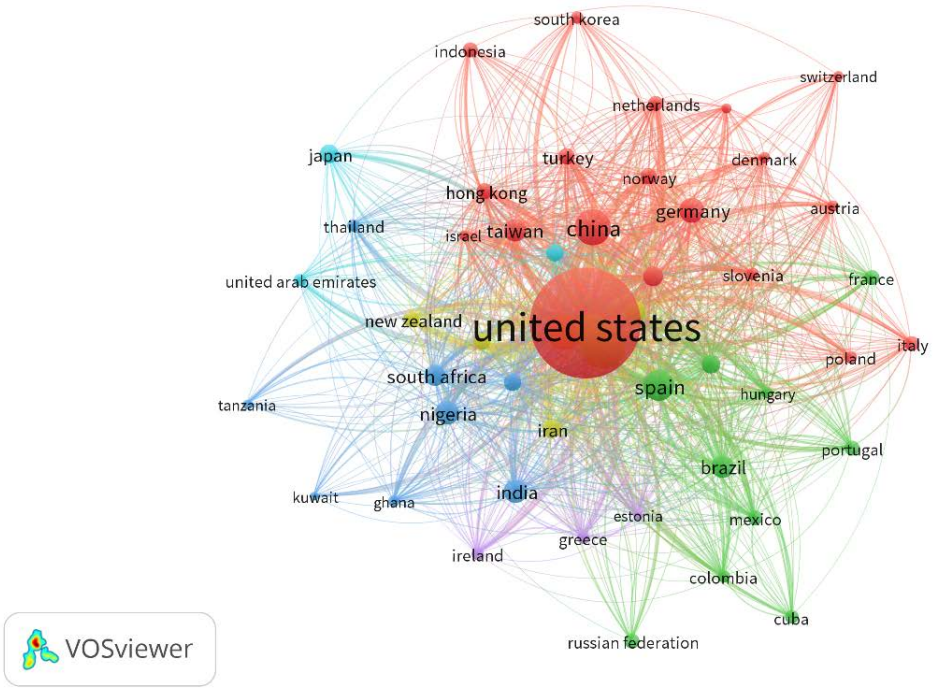

Figure 3. Co-authorship between countries

Analysis of Keywords

Figure 4 depicts the evolution of keyword co-occurrence in information literacy literature. When a minimum of ten occurrences are chosen from 11550 keywords, 432 meet the standards. The most often occurring term is *'information literacy'*, which appears 3770 times and has a total link strength of 8095, followed by *'academic libraries'* (*N*=490; *TLS*=1598), *'library instructions'* (*N*=376; *TLS*=1134), and *'higher education'* (*N*=311; *TLS*=935). The graphical map is divided into 13 clusters which contain Cluster 1 (red solid), Cluster 2 (lime green node), Cluster 3 (strong blue), Cluster 4 (intense yellow), and so on.

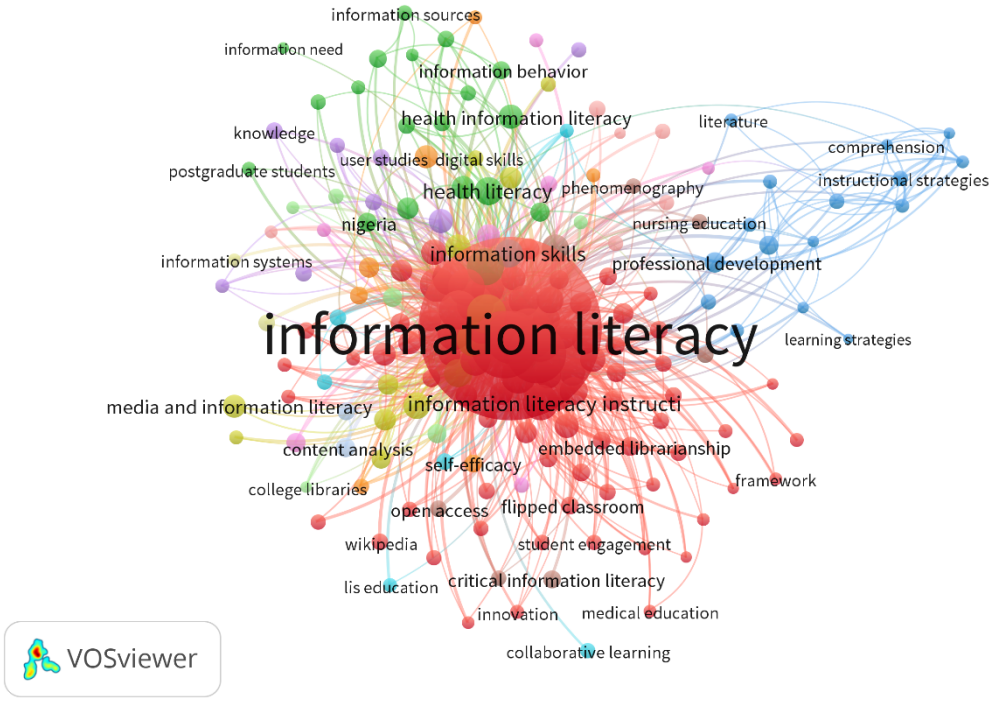

Figure 4. Keyword occurrence and linkage

Conclusion

This research highlights the most influential information literacy-related publications, authors, nations, institutions, and journals. The analysis was prepared using RStudio and VOSviewer. As of 2021, 13684 authors had published 8769 records in this field. Maria Pinto had 59 articles published. With 101 publications, Purdue University is rated as the most influential institution. Comparably, with 3745 papers, the United States publications dominate all countries. '*Communications in Computer and Information Science*' has the most articles published in this domain, with 386 papers. The core focus of this study is the bibliometric evaluation of worldwide research output on '*information literacy*.' The research was based on 8769 records obtained from Scopus. The average number of citations per document is 10.81. The collaboration index was calculated to be 2.55. India is in the eighth position regarding country-wise publication output with a multi-country production value of 7. Primary keywords include '*information literacy*', '*academic libraries*', '*library instruction*', '*higher education*', and '*digital literacy*'.

The study is constrained since only Scopus documents were used for the bibliometric analysis. This database may not have included many journals

containing documents related to information literacy. There is potential for the researcher to undertake a more in-depth analysis using data from Scopus or any other database, *viz.* Web of Science, Dimensions, Lens, Google Scholar, etc. This type of research is valuable for reviewing and determining global trends in information literacy.

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