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Oluwaseyi H. Wusu
University of Malaya, Malaysia, drwusu1@gmail.com

Nneka G. Lazarus
Adeniran Ogunsanya College of Education, Lagos, Nigeria, nnekalazarus@gmail.com

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MAJOR TRENDS IN LIS RESEARCH: A BIBLIOMETRIC ANALYSIS

James Oluwaseyi Hodonu-Wusu[1, 2], Lazarus, Gift Nneka[2, 3]

[1]Department of Library and Information Sciences,
Faculty of Computer Science and Information Technology,
University of Malaya, Kuala Lumpur, Malaysia
[2] University of Ibadan, Ibadan, Nigeria
Department Library, Archival and Information Studies,
Faculty of Education, U.I Ibadan.
[3]Adeniran Ogunsanya College of Education, Otto/Ijanikin, Lagos, Nigeria
E-mail: wususong@siswa.um.edu.my[1, 2], nnekalazarus@gmail.com[2, 3]

Abstract

This study provides an overview of the Library and Information Science (LIS) research from 1980 through 2017. We employ bibliometric and text mining analyses on a sample of 500 most cited articles to examine the impact of factors such as number of authors, enhanced institutions, document types and keywords on the number of citations that they received. We also investigate major trends in LIS research literature including contribution of different countries, variations across publication years and identifying active research areas and major journal outlets. This study serves as a resource for future studies on LIS trends demonstrating the attributes of the most cited articles in this literature. Specifically our result shows that the most cited articles are from USA, England and China. In Africa, South Africa and Nigeria are among the top 25 countries that are productive in LIS research. The most prolific year in terms of the number of published articles is in 2016 and the total number of citation is 51,589. We also found a positive and statistically significant relationship between the number of publications' keyword, and the number of citations that they have received. Keywords analysis reveals that LIS research in combination of (academic libraries, information literacy, bibliometric, citation analysis, Open Access) and few others will be future research trends in LIS-related fields. Results obtained from this study can provide valuable information for researchers to better identify future hotspots in LIS-related disciplines.

Keywords: Bibliometric, Citation Analysis, LIS professionals, LIS Research, Research Productivity

Introduction

Generally, bibliometric analysis refers to mixture of several frameworks, tools and procedures to study and analyze citations of scholarly publication. Bibliometric techniques have been used by researchers to track relationships amongst academic journal citations. Bibliometrics analysis studies quantitative aspects of recorded information. The bibliometric study uses various approaches of citation analysis in order to determine connections between researchers and their work (Koo, 2017). The Bibliometric analyses are performed in Library and Information Science (LIS) study in order to classify the authors, their institutions, the core journal published in, indexing, research formulating search strategies used in case of automated system, comparative assessment of the secondary services, bibliographic control, preparation of retrospective bibliographic and library Management (Drew, Pettibone, Finch, Giles, & Jordan, 2016; Gasparyan et al., 2016; King, Hooper, & Wood, 2011; Müller, Ansari, Ebrahim, & Khoo, 2016; Perrier, Lightfoot, Kealey, Straus, & Tricco, 2016).

In the recent years, there have been a number of studies conducted to assess research productivity in subject areas such as library and information science, knowledge management, physics, medical science, and biological sciences (Baladi & Umedani, 2017; Drew et al., 2016; Gore, Nordberg, Palmer, & Piorun, 2009; Perrier et al., 2016; Sillet, 2013; Thompson & Walker, 2015; Vali, Izadi, Jahani, & Okhovati, 2016). Again, recent studies show that the United States, United Kingdom, Canada, Australia, Germany, South Africa, New Zealand, Spain, Brazil, and China are top ten countries that have made remarkable contributions to global research on LIS, although their

comparative productivity varies across various disciplines of research (Chuang & Ho, 2014; Clifford & Shakeshaft, 2017; Sweileh et al., 2016; Wei, Wang, & Zhuang, 2016). Furthermore, several studies have also been carried out to established the findings from LIS research work where bibliometric methods techniques are used to monitor their research outputs (Drew et al., 2016; Scotti et al., 2016; Zyoud et al., 2015).

A study from (Gore et al., 2009) analyzed articles from the *International Information & Library Review* (IILR) and *Library & Information Science Research* (LISR), indexed in the *Science Direct* database of 2000 to 2010 covering aspects such as author partnership, growth of the literature, the geographical distribution of LIS authors, and citation patterns. Also, Chang and Huang (2012) used bibliometrics analyses to evaluate an interdisciplinary approach in LIS studies from 1978 to 2007. In their study, three bibliometric methods were employed –direct citation, bibliographic coupling, and co- authorship. Their findings showed that LIS researchers prefer to cite their publications in the same field. Furthermore, half of the co- authors were affiliated with library and information sciences related institutions.

There have been various methods in analyzing bibliometric studies, bibliometric visualization, mapping concepts and social network analysis approaches are very common these days, specifically with reverence to patent studies in information technology and management sciences (Chen & Wu, 2017; Drew et al., 2016; Estabrooks, Winther, & Derksen, 2004; Master, Lebwohl, Ludvigsson, & Green, 2013; Merigó & Núñez, 2016; Živković et al., 2015). Also, Social networks are also used in bibliometric analysis to identify the global trends and reveal the collaboration rate

of LIS publications (Ellegaard & Wallin, 2015; Kalita, Shinde, & Patel, 2015; Ma et al., 2016; Zhang et al., 2015; Zyoud, Waring, Al-Jabi, & Sweileh, 2017).

In this study, several keywords ranges from LIS researchers, LIS professionals, Librarians, Library and Information Practitioners are used to examine research trends in LIS by comparing all articles published in Web of Science databases from 1980 to 2017. We further analyzed the articles based on the country of origin, publication year, number of authors, number of references, number of pages, number of keywords, research areas, and publisher outlet to explore the major trends in LIS research and factors impacting the number of citations received by them. In the following sections, we first describe our methodology and then report the findings and discuss their implications for future studies.

Methodology

To derive our model and following prior literature, we first performed a broad search to collect publish LIS research studies (Estabrooks et al., 2004; Perrier et al., 2016). We collected our data from the "Web of Science Core Collection" that includes Science Citation Index Expanded "SCI-EXPANDED", Social Sciences Citation Index "SSCI", Arts & Humanities Citation Index "A&HCI", Conference Proceedings Citation Index- Science "CPCI-S", Conference Proceedings Citation Index- Social Science & Humanities "CPCI-SSH" and recently added Emerging Sources Citation Index "ESCI" to include articles with acceptable level of quality (Chuang & Ho, 2014; Zhu et al., 2015). The results of our search span from 1980 to September 2017. We utilizes Boolean combinations of Library and Information Sciences keywords or related terms to retrieve relevant articles. Our first attempt using keyword, "Library and Information Science" included in the title returned 6,498 articles. The below report reflects citations source items indexed within Web of

Science Core Collection. We perform a Cited Reference Search to include citations to items not indexed within Web of Science Core Collection.

Results

Bibliometric analysis based on trend of publications and times cited per year since 1980 through 2017

This report provides an analysis on the records downloaded from Web of Science from 1980 through 2017. The analysis identifies the important authors, journals, and keywords in the dataset based on the number of occurrences and citation counts. A citation network of the provided records is created and used to identify the important papers according to their in-degree, total citation count and PageRank scores (Knutas, Hajikhani, Salminen, Ikonen, & Porras, 2015). The analysis finds also often-cited references that were not included in the original dataset downloaded from the Web of Science. The analyzed dataset consist of top 500 records with 72 variables. Moreover, one of the most popular bibliometric indicators used in assessing research quality is the number of citations the article has received (Cabezas-Clavijo, Robinson-García, Escabias, & Jiménez-Contreras, 2013; Chuang & Ho, 2014; Garner, Hirsch, Albuquerque, & Fargen, 2017; Kim et al., 2017). In this study as shown in Table 1, Figures 1 and 2, we analyzed the time trend of LIS total publications per year followed by the sum of times LIS research publications are cited per year. It is evident that there has been a low increase in the number of citations from 1982 to 1997 and increasing steadily from 1998 to 2016 but a sharp decrease was found in 2017 this may be as a result that the year still remains almost four months before 2018 and so the aforementioned outcomes from the Web of Science database. Also in Fig. 2, a total sum of the cited publication

was 65,444 on the average of 10.2 publications per year while the h-index was at 96 likewise the sum of times cited without self-citation was at 58,079 while the citing articles was 51,589 and the citing articles without self-citations was 49, 414. The lowest number of publications was in 1981 with 13 (0.246%) publication while the highest number was in 2016 with 595 (9.162%) publications (see Table 1).

Fig. 1: Analyses Trends of LIS Research by year of publication

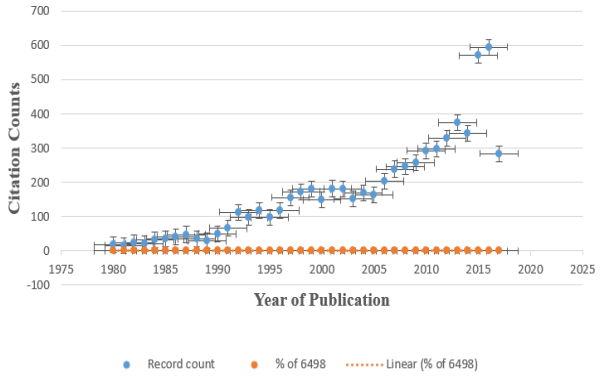


Fig. 2: Sum of Times Cited by Year

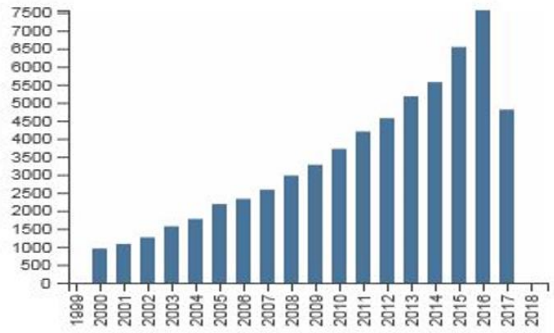


Table 1: Analyses by year of publications

Publication Years	Record count	% of 6498
2016	595	9.157%
2015	570	8.772%
2013	374	5.756%
2014	343	5.279%
2012	329	5.063%
2011	298	4.586%
2010	293	4.509%
2017	284	4.371%
2009	257	3.955%
2008	245	3.770%
2007	239	3.687%
2006	204	3.139%
2001	182	2.801%
1999	181	2.785%
2002	181	2.785%
1998	172	2.647%
2004	170	2.616%
2005	163	2.508%
1997	156	2.401%
2003	151	2.324%
2000	149	2.293%
1996	118	1.816%
1994	117	1.801%
1992	113	1.739%
1993	98	1.509%
1995	98	1.509%
1991	67	1.031%
1990	50	0.769%
1987	48	0.739%
1986	41	0.631%
1985	36	0.554%
1988	36	0.554%
1984	33	0.508%
1989	29	0.446%
1982	23	0.354%
1983	22	0.339%
1980	17	0.262%
1981	16	0.246%

The 25 leading authors who contributed to LIS research and their institutions

From this study, the most 25 prolific authors were shown in Figure 3. These are Hjorland, B. from Royal School of Library and Information Science, University of Copenhagen, Denmark, with a record of 29 citations in LIS research (29; 0.43%) followed by Thelwall, M from University of Wolverhampton, England (25; 0.39%), Anonymous from National Social Science Fund, People Republic of China (22; 0.34%), Budd, John M. from University of Missouri, School of Information Science and Learning Technology, Columbia, MO USA and Martinez-Avila, Daniel are from Sao Paulo State University, UNESP, Department of Information Science, Marilia, Brazil; with (21; 0.32%), Bawden, D and Mandel, L are from University of Rhodes, Graduate schools of Library and Information Studies, Kingston, USA with (20; 0.31%), Cronin, B (20; 0.31%), Fourie, I. from University of Pretoria, South Africa with (19; 0.29%), Hernon, P and Associates are from Zhejiang University Library, Hangzhou, People Republic of China with (18; 0.28%), Sugimoto, C.R (18; 0.28%) from Indiana University, School of Information and Computer, Bloomington, USA, Willet, P. is from University of Sheffield, Information School, Sheffield, Yorkshire, England with (18; 0.26%), Gurusamy, K.S (16; 0.25%), Oppenheim, C (16; 0.25%), Ding, Y (15; 0.23%), from Indiana University, School of Information and Computer, Bloomington, USA; Fox, E. A (15; 0.23%), Zhang, Y from Zhejiang Chinese Medical University, People Republic of China with (15; 0.23%), Davidson, B. R (14; 0.22%), while D'alessandro, D. M; Marshall, J.G; Wolfram, D and Yan, Erjia. J (from Drexel University, Coll. Comp & Information, Philadelphia, USA) were (13; 0.20%), Robinson, L (12; 0.19%), Murphy, J from UCL, Health Information & Multi-professional Education, London, England with (12; 0.19%), while Walters, W. H (11; 0.17%) from Menlo College, Bowman Library, USA; Pinto, M (11; 0.17%) from University of Granada Spain, and

Onyancha, O. B from University of South Africa, Department of Information Science, Pretoria, South Africa had (11; 0.17%) citations. This is in agreement with the earlier studies of (Chuang & Ho, 2014; Zhu et al., 2015). Similar kind of trends have been observed by Thompson & Walker, 2015; Vali, Izadi, Jahani, & Okhovati, 2016.

Fig. 3: Top 25 Citation by author of LIS Research

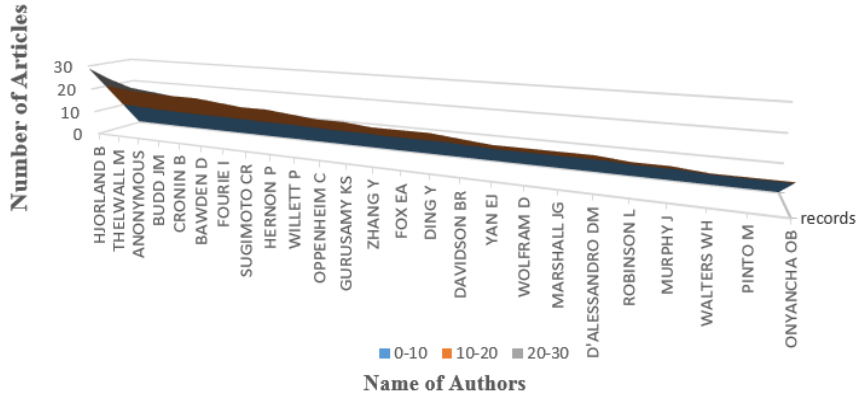


Figure 4 shows the top 25 enhanced institutions citation trendline of the researchers in LIS. It can be observed from the figure that among the G14 institutions and of the record of 6,498, University of California System top all the universities with 169 (2.60%) citations, followed by University of Illinois System with 145 (2.23%), Indiana University System has 131 (2.02%), University of London 117 (1.80%), Indiana University Bloomington 115 (1.77%), University of North Carolina 112 (1.72%), University of Illinois Urbana Champaign has 93 (1.43%), University of North Carolina Chapel Hill 84 (1.29%), University of Toronto 82 (1.26%), Pennsylvania Commonwealth System of Higher Education PCSHE has 81 (1.25%), University of Wisconsin System 79 (1.22%), University of California Los Angeles 77(1.19%) Western University, University of Western Ontario 76 (1.17%), while State University System of Florida has 65 (1.00%). This means that the

enhanced institution analyzed the best institutions that are productive in LIS publications as well as their citation impacts in LIS research. Others are Royal School of Library Information Science with 64 (0.99%), State University of New York Suny System 64 (0.99%), University College London 63 (0.97%), University of Arizona 59 (0.91%) University of Sheffield 59 (0.91%), Rutgers State University 54(0.83%), National Institutes of Health NIH USA has 52 (0.80%), University of Alberta with 52 (0.80%), University System of Maryland with 51 (0.79%), University of Illinois Chicago with 50 (0.77%) University of Missouri System and 50 (0.77%) from the result, it shows that the remaining institutions that made it to top 25 are with less than 1.00% citation. Also, from the result, as shown from Web of Science Database, (WoS), one thousand two hundred and ten (1,210) Institutions/Organizations-Enhanced values are outside display options and that out of the total records of 6,498, two hundred and thirty four (234) records are with (3.60%) which do not contain data in the field being analyzed.

Fig. 4: Enhanced Institutions Citation of researchers in LIS Research

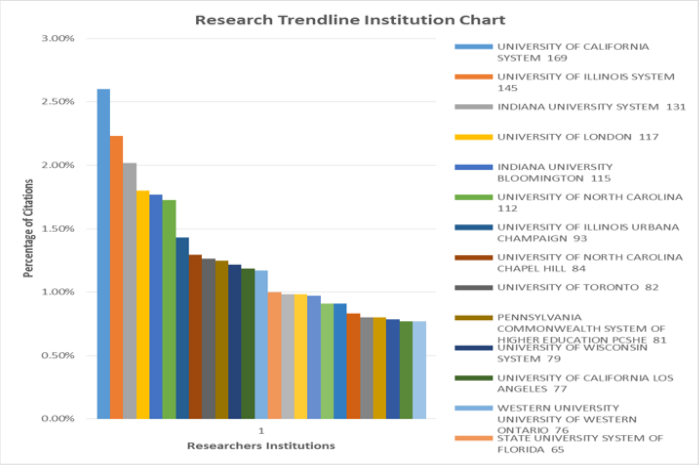


Table 2
Analyses by Document Types

Document Type	Citation Count	% of 6498
Article	4303	66.26
Proceedings Paper	1014	15.61
Review	912	14.04
Book Review	356	5.48
Editorial Material	166	2.56
Meeting Abstract	22	0.34
Note	22	0.34
Biographical Item	9	0.14

There were a total of 6498 records analyzed in LIS research from 1980 through 2017. However, Table. 2 shows document types of the publication with 9 and above citations, out of which the first document type "article" accounted for a 4,303 (66.26%) citations in LIS research. The second and third types are proceedings papers and reviews with 1,014 (15.61%) and 912 (14.04%) respectively. Others are book review 356 (5.48%), editorial material with 166 (2.56%), meeting abstract 22 (0.34%), note 22 (0.34%) and lastly biographical item with 9 22 (0.14%) citations. This indicates that many of LIS research publications are in form of Journal Articles.

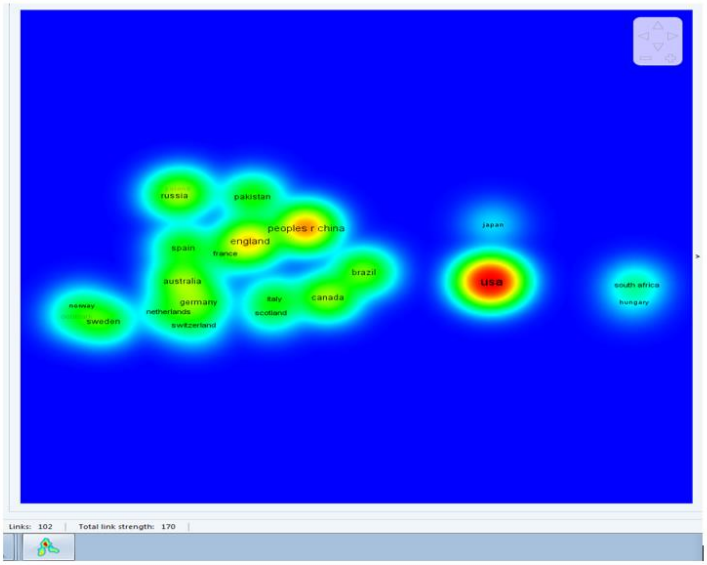


Fig. 5. Density visualization map-item ranking the most 25 productive countries/territories in LIS research.

In presenting the picture of LIS research across different countries/territories, Fig. 5, classifies top 25 countries/territories on the map based on the total number of citations that each country/territory received. Countries like USA has (2568, 39.54%), England (619, 9.53%), Peoples Republic of China (397, 6.13%), Canada (382, 5.88%), Spain (222, 3.42%), Germany (213, 3.28%), Australia (207, 3.19%), Brazil (162, 2.50%), India (145, 2.23%), Netherlands (124, 1.91%), Denmark (116, 1.79%), South Africa (104, 1.60%), Scotland (103, 1.59%) and Japan (101, 1.56%) have more than 100 citations in LIS research and belong to G14 countries. Of the top 14 countries, only 3 (China, India and Japan) belong to Asian region which indicates that they remain the top Asian productive countries in the region. Similarly in Africa, South Africa is the only one that have more than 100 citations and in the top G14 countries that are productive in LIS research. Others that made it top twenty-five are Italy with (100, 1.54%), Iran (97, 1.50%), Sweden (97, 1.50%), Taiwan (79, 1.22%), France (77, 1.19%), Finland (74, 1.14%), Malaysia (71, 1.09%), Mexico (64, 0.99%), South Korea (60, 0.92%), Belgium (57, 0.88%), Israel (57, 0.88%), Nigeria (51, 0.79%), Norway (50, 0.77%), Greece (47, 0.72%), Russia (46, 0.71%), Switzerland (45, 0.69%) and Wales (42, 0.65%). This means that there is a sharp difference in the study of (Chuang & Ho, 2014; Zhu et al., 2015) as country like China, improve in their publication citations compared to the earlier studies.

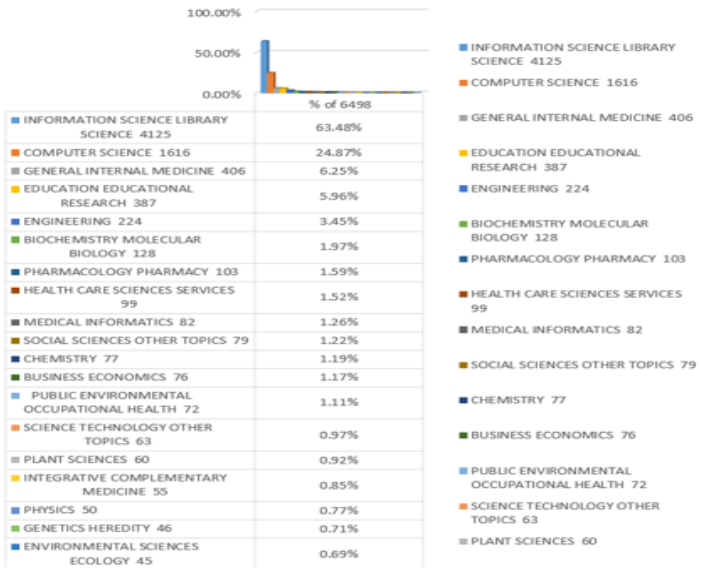
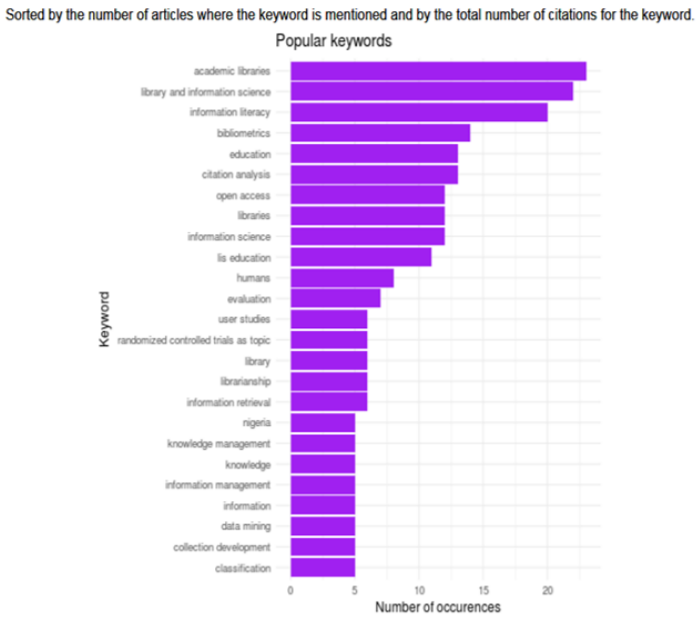


Fig. 6: Analyses by research areas

Analysis by research areas was conducted using WoS Database for LIS research. A total of 6498 records were returned. Information science and library science top the research areas of the authors in LIS with 4125 (63.48%), others in the top five are computer science 1616 (24.87%), General Internal Medicine 406 (6.25%), education and educational research 387 (5.96%) and engineering 224 (3.45%). The last five of the top 25 research areas are neuroscience neurology 40 (0.62%), history philosophy of science 38 (0.59%), nursing 37 (0.57%), psychology 35 (0.54%) and telecommunication 35(0.54%).

Fig. 7: Important Keywords in the study



Important keywords sorted by the number of articles where the keyword is mentioned and by the total number of citations for the keyword published in LIS research. Analysis of co-occurrence of author keywords, minimum number of occurrences of a keyword was set to 20, of the 36,623 keywords: 3,619 word count of keywords meet the threshold. For each of these keywords, the number of co-occurrence links was calculated. The keywords with the largest number of links are selected and displayed in Figure 7.

Table 3

Analysis by the top 25 most popular publishing Journals in LIS research

Publishing Journal	Citation Count	% of 6498
Cochrane Database of Systemic Review	298	4.59
Journal of Documentation	181	2.79
Library Information Science Research	179	2.76
Library Trends	174	2.68
Journal of Medical Library Association	131	2.02
Journal of the American society for Information Science and Technology	129	1.99
Library Quarterly	125	1.93
Information Research an International Electronic Journal	117	1.80
Journal of Education for Library and Information Science	110	1.69
Electronic Library	109	1.68
Scientometrics	109	1.68
College Research Libraries	106	1.63
Bulletin of the Medical Library Association	102	1.57
Journal of Academic Librarianship	101	1.56
Libri	92	1.42
Health Information and Library Journal	82	1.26
Journal of Information Science	81	1.25
Journal of Librarianship and Information Science	81	1.25
Information Processing Management	80	1.23
Education for Information	70	1.08
Journal of the American Society for Information Science	70	1.08
Library Hi Tech	69	1.06
Lecture Notes in Computer Science	67	1.03
Knowledge Organization	58	0.89
ASLIB Proceeding	50	0.77

There were a total of 6498 records analyzed in LIS research from 1980 through 2017. Nevertheless, Table. 3 shows source of publishing journals with 50 and above citations, out of which the first 25 publishing journals accounted for a 2771 (42.7%) that published in LIS research. The first top five journals are Cochrane database of systematic reviews with 298 (4.589%), Journal of documentation 181(2.787%), Library information science research 179 (2.756%), Library Trends 174(2.679%), Journal of Medical Library Association 131(2.017%) and the least five of the twenty five journals are Journal of American society for information science with 70(1.078%), Library Hi Tech 69(1.063%), lecture notes in computer science 67(1.032%), Knowledge Organization has 58(0.893%) while ASLIB proceedings is 50(0.770%). This indicates that many of LIS research journals are from the Cochrane database of systematic reviews, Journal of documentation, Library information science research, Library Trends and Journal of Medical Library Association.

4. Discussion

The goal of this study is to carry out a bibliometric assessment on the major trends in LIS research globally from 1980 to 2017. Using Web of Science (WoS) Database, a total of 6, 498 record count was found. We conducted analyzes based on the top major 500 citation articles of the total records. Results of our analyses show the number of citations LIS research in our study have received, a positive and significant relationship with the number of keywords included in the research areas from which they are created. This reveals the importance of the number of keywords in the returned articles. From the study, it also shows that studies with many keywords are more likely to reveal a comprehensive variety of areas with more curiosity to scholars. Furthermore, we found positive and statistically significant correlation between the number of citations and number of authors with their publications in our study. Based on our study, publication year between 1980 and 1997 have witnessed very low number of LIS research publications while from 1998 till 2016 witnessed a systematic increased in the number of publications in LIS research. The highest publication boom was in 2016. More so, US, England still account for the majority of studies with higher number of citations while People Republic of China came up from being the fifth and sixth in earlier studies to maintain a third position in this study (Cabezas-Clavijo, Robinson-García, Escabias, & Jiménez-Contreras, 2013; Kim et al., 2017; Royle, Kandala, Barnard, & Waugh, 2013; Shen et al., 2014). The novelty of this study is by using different keywords to include more articles and research undertaking in LIS research. This study has several implications for the librarians and other practitioners which was explicitly in the next section of this work.

5. Implications

The outcomes of this bibliometric study have various major implications for evaluation of the scientific outputs of library and information science (LIS) research methods. This bibliometric analysis shown a corpus of key data where scholars and researchers can gain insights into the contributions of countries, journals, source titles/publishers, conference titles, document type and leading authors in LIS fields of research. Besides, it reveals the scientific contributions and establishes the research trends of LIS discipline movement. The generated measurements, whether they were quantitative or qualitative gauges, can provide a base for further review and inquiry into research findings in the scrutinized discipline. For instance, indicator such as authors' productivity and the productivity of their countries, can be utilized to indicate the progress of their research productivity as well as their countries in the future. If future analysis indicates that their productivity indicator is rising in comparison to the generated one in this analysis, this would indicate the progress that the authors and their countries are making huge progress toward increasing research productivity in LIS as we can see in the case of China. Likewise, other statistics such as levels of collaboration, and citations can be ascertained in future studies. Another inference is related to the possibility of identifying the changes in future research trends compared to the present ones. The hope that this study will help researchers and librarians in future works towards expansion of this method.

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