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# Analysis of the 100 most-cited papers in one of the leading Library and Information Science journals “*Scientometrics*”

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## Abstract

*Scientometrics* is one of the leading peer-reviewed journals in the field of Library and Information Science (LIS). The present study is aimed to evaluate the salient characteristics of the 100 most-cited papers of *Scientometrics*. The bibliographic data of most cited papers were extracted from the Scopus database. The attributes of selected papers were analyzed by using Microsoft Excel, VOSviewer, and Biblioshiny software. These papers were published between 1979 and 2017. All papers gained citations with a mean ratio of 332.86 citations per paper and the range of citations varies from 155 to 3,222. These papers were contributed by 221 authors, with an average of 2.21 authors per paper. Thirty-two papers were contributed by a single author pattern and these papers gained a higher proportion of citations as compared to multi-author papers. Likewise, the open accessed papers gained more citations as compared to subscription-based papers. Glänzel W. emerged as the most prolific author while the United States contributed the highest number of papers. This paper also highlighted the frequently used keywords and the analysis of cited references. *Scientometrics* is an important journal that has been providing a platform to LIS researchers, focusing on research evaluation, altmetrics, bibliometrics, and citation analysis, etc. The findings of the current study assist to recognize the publication trends and research markers in the area of scientometrics.

**Keywords:** Bibliometrics, Scientometrics, Research evaluation, Citation analysis

## Introduction

The research script gives credit to the previously published relevant studies by citing its work inside the papers as in-text citation and mentioning the bibliographic detail of the work in the list of references. Citations qualify the reader to read and retrieve the referred source. This is a process of acknowledging the preceding literature, not only for the fulfillment of the ethical obligation of research but also giving recognition to the unique ideas generated by the prior author(s) and conceding as intellectual gratitude (Rousseau 2008; Webster and Watson, 2002). Citation is the vital component in the growth of scholarly communication, evaluation of knowledge and constructing new theories on exiting literature (Sellitto, 2004; Hamrick, Fricker & Brown 2010). The highly cited and influential papers enhance the credibility of the author(s), affiliated institution, and the country as well as the profession. These papers are the significant parameters of research appraisal (Miyairi & Chang 2012; van Raan 2000). The citation analysis is an important indicator of bibliometrics (Garfield 2006).

The process of evaluating the scholarly literature is known as the science of bibliometrics or scientometrics. It is an approach to measure the publications data by applying mathematics and statistics in a specific categories of knowledge, a definite source of communication, country or region. Some analysts opine that the bibliometric method fails to evaluate the quality and worth of publications (Furlan & Fehlings, 2004), Feijoo et al., (2014) argued that the citation-count of the paper does not reflect the quality of research but only provides an indication of prolific authors, most contributing institutions, country, and publication trends. Other critics are confident about the benefits of bibliometric studies, they claimed that citation is one of the

quality parameters of published research and supports recognizing the influence of research on a particular area of knowledge (Elia & Sife, 2018). The bibliometric studies of most cited papers are very frequent in biomedical sciences as compared to other branches of knowledge (Haq, Ahmed & Abbasi, 2021). Levitt and Thelwall (2009) asserted that the most cited articles are connected with quality research.

Journals are the essential medium for exchanging knowledge, sharing innovative ideas, disseminating the findings of the experiments and experiences to the rest of the world. The publishing process also validates the quality of research (Haq & Alfouzan 2019; Aina & Mabawonku 1996). *Scientometrics* is a peer-reviewed, leading academic and interdisciplinary journal indexed in all the renowned databases. It was started in 1978 under the editorship of Tibor Braun. Its subtitle explicitly states that this journal is devoted to "all quantitative characteristics of the science of the science, communication in science and science policy" (<https://www.springer.com/journal/11192/>). This journal is standing on 13<sup>th</sup> and 21<sup>st</sup> ranked in General Social Sciences and Library and Information Science categories, respectively, in Elsevier's Scopus database with 5.2 CiteScore, whereas in the Journal Citation Report 2020 of Clarivate Analytics Web of Science, it has 3.238 impact factor. Garfield (1978) wrote in the editorial statement of the opening issue of *Scientometrics*,

*"... We never dreamed that an availability of large scale citation indexes would spur the development of an entirely new field of Scientometrics. Of course, people have been measuring science in one way or another for a long time; and Derek Price has been one of the pioneers. There is little doubt that the specific organization and availability of Science Citation Index has made possible measurement of scientific activities in a way that was previously difficult or impossible... My hope is that future contributors to our new journal will be interested in and work in the specialty of bibliometrics because this area of research has great promise in helping to expand our knowledge about the scientific enterprise.... We urge the wider utilization, not only of the Science Citation Index data, but of any other bibliographic databases to provide greater insights into the working of science. It is with this sense of purpose that the publication of Scientometrics is welcomed and we will do our utmost to make it a success."*

*Scientometrics* has been regularly publishing quality research over the last four decades. Recently, a study assessed the 100 most-cited papers of *Scientometrics* indexed in Web of Science (WoS) to determine the correlation of its citations with Scopus and Google Scholar. The 100 most cited papers gained 23,015 citations with a range of citations from 112 to 1273. The study compared the association of citations with Scopus and Google Scholar and found a positive correlation among the citations in the three databases. This study didn't assess the bibliometric indicators of the most-cited papers (Renjith & Pradeepkumar 2021). The current study is conducted to fill this gap and present the attributes of the 100 most cited papers published in *Scientometrics* as reflected in the Scopus database.

## Research Objective

1. To review the publication and citation trends of most-cited papers published in *Scientometrics*
2. To examine the authorship patterns, exist in the most-cited papers
3. To assess the co-occurrence network of most-cited authors and countries
4. To analyze the co-occurrence network of keywords
5. To evaluate the cited references and sources

## Literature Review

Elia and Sife (2018) traced the history of the analysis of top-cited papers. They mentioned that Garfield used the phrase "classic papers" for highly cited papers and he compiled the list of 50 most-cited papers published in 1969. Later he produced the list of highly-cited papers published from 1961 to 1972. LIS researchers have been evaluating the most-cited papers based on the dataset retrieved from WoS, Scopus and Google Scholar.

Kharabati-Neshin et al., (2021) assessed the highly cited papers on the Information Science and Library Sciences (IS&LS) category indexed in Web of Science (WoS) published from 1983 to 2018. Out of the total 366,756 papers, 433 papers were selected and these papers were published between 2009 to 2018. Thelwall

M. was found the most productive author with 16 papers, while the University of Maryland was found the most contributing institution, and more than half (55%) of the papers were written by the authors affiliated with the United States, followed by China, England and Canada. The analysis of preferred sources of publications showed that the *Journal of the American Medical Informatics Association* stood on the top with 74 papers, followed by *MIS Quarterly*, *International Journal of Information Management*, and *Scientometrics*.

Sun and Yuan (2020) examined the top-cited 1% papers (n=501) of IS&LS category of WoS, published from 2009 to 2019. All articles gained 21,127 citations with a mean ratio of 42.16 citations per paper. These papers were produced by 1,579 authors affiliated with 680 institutions of 59 countries. Thelwall, M. was found as the most contributing author with six papers. Slightly less than half (45%) of the articles were produced by the authors of the United States. The majority of articles (413; 82%) were published in the top 20 sources/journals and *MIS Quarterly* occupied the top rank with 68 (13.57%) papers. This study seems to be a replication of the previous research conducted by Bauer, Leydesdorff, and Bornmann, (2016). They also analyzed the top-cited 1% papers on IS&LS published from 2002 to 2012, the study identified 305 papers, written by 798 authors belonging with the 275 institutions of the world.

A study conducted in 2009 analyzed the 82 highly-cited papers indexed in the IS&LS category of WoS. These papers were published in 46 years from 1956 to 2001. The bulk of the papers (34%) was published in *MIS Quarterly* and the multi-author research received more citations. The study concluded that the quality of research attracts citations but the interdisciplinary research gains more citations (Levitt & Thelwall 2009).

Ivanović and Ho (2016) analyzed the 501 highly cited articles indexed in the IS&LS category of WoS having at least 100 citations. Harvard University emerged as the most contributing organization with 22 articles and half of its articles (n=11) were produced by Bates, D.W. and he also emerged as the most productive author. The analysis of source publications showed that 26 articles were published in *MIS Quarterly*, and *Scientometrics* stood on 6<sup>th</sup> rank with 29 articles. More than two-thirds (67%) of the highly cited papers were written by the United States, Canada (10%) and United Kingdom (9%).

Haq, Ahmed and Abbasi (2021) assessed the 100 most-cited papers of *Library Philosophy and Practice*. These papers received an average of 16.78 and 81.58 citations per paper in the Scopus and Google Scholar databases, respectively. The Nigerian authors contributed the highest number of papers, followed by the United States and India. Half of the papers were written by a single author pattern and these papers gained a higher ratio of citations as per Scopus database but the situation was reversed in Google Scholar, where multi-author papers received the higher ratio of citations. Khalid Mahmood emerged as the most productive author with four papers. The subject dispersion showed that the "Electronic Resources" was the topmost area of research in most-cited papers.

Renjith and Devi (2020) explored the 113 highly cited papers having more than 20 citations each in Google Scholar and published in DESIDOC Journal of Library and Information Technology. The top-10 most cited papers gained 1,687 citations and were published from 2006 to 2011. A total of 230 authors contributed in 113 papers and Gupta, B. M. contributed the highest number of papers (n=6). The study applied a statistical test to calculate the citation density with publication age and found a non-significance correlation. Goedeken (2015) also dig out the patterns of most cited papers from Google Scholar published in the *Journal of Library History*.

Elia and Sife (2018) scrutinized the top-10 articles on LIS published in 2006 and the dataset was extracted from Google Scholar. These articles gained 9,838 citations with a mean ratio of 984 citations per article and three articles received over 1000 citations. All 10 articles were contributed by 23 authors and four articles were found in a single author pattern. Out of the top five articles, four were written by a single author. The authors of the United States contributed four papers while the other six articles were produced by the authors of five countries. Half of the articles were published in *Scientometrics* followed by the *Journal of the Association for Information Science and Technology* (n=2). The analysis of subject dispersion, out of 10, nine articles dealt with citation analysis by using bibliometrics or scientometrics approaches.

Noruzi (2017) examined the hot papers of IS&LS in WoS. Hot papers received higher citations soon after their publications than other papers showed that the selection of hot papers is based on citation counts of the last two years. Only six papers were found published in 2016 and 2017 and two papers were single-authored. These papers gained 212 citations, varying from 5 to 76 citations. The subject segregation revealed that two papers were written on bibliometrics, two on surveys and one each in content analysis and empirical study focused on bibliometrics. All papers were published in five journals.

Blessinger and Hrycaj (2010) analyzed the 32 highly cited articles on LIS published from 1968 to 2000, 38% of the articles were published in the Journal of the American Society for Information Science. A majority of articles (69%) were written by multi-author pattern, and 70% of the authors were the LIS faculty members, others were researchers but not a single highly cited paper was contributed by a practicing librarian.

Mahapatra and Sahoo (2021) investigated the highly cited articles in social sciences. A total of 98,719 papers were found in the Scopus database published from 1947 to 2020. Less than one percent (0.84%) of the articles (n=839) gained more than 200 citations each (total 201,047 citations, average 239.62). The highest number of articles (n=371) were published from 2001-2010. The study presented the analysis of top-10 journals with a number of articles, citations and citation impact as well as top-10 highly cited papers. Forty-six percent of the articles were contributed by the United States, followed by the United Kingdom (24%), and Canada (6%).

Ivanovića and Ho (2017) analyzed the 2,091 highly-cited articles on the Education and Educational Research category of WoS database. These articles were published between 1926 to 2013 and about three-fourth (73%) of the articles were published in the 1990s and 2000s. Out of the eight highly-cited papers having more than 1199 citations, five were written by a single author. The analysis of journals showed that out of 24 leading journals having more than 29 articles each, and 19 journals were being published from the United States and four from the United Kingdom. Approximately half of the cited articles (47%) were published in 13 leading journals. All top-20 research organizations belonged to the United States and their productivity varies from 19 to 103 articles. Seventy percent of the articles were contributed by the United States, followed by United Kingdom, Canada and Australia.

## **Methodology**

The dataset of 100 most-cited papers published in the *Scientometrics* was downloaded from the Scopus database on December 2, 2021. The name of the journal was typed and selected the option of source publication and further arranged by the most cited option and the bibliographic information of the topmost 100 papers was downloaded in Comma Separated Value (CSV) file. Microsoft Excel, VOSviewer and Biblioshiny software have been applied for data analysis and visualization. Excel spreadsheet has been used to present the number of papers/citations by year. The total authors have been counted and further, the authorship patterns in relation to the citations have also been calculated. The most productive authors, contributing countries, frequently applied keywords and analysis to top-cited sources have been presented in tabular as well as graphic format produced by VOSviewer and Biblioshiny. The scope of the current study is limited to the citation counts in the Scopus database.

## **Results**

The 100 most-cited papers published in *Scientometrics* received 33,286 citations with an average of 332.86 citations per paper. The range of citations varies from the minimum 155 to the maximum of 3,222 and the three topmost papers gained more than 1,000 citations each. The bibliographic details of papers and number of citations are given in the Appendix.

### ***Authorship patterns***

A total of 221 authors including multiple counts contributed to the 100 most-cited papers with an average of 2.21 authors per paper. The authorship patterns with the number of citations have been presented in Table 1. The analysis reveals that about one-third (n=32) of the total papers are contributed by a single-author pattern and these papers gained 11,813 citations with an average of 369.15 citations per paper whereas the 68 multi-author papers receive 21,473 citations with an average of 315.77 citations per paper. Further, the analysis of patterns shows that two-author pattern has been found the highest preference followed by a single author and three author patterns. A single author's papers receive a slightly higher ratio of citations as compared to the two-author pattern, while the six-author pattern gains the lowest citation impact.

**Table 1, Authorship patterns versus citation impact**

Authorship Patterns	Total Papers	Total Citations	Citation Impact
Single-author pattern	32	11,813	369.15
Two-author pattern	38	13,581	357.39
Three-author pattern	18	5,223	290.16
Four-author pattern	5	1,160	232.00
five-author pattern	4	908	227.00
Six-author pattern	2	399	199.50
Seven-author pattern	1	202	202.00

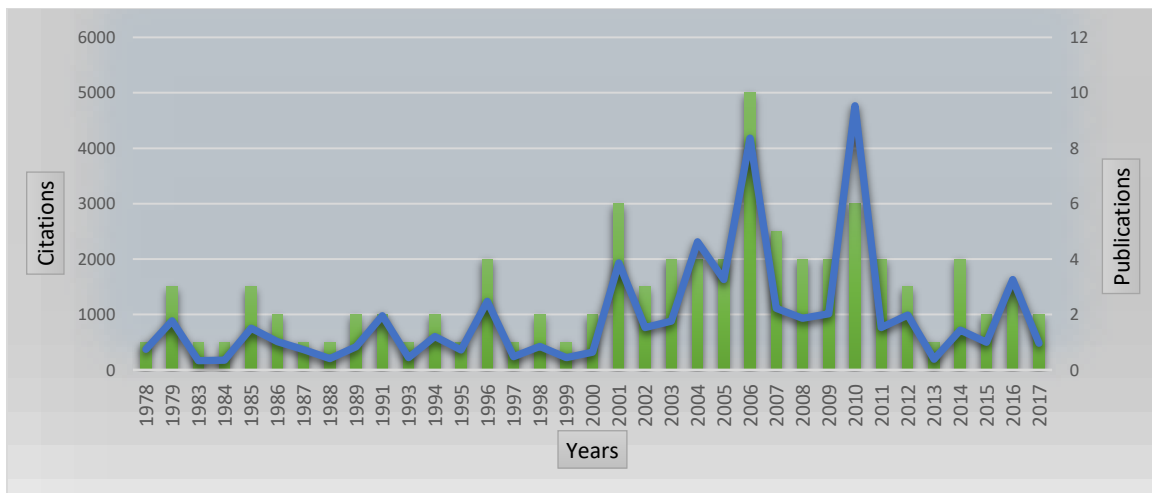
**Analysis of document's type**

The analysis of document type shows that a majority of papers (n=87) are written as articles, followed by reviews (n=8) and conference papers (n=5). The reviews gain the highest citation impact with a mean of 427.50 citations per review followed by articles and conference papers with an average of 325.77 and 304.80 citations per paper, respectively. The open-accessed papers (n=29) consisted of 26 articles, two reviews and one conference paper and these papers gained an average of 439.51 citations per paper while 71 subscription-based papers (61 articles, 6 reviews and 4 conference papers) gained an average of 289.29 citations per paper.

**Periodic growth of 100 most-cited papers**

Figure 1 exposed the periodic distribution of papers and citations by year. The publication period of 100 most-cited papers comprised of forty years from 1978 to 2017. A total of 26 papers cited by 7,525 times with an average of 289.42 citations per paper were published in the first 20 years from 1978 to 1997. The highest number of papers (n=74) were published in the last 20 years from 1998 to 2017. These papers gained a higher citation impact with an average of 384.39 citations per paper. The year 2006 was found the most productive, 10 papers were published in this year, followed by 2001 and 2010 with 6 papers each. The highest peak of the blue line in Figure 1 against the year 2010 indicated that the papers published in this year gained the maximum citation impact with an average of 794.33 citations per paper. The second highest peak of citations shown against the papers published in the year 2006, these papers have cited an average of 418.10 citations per paper.

**Figure 1, Distribution of papers and citations by year**



**Co-authorship analysis of authors**

A total of 166 authors identified in the examination of authors as separate names, that contributed in 100 most-cited papers and 84% (n=139) of the authors contributed in a single paper each, while 11 and 12 authors contributed in two and three papers each, respectively. The top four authors contributed more than three papers each, out of the top-16 authors shown in Table-2. Glänzel W. has been found as the most productive

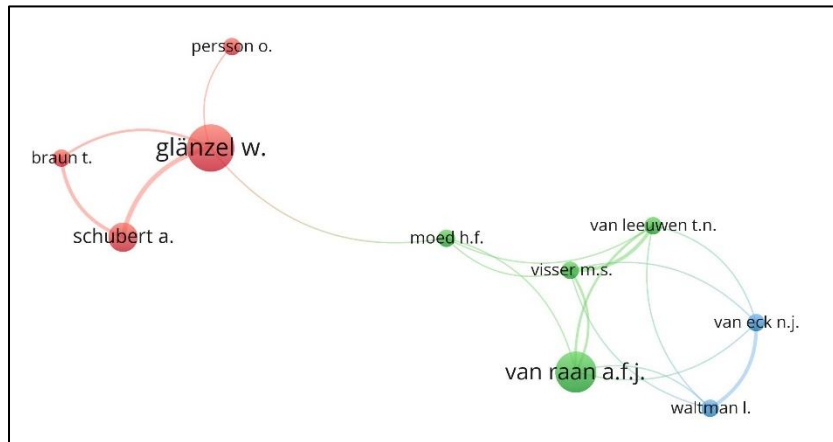
author with eight papers, followed by van Raan A. F. J., Schubert A., and Ho Y.-S. with seven, five and four papers, respectively. Although the collaboration of Van Eck N. J. and Waltman I. contributed three papers these papers have been found as most influential in terms of citation impact. These papers gained 3,706 citations with an average of 1,253.30 citations per paper. The collaboration of Van Leeuwen T.N. and Visser M.S. also produced three papers, which gained the high value of link strength.

**Table 2, List of most productive authors in 100 most-cited papers**

Serial No.	Author's Name	Total papers	Total citations	Link Strength	Citation Impact
1.	Glänzel W.	8	2,538	9	317.3
2.	Van Raan A.F.J.	7	2,154	8	307.7
3.	Schubert A.	5	1,449	7	289.8
4.	Ho Y.-S.	4	1,981	7	495.3
5.	Van Eck N.J.	3	3,706	6	1,235.3
6.	Waltman I.	3	3,706	6	1,235.3
7.	Moed H.F.	3	1,014	7	338.0
8.	Braun T.	3	1,009	5	336.3
9.	Persson O.	3	959	6	319.7
10.	Bar-Ilan J.	3	791	8	263.7
11.	Narin F.	3	772	3	257.3
12.	Rosen r.	3	737	3	245.7
13.	Meyer M.	3	667	2	222.3
14.	Van Leeuwen T.N.	3	597	10	199.0
15.	Visser M.S.	3	597	10	199.0
16.	Thelwall M.	3	525	4	175.0

The analysis of co-occurrence of top authors generated by VOSviewer software identify nine different nine clusters as shown in Figure-2. Cluster-1 consisted of the four authors, Braun T., Glänzel W., Persson O., and Schubert A. represents in orange color circles, while cluster-2 comprised of green circles also consisted of four authors, Moed H. F., Van Leeuwen T. N., Van Raan A.F.J., and Visser M. S. Blue circles represent the third cluster of two authors, Van Eck N. J., Waltman I. The other six clusters, from 4 to 9, consisted of a single author each.

**Figure 2, Co-occurrence network of authors generated by VOSviewer**



**Co-authorship analysis of countries**

The co-authorship analysis of countries shows that all authors of the 100 most cited papers are affiliated with 26 countries. Authors of eight countries have shared a single paper each, while authors belonging to three and five countries contributed two and five papers each, respectively. The top-10 countries contributed more than three papers each as shown in Table 3. The highest number of papers were written by the United States,

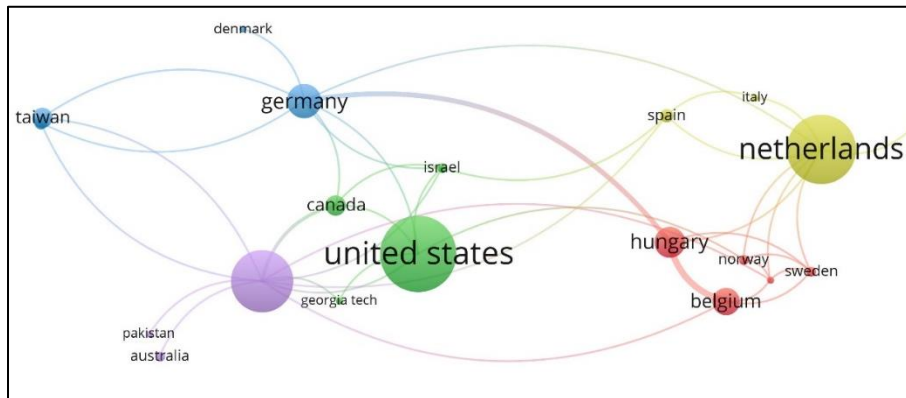
followed by Netherlands, United Kingdom and Germany. The maximum link strength has been gained by the papers of the United Kingdom followed by Germany and Hungary while the highest citation impact was received by Netherlands, followed by Taiwan and Belgium.

The mapping of the co-authorship network of countries generated by VOSviewer software exposed that authors of 20 countries comprised in the five clusters (Figure 3). The red color circles in the first cluster consisted of the five countries, Belgium, Finland, Hungary, Norway and Sweden. The second cluster of green circles, involved the authors of the four countries, Canada, Georgia, Israel, and Canada. The blue and orange circles represent the third and fourth clusters, both clusters contain the authors of four countries each, China, Denmark, Germany, & Taiwan; and France Italy, Netherland & Spain, respectively. Only three countries, Australia, Pakistan and United Kingdom comprised the fifth cluster.

**Table 3, List of most contributing countries in 100 most-cited papers**

Serial No.	Country's Name	Total papers	Total citations	Link Strength	Citation Impact
1.	United States	22	6,184	6	281.09
2.	Netherlands	20	8,517	8	425.85
3.	United Kingdom	18	4,879	12	271.06
4.	Germany	10	2,856	10	285.60
5.	Hungary	9	2,881	9	320.11
6.	Belgium	8	3,222	7	402.75
7.	Canada	6	1,916	5	319.33
8.	Taiwan	6	2,478	4	413.00
9.	China	4	685	4	171.25
10.	Spain	4	785	4	196.25

**Figure 3, Co-occurrence network of countries generated by VOSviewer**



**Co-occurrence of author's keywords**

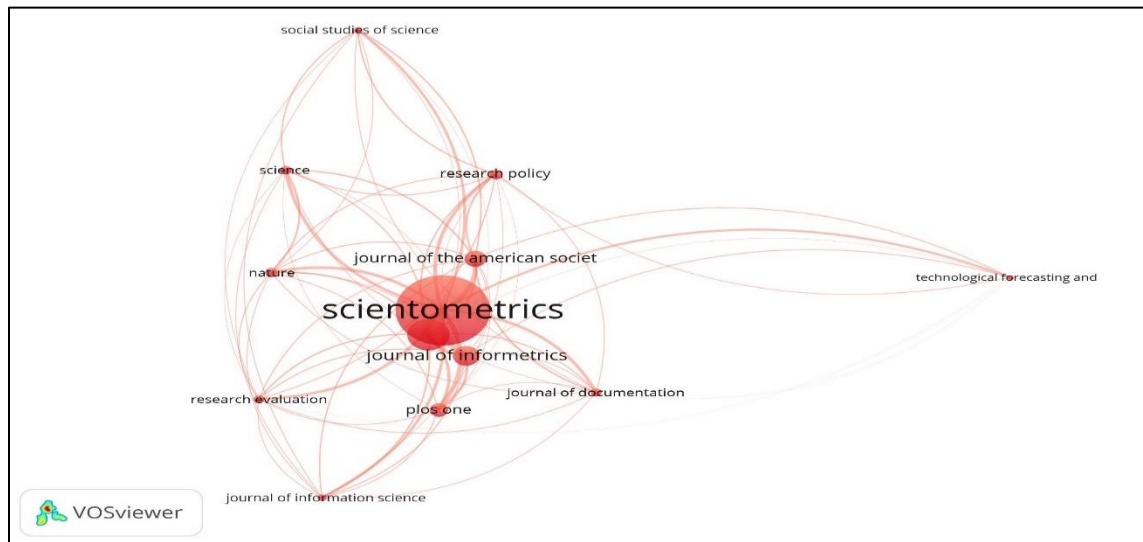
A total of 117 keywords were used in 100 most-cited papers, 60% (n=70) of the keywords comprised in the 10 clusters (Figure -4). Cluster 1 in red color consisted of 10 keywords included bibliometric, big data, circular economy, citycape, consumer behavior, innovation systems, intellectual development, internet of things, scientific visualization, and sustainability. Cluster 2 in green color comprised of nine keywords consisted of bias, citation aging, citation time window, competition, field normalization, misconduct, publications, publish or perish, and research evaluation. Cluster 3 in blue color involved in the eight keywords, disciplinary differences, online reference managers, research impact, research influence, scholarly communication, Twitter, validation and webometrics. The lowest number of keywords (n=5) were found in cluster number 10 as shown in orange color, comprised of the keywords of h-index, manipulation, q-index, self-citation, simulation.





A total of 3,252 references were cited in the 100 most-cited papers with an average of 325.20 references per paper. These references were taken from 1,284 sources/journals, 13 sources met the threshold in terms of the total strength of the co-citations links generated by the VOSviewer shown in Table -4 and Figure-6. The highest number of references (n=541) were taken from the *Scientometrics*, followed by the *Journal of the American Society for Information Science and Technology* (n=120) and the *Journal of the American Society for Information Science* (n=88).

**Figure 6, Co-occurrence network of cited-sources by VOSviewer**



## Discussion

Citation analysis is one of the significant indicators of the bibliometric method, that analyzes the patterns and frequency of citations in publications (Garfield, 1972). The amount of citations is extensively applied to examine the influence of an individual paper as well as quantify the standard of the journal (Moed, 2009). The highly cited papers have a vital impact upon the growth of a given area of knowledge or discipline because they provide the origin of novel ideas, and techniques (Garfield, 1987). The bibliographic detail of most cited papers is valuable for multiple motives. The utmost motive is that usually, the bibliometric indicators of most cited papers expose the productive authors, contributing institutions, countries, preferred areas of subject and sources of publications. Further, it provides the reader a historical and thematic development in the research pattern of the particular subject over time. Lastly, these papers may support the scholars to develop or modify their research curiosity (Garfield 1972).

*Scientometrics* is an important journal that published multidisciplinary nature of articles, focusing on the evaluation of the research and citation analysis. The 100 most cited papers published in *Scientometrics* are analyzed in the present study. These papers have been published between 1978 to 2017 and the number of their citations varies from the minimum 155 to the highest 3,222 with an average of 332.86 citations per paper. The papers published during 2018 to 2021 have not been grasped the place among the 100 most cited papers as Picknett and Davis (1999) also asserted that the latest articles required some years to accumulate citations.

Forty-one most cited papers were published from 1998 to 2007, and these papers gained an average of 336.21 citations per paper. While 33 papers were published from 2008 to 2017 and these papers secured an average of 363.51 citations per paper. The highly-cited paper "Software survey: VOSviewer, a computer program for bibliometric mapping" was published in 2010 and gained 3,222 citations, the citation density by year shows that this paper has been cited 268.5 times per year (Van Eck & Waltman, 2010). The top-three most cited papers received 5,831 citations (17.51% of the total citations), and this number is even higher than the citations (n=5,689) gained by 20 most cited papers published in 17 years from 1979 to 1994.

Interestingly, a single author and open accessed papers received a higher ratio of citations. The analysis of document's type reveals that the majority of papers (n=87) have been published as articles while only 8 review papers clutches in the galaxy of highly cited papers but review papers gain more citations as compared to articles and conference papers. A total of 221 authors contributed with an average of 2.21 authors per paper but as a separate name a total of 166 authors were traced and 84% of them contributed in a single paper each. Wolfgang Glänzel has been found as the most productive with eight papers. He is a German statistician, obtained his Ph.D. in 1987 from University Leiden, Netherlands and his research topic is entitled 'quantitative science studies'. Currently, he is serving as Professor and Director, Centre for R&D Monitoring, KU Leuven, Belgium and he is also editor-in-chief of *Scientometrics*. The findings of most-cited articles based on IS&LS of WoS, Thelwall M. was found most productive in two recent studies (Kharabati-Neshin et al., 2021; Sun and Yuan, 2020), but in our study, he stands on the fifth rank with three papers.

In the analysis of the most contributing countries, the United States occupies to the top position with 22 papers. The other studies also endorsed the same findings. Ivanović and Ho (2016), in the highly cited 501 papers on IS&LS, 67% of the articles were contributed by the United States. Other studies reported that 55% and 45% of the highly cited articles published between 1983 to 2018, and 2009 to 2019, respectively, were produced by authors affiliated with the United States (Kharabati-Neshin et al., 2021; Sun and Yuan, 2020). Ivanović and Ho (2017) assessed highly cited papers on education and in the analysis of 20 most contributing institutions, all institutions belonged to the United States.

The evaluation of cited references of 100 most-cited papers reveals that out of the total 3,252 references, 541 (16.63%) references are considered as self-citation of the journal. The analysis of the keywords provides understanding to determine the subject dispersion as shown in Figure 5. The wordcloud shows that most of the articles are focusing on bibliometric analysis, h-index, bibliometrics, altmetrics, citation analysis and webometrics.

The study analyzed the 32 highly cited articles in LIS published from 1968 to 2000, revealed the subject dispersion that 68% of the articles were written on research in librarianship/users, followed by technology (22%), library operation (8%) and LIS profession (2%). The study also exposed that not a single practicing librarian was found as author in these highly cited articles (Blessinger & Hrycaj 2010). The LIS scholar may can choose this topic for research to analyze the author's association in the most cited papers.

The study is limited to citation counts provided by the Scopus database. Future studies on *Scientometrics* could perform an in-depth analysis of subject dispersion with citation impact to highlight the preferred area of research and could also analyze the research methodology as well as application of the software. The evaluation of the citation density by year may also be carried out in forthcoming studies.

## **Conclusion**

The present study will support authors to get conversant with the highly cited articles, most influential researchers, productive countries, and frequently used keywords in *Scientometrics* Journal. The most occurred keywords may give understanding into the subject dispersion that is covered in the most-cited papers. Albeit, it was a recognized fact that the multi-author or collaborative research papers, usually gained the higher ratio of citations but in the present study, the papers contributed by a single author pattern had higher citation impact. VOSviewer, and Biblioshiny software were used for showing the co-occurrence network of authors, countries and keywords in the graphic visualization format.

## **Conflicts of interest**

The authors declare that they have no conflict of interest.

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## Appendix

Serial No.	Bibliographic Description of Paper	Citations
1.	Van Eck, N. J., & Waltman, L. (2010). Software survey: VOSviewer, a computer program for bibliometric mapping. <i>Scientometrics</i> , 84(2), 523-538.	3222
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3.	Egghe, L. (2006). Theory and practise of the g-index. <i>Scientometrics</i> , 69(1), 131-152.	1243
4.	Mongeon, P., & Paul-Hus, A. (2016). The journal coverage of Web of Science and Scopus: a comparative analysis. <i>Scientometrics</i> , 106(1), 213-228.	890

5.	Callon, M., Courtial, J. P., & Laville, F. (1991). Co-word analysis as a tool for describing the network of interactions between basic and technological research: The case of polymer chemistry. <i>Scientometrics</i> , 22(1), 155-205.	656
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17.	Porter, A., & Rafols, I. (2009). Is science becoming more interdisciplinary? Measuring and mapping six research fields over time. <i>Scientometrics</i> , 81(3), 719-745.	422
18.	Braun, T., Glänzel, W., & Schubert, A. (2006). A Hirsch-type index for journals. <i>Scientometrics</i> , 69(1), 169-173.	419
19.	Melin, G., & Persson, O. (1996). Studying research collaboration using co-authorships. <i>Scientometrics</i> , 36(3), 363-377.	401
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