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Visualizing Publication Trends in Webology Journal: A Bibliometric Review based on the Scopus Database (2006-2020)

Ayush Kumar Patel

Department of Library & Information Science, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India, ayush.kumarvns2012@gmail.com

Madan Singh

Department of Library & Information Science, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India, madanrawatgeit@gmail.com

Kunwar Singh

Assistant Professor, Department of Library and Information Science, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India, singhdlibhu2015@gmail.com

Avadhesh Kumar Patel

Department of Library & Information Science, Banaras Hindu University, Varanasi-221005, Uttar Pradesh, India, akpbhu20@gmail.com

Akhilesh Kumar Varma

Librarian, Govt. College Jaitwara, Satna, M.P., India, akhileshbhu23@gmail.com

See next page for additional authors

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Authors

Ayush Kumar Patel, Madan Singh, Kunwar Singh, Avadhesh Kumar Patel, Akhilesh Kumar Varma, and Ramesh Kuri

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Ayush Kumar Patel

Department of Library & Information Science, Banaras Hindu University, Varanasi, 221005. Email ID: ayush.kumarvns2012@gmail.com

Madan Singh

Department of Library & Information Science, Banaras Hindu University, Varanasi, 221005. Email ID: madanrawatgeit@gmail.com

Kunwar Singh

Assistant Professor, Department of Library & Information Science, Banaras Hindu University, Varanasi, 221005. Email ID: singhdlibhu2015@gmail.com

Avadhesh Kumar Patel

Department of Library & Information Science, Banaras Hindu University, Varanasi, 221005. Corresponding Author Email ID: akpbhu20@gmail.com

Akhilesh Kumar Varma

Librarian, Govt. College Jaitwara, Satna, M.P. Email ID: akhileshbhu23@gmail.com

Ramesh Kuri

Assistant Professor, Department of Library & Information Science, Rani Channamma University, Belagavi, Karnataka 591156. Email ID: rameshkuri.rcu@gmail.com

ABSTRACT

This study aims to explore the publication trends in Webology Journal. The Scopus database was chosen for the extraction of bibliographic data for the period 2006 to 2020. Then, VOSviewer software was used to analyse the data and generate visualization network maps. A total of 295 publications were found during the study period. The various bibliometrics indicators have been applied to identify the publication trends of Webology Journal. The finding revealed that the highest number of papers (92) and the maximum number of citations (273) appeared in 2020. Among the most contributing nations, Iran has contributed 63 documents, followed by India 50 and the United States 25. Further, the author, A. Noruzi, has found a highly productive and cited author among other authors by contributing 24 documents with 68 citations in Webology journal. The University of Tehran contributed 19 publications and was identified as the top ten highly effective research institutions. The study concludes that Webology journal publishes quality publications, and it is considered one of the leading journals' in the web technology field.

Keywords: Bibliometrics, Publication trends, Authorship Pattern, Scopus Database, Webology, Journal, VOSviewer

Introduction

The bibliometric study is an important area of research in library and information science (Vellaichamy & Jeyshankar, 2015; Singh, 2017). It is one of the most popular tools for evaluating scientific activity (López-Muñoz et al., 2003; Hanumantharaju & Gadagin, 2016; Singh et al., 2017a). It is widely used to summarize the most representative results of a set of bibliographic documents (Martínez-López et al., 2018). The term "Bibliometrics" is a combination of two words: "biblio" and "metrics" (Sengupta, 1992; Osareh, 1996). The term "biblio" is derived from the Greek and Latin word "biblion", which means book. On the other hand, the word "metrics" is retrieved either from the Latin or Greek word "metricus" or "metrikos", respectively each means the measurement. In 1969, Pritchard coined the term bibliometrics as a statistical method for the quantitative analysis of all areas of knowledge (Hood & Wilson, 2001; Mokhtari et al., 2019). According to Pritchard (1969), bibliometrics is concerned with "applying mathematical and statistical methods to books and other means of communication". Schrader (1981), as a teacher of bibliometrics, defines bibliometrics more explicitly as the scientific study of recorded discourse. In other words, bibliometric is defined as the study of analyzing the characteristics and distribution of documents by statistical methods (Roy, 1983). Moreover, it is recognized as an effective technique for summarizing a particular field of research (Janmajaya et al., 2018). It is a discipline that studies quantitatively in journals, research institutes, a research field, a country, and so on (Pritchard, 1969; Broadus, 1987; Mokhtari et al., 2019).

Several bibliometric analytical tools, such as VOSviewer, have been developed to help researchers better analyze and understand the development and evolution trend of the journal. The VOS (Visualization of Similarities) viewer can present the structure of journal publications through co-citation analysis, co-author analysis, and co-occurrence analysis (Wang et al., 2020). It was developed by Nees Jan van Eck and Ludo Waltman, Center for Science and Technology Studies, Leiden University, The Netherlands (Wang et al., 2021). The main advantage of VOSviewer software is the easy visualization of bibliographic data (Fabregat-Aibar et al., 2019). Visualization represents a wide range of structures, some of which are well defined and others marked as new ideas (Chen, 2013). The purpose of this study was to measure the publishing trends of the Webology journal, which has been recognized as one of the most critical sources of journals on the World Wide Web.

About the Journal

Webology is open access, a peer-reviewed international journal published in English, dedicated to the world wide web, and a forum for discussions and experiments (Noruzi, 2016). The journal was started in August 2004, Volume-1 Issue-1 and ISSN: 1735-188X.

Editor-in-Chief: AlirezaNoruzi, Ph.D. The journal was published quarterly from 2004-2008 and has been semi-annual since 2009. It addresses the issue by producing, collecting, recording, processing, storage, presentation, sharing, transmission, retrieval, dissemination of information, and social and cultural impact. It is a strong emphasis on networks and new information technologies. The University of Tehran, Iran, previously published this journal, but now Info Sci Publishers has taken over responsibility for this publication. It follows Open Access (O.A.), SHERPA/RoMEO, and Attribution-Noncommercial-No Derivatives International (CC BY-NC-ND) license (Webology, n.d.). This journal has its website (<http://www.webology.org>). The webology journal comes under the third quartiles (Q3) with 15 h-index (Scimago, n.d.). According to the Scopus database, webology has Citescore: 0.9, SJR: 0.178, and SNIP: 0.757 (Scopus, n.d.). In addition, the webology journal is indexed by various databases such as Scopus, ProQuest, EBSCO, LISA, DOAJ, Open J-Gate, FRANCIS, Web Citation Index, Academic Journal Database, China Education Publications Import & Export Corporation (CEPIEC) (Ahmad et al., 2018).

Review of Literature

The literature review provides a clear framework for understanding research interests, patterns, and the impact of research productivity in knowledge. In recent times, many authors have been doing a lot of bibliometric studies on single journals. Some of them have been studied and presented as follows:

Donthu et al. (2021) performed a bibliometric analysis of forty years of the International Journal of Information Management publications. They found that the single-authored publications dominated the journal's publication during the first two 5-year periods (1980–1984 and 1985–1989). The percentage had decreased from 78.95% between 1980 and 1984 to 7.78% between 2014 and 2019.

Singh et al. (2021) examined the DESIDOC Journal of Library and Information Technology (DJLIT) for a selected period of 2012-2020. This study pointed out that the highest number, 12.99%, of publications were published in 2012, and the lowest number, 9.98% of research publications, appeared in 2020.

Hassan et al. (2021) presented a thorough overview of the Journal of International Women's Studies (JIWS). The findings revealed that the maximum articles had been written by one author (71.55%), followed by two (18.63%), three (5.29%), four (2.76%). The leading country publishing in the journal was United States (27.34%), followed by the United Kingdom (15.66%).

Singh, Varma, and Singh (2021) explored the research productivity and performance of journals of informetrics (JOI) for selected 13 years between 2007-2019 and observed that

the maximum number of citations was 3265(13.44%) found in 2011. In contrast, the minimum number of citations were 279(1.15%) found in 2019.

Nath and Jana (2020) carried out the bibliometric analysis of 377 research articles published in the journal *Annals of Library and Information Studies (ALIS)* from 2008 to 2018. This study revealed that the authors from India published the maximum number of articles (62.86%), and the most productive author was B. K. Sen, who published 26 articles.

Viswanathan et al. (2020) analyzed the research productivity published in the *Indian Journal of Pediatrics*. The study's significant finding shows that the All India Institute of Medical Sciences, New Delhi, was the institution's major contributor. Further, the study revealed that India was the most productive country with a 55.88% share of contributions to the journal.

Vellaichamy and Jeysankar (2020) reviewed the 1353 papers published in the *Journal of Ornithology* during 2000-2015. This study observed that the maximum number of publications were found in the form "Articles" with 1174(86.77%) publications and the highest number of publications contributed by M. Wink with 21(1.55%) publications.

Saberi et al. (2019) conducted a bibliometric study and visualization of *Library Philosophy and Practice (LPP)* during 1998-2018. This study analyzed that Bhatti, R. (19 papers), Nigeria (549 papers), University of Ibadan (78 papers) were the most productive and influential authors, countries, and universities in LPP, respectively.

Martínez-López et al. (2018) studied a bibliometric analysis on fifty years of the *European Journal of Marketing*. The study's findings concluded that British authors and institutions were the most productive in the journal, although Australians were growing significantly the number of papers published.

Singh et al. (2017b) examined the articles published in the *Partnership: The Canadian journal of library and information practice and research* 2010-2016. It was found that single authors' contributions 187(71.92%) were more predominant than the joint authors, and out of the total 264 contributors, Canada contributed the highest number of articles, 251(95.07%).

Kuri and Aadin (2016) discussed the results of a bibliometric analysis of the journal titled "*International Journal of Information Dissemination and Technology (IJIDT)*" for the period of 2011-2015. The study identified that more than 26% of articles appeared in the domain of "Information technology" and "Library Technology."

Merigó et al. (2016) performed a bibliometric review of all of the papers published in the International Journal of Intelligent Systems between 1986 and 2015. This study revealed that slightly more than 1% of the papers had received more than 100 citations, approximately 25% had received at least ten citations, and 77% of the papers had received at least one citation.

Kuri and Palled (2016) observed the articles published in the Journal of Indian Library Association (ILA) for 2012, 2013, and 2014. This study showed that most articles were multi-authored, and Indian contributors had published the majority, 64(96.97%) of articles.

Objectives of the study

The key objectives of the study are as follows:

- To examine the publication trends and citations of the journal during 2006 to 2020;
- To measure the annual growth rate (AGR), relative growth rate (RGR), and doubling time (D.T.) of papers;
- To study the degree of collaboration (D.C.), collaborative coefficient (CC), and collaboration index (CI);
- To find out the authorship productivity and co-authorship network analysis;
- To study the co-occurrence network of keywords.

Methods

Data Source

The present study was conducted to examine the scholarly publications of 'Webology Journal'. The Scopus database (largest multidisciplinary database of abstracts and citations) (<https://scopus.com/>) was used to extract bibliographic data for 2006-2020. The reason for choosing this database is that from 2006 onwards, the Scopus database has started indexing all the publications of Webology journal.

Search Strategy

The document search was performed by choosing the source title in the Scopus database. The term 'Webology' was enclosed within the quotations mark to search for the exact phrase. The search string was as follows: SRCTITLE (webology) AND (EXCLUDE (PUB YEAR, 2021)). A total of 295 papers' bibliographic data were extracted in the .csv file format.

Data analysis and visualization

After extracting the data, it was subsequently tabulated, examined, and analyzed using various bibliographic indicators for making intended observations. The researchers have applied various bibliometrics indicators to study the publication trends of Webology journal. In addition, VOSviewer software version 1.1.16 was used for visualizing the data.

Results and discussion

Year-wise publication trends with citations

A total of 295 documents indexed in Scopus were reviewed in this study. Figure 1 shows the progress trend of published papers in Webology from early 2006 to late 2020. Most papers 92(31.19%) were published in 2020, and the lowest papers, 9(3.05%), were published in 2010. It was clear from the study that publication trends fluctuated from 2006 to 2017, whereas since 2018, an increasing trend has been observed.

A review of citations indicated that papers of Webology journals received 1304 citations from 2006 to 2020. The citation trend of the papers published in Webology is shown in Figure 1. It indicated that the trend of citations received by Webology publications fluctuated from time to time, whereas an upward trend is found in the citation from the past three years. The highest number, i.e., 273(20.94%) of citations received in 2020, whereas the least number, i.e., 21(1.61%) of citations received in 2010.

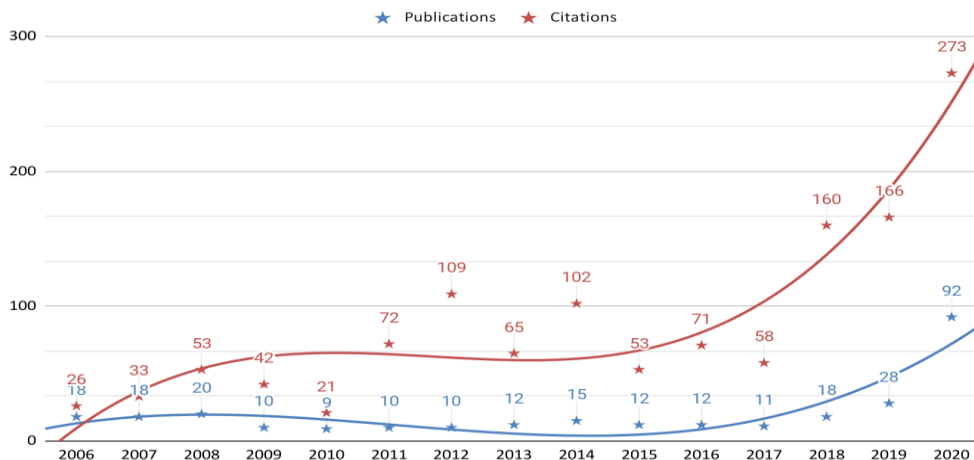


Figure 1: Year-wise growth trends of publications with citations

Annual growth rate (AGR)

The annual growth rate (AGR) is calculated based on the formula cited by Kuri et al. (2020) in their study and mentioned as follows:

$$AGR = \frac{End\ Value - First\ value}{First\ value} \times 100$$

Table 1 illustrates the annual growth rate of publication of Webology journal during the study period. The maximum AGR was recorded with a value of 228.6 in the year 2020, followed by 63.64 in 2018, whereas in 2009 and 2010, the AGR was recorded -50.00 and -10.00, respectively.

Relative growth rate (RGR)

Further, the RGR determines the growth in terms of increasing the size per unit of size. For calculating the mean relative growth rate (RGR) over the specific period of the interval, the following formula has been used.

$$RGR = \frac{W2 - W1}{T2 - T1}$$

Where,

W1 = Natural logarithms of no. of a paper published until the previous year

W2 = Natural logarithms of no. of a paper published until the present year

T2-T1 = Difference between the initial year and the final year.

Table 1 indicates the highest relative growth rate with a value of 0.69 in 2007, whereas the lowest was 0.07 in 2017. The average relative growth rate of publication during the period of 2006-2020 was 0.19.

Doubling time (DT)

The doubling time of the published papers is an excellent measure to estimate the time after which total papers doubled. It is equal to the natural logarithm of 2, divided by RGR.

$$DT = \frac{0.693}{R}$$

Where,

R = Relative growth rate

According to table 1, the highest value of D.T. is 9.54 in the year 2017.

Table 1: AGR, RGR, and DT of papers

Year	TP	CS	W1	W2	AGR	RGR	DT	Year	TP	CS	W1	W2	AGR	RGR	DT
2006	18	18	-	2.89	-	-	-	2014	15	122	4.67	4.8	25	0.13	5.28
2007	18	36	2.89	3.58	0.00	0.69	1	2015	12	134	4.8	4.9	-20	0.09	7.39
2008	20	56	3.58	4.03	11.11	0.44	1.57	2016	12	146	4.9	4.98	0.00	0.09	8.08
2009	10	66	4.03	4.19	-50.00	0.16	4.22	2017	11	157	4.98	5.06	-8.33	0.07	9.54
2010	9	75	4.19	4.32	-10.00	0.13	5.42	2018	18	175	5.06	5.16	63.64	0.11	6.38
2011	10	85	4.32	4.44	11.11	0.13	5.54	2019	28	203	5.16	5.31	55.56	0.15	4.67
2012	10	95	4.44	4.55	0.00	0.11	6.23	2020	92	295	5.31	5.69	228.6	0.37	1.85
2013	12	107	4.55	4.67	20.00	0.12	5.83	Total	295	590	5.69	6.38	220.7	-	-

Note: TP=Total Publication and CS=Cumulative Sum

Authorship productivity

Productivity has been calculated based on the formula cited by Verma and Singh (2017) in their study and mentioned as follows:

$$\text{Author productivity} = \frac{\text{Total Publications}}{\text{Total Authors}}$$

Table 2 shows the analysis associated with author productivity of Webology. The highest number of author productivity, 0.75, was found in 2007, while the lowest, 0.30, was found in 2019. It identified that the total average productivity per author is 0.51.

Table 2: Author productivity of Webology journal

Year	Total Publications	Total Authors	Productivity per Authors	Year	Total Publications	Total Authors	Productivity per Authors
2006	18	26	0.69	2014	15	31	0.48
2007	18	24	0.75	2015	12	31	0.39
2008	20	28	0.71	2016	12	25	0.48
2009	10	14	0.71	2017	11	27	0.41
2010	9	16	0.56	2018	18	44	0.41
2011	10	22	0.45	2019	28	92	0.30
2012	10	17	0.59	2020	92	266	0.35
2013	12	27	0.44	Total	295	690	0.43

Degree of collaboration (DC)

The degree of collaboration is defined as the ratio of the number of collaborative research papers to the total number of research papers in the discipline during a specific period.

The following formula suggested by Subramanyam (1983) has been used in this study to determine the degree of collaboration.

$$DC = \frac{Nm}{Nm + Ns}$$

Where,

DC = Degree of collaboration

Nm = Number of multi-authored research papers in the discipline published during a year

Ns = Number of single-authored papers in the discipline published during the same year.

Collaboration coefficient (CC)

The collaboration coefficient (CC) measures the strength of collaboration among the authors. To determine the collaboration coefficient, the following formula, suggested by Ajiferuke et al. (1988), has been used.

$$CC = 1 - \frac{\sum_{j=1}^k \binom{1}{j} F_j}{N}$$

Where,

CC = Collaboration coefficient

F_j = Number of j authored research papers

N = Total number of research papers published in a year

k = The most significant number of authors per paper.

Table 3 and Figure 2 shows the maximum degree of collaboration with a value of 0.86 appeared, along with the maximum collaboration coefficient was also found with a value of 0.52 in the same year 2019, and the lowest degree of collaboration and collaboration coefficient with a value of 0.17 and 0.10 respectively in the year 2007. The value of the collaboration coefficient lies between 0 and 1, with a near 0 value that means that authors have a weak collaboration rate, and greater than 0.5 value means that authors have a strong collaboration rate. The average degree of collaboration appeared as 0.60, and the average collaboration coefficient was 0.34 during the study period 2006-2020.

Table 3: Degree of collaboration (DC) and collaboration coefficient (CC)

Year	single	Two	≥Three	DC	CC	Year	single	Two	≥Three	DC	CC
2006	12	4	2	0.33	0.19	2014	5	6	4	0.67	0.38
2007	15	1	2	0.17	0.10	2015	2	4	6	0.83	0.50
2008	13	6	1	0.35	0.18	2016	5	3	4	0.58	0.35
2009	6	4	0	0.40	0.20	2017	3	3	5	0.73	0.44
2010	3	5	1	0.67	0.35	2018	4	7	7	0.78	0.45
2011	4	2	4	0.60	0.37	2019	3	7	11	0.86	0.52
2012	5	3	2	0.50	0.28	2020	18	21	33	0.75	0.45
2013	3	6	3	0.75	0.42	Total	101	82	85	0.60*	0.34*

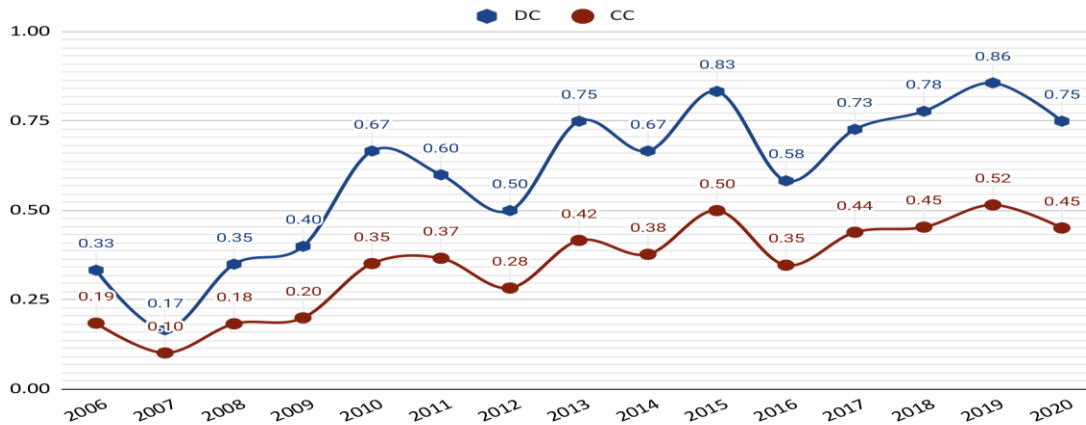


Figure 2: Degree of collaboration and collaboration coefficient

Collaboration index (CI)

It is the mean number of authors per joint paper (Rai et al., 2019). For this analysis, the researchers have omitted the single-authored papers, which are equal to 1 always. To determine the mean number of authors per jointly authored paper, the following formula has been used.

$$\text{Collaboration index}(CI) = \frac{\text{Total authors}}{\text{Total joint papers}}$$

Figure 3 revealed a maximum collaboration index with a value of 3.56 in 2019, and a minimum collaboration index appeared at 2.00 in 2009. The average collaborative index appeared at a value of 2.72 during the stipulated study span.

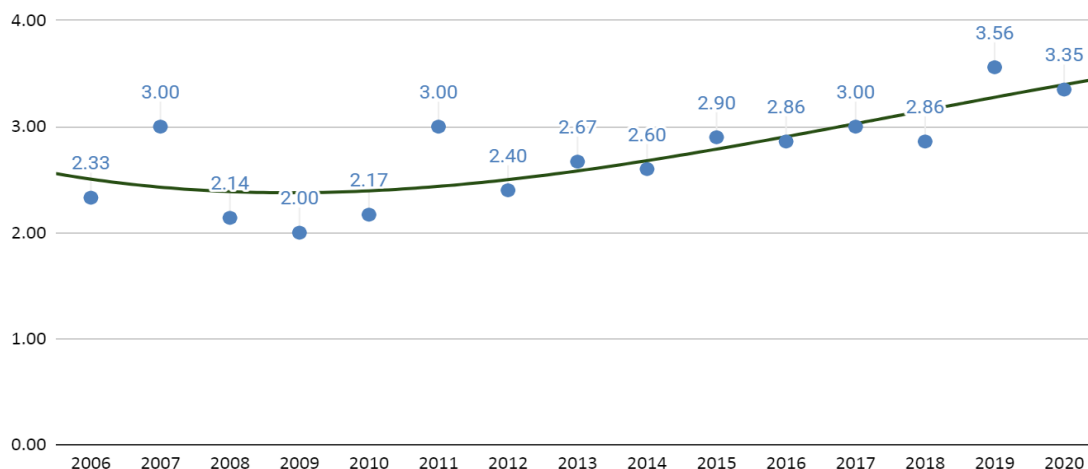


Figure 3: Year-wise collaboration index of publications

Co-authorship analysis of authors

The collaboration network of authors shown in Figure 4. There are different colors, which represent the different clusters. Among these clusters, cluster 1, represented by a red circle, consists of 24 authors, including Mohammadi, M.; Mansouri, M.; Abdekhod, M.; Sahri, M.A. and Banisafar, M. while cluster 2 consists of 12 authors, represented by the green circle, including Regin, R.; Rajesh, S. S.; Prakash, K.; Mostafa, R.; R., Kavitha, P. and Rahim, R. Cluster 3, indicated by a blue circle, consists of 11 authors, including Noruzi, A.; Naseri, Z.; Yousefi, S.; Fallah, M.; Farzin, A.; Ansari, M. and cluster 4, represented by the yellow circle, consists of 10 authors including Saberi, M.K.; Fazli, F.; Mirezati, S.Z., and Sahebi, S. Finally, the purple-colored circle cluster 5 consists of 10 authors, including Devi, T.K.; Mudgal, K.K.; Karthick, T. and Jayanti, R.R. Other clusters are also shown in different colors.

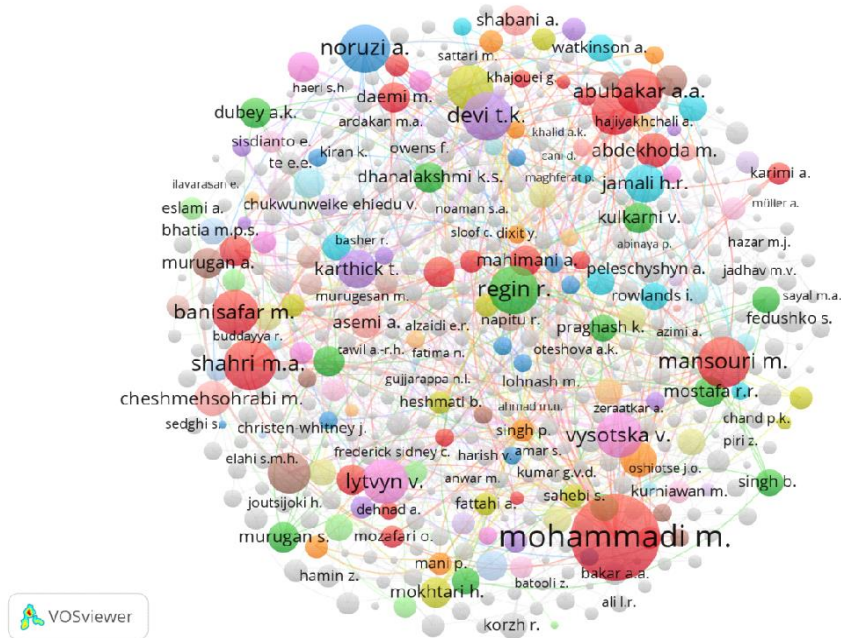


Figure 4: Co-authorship analysis of authors based on citations

Comparison between highly productive Vs. highly cited authors

The total link and link strength are displayed for highly productive authors vs. highly cited authors (Patel et al., 2021a). As indicated in Table 4, all five highly productive authors are not highly cited authors (except Noruzi, A.). However, highly productive authors have strong collaboration networks. The researchers found that the highly productive author is Noruzi, A (24 documents), and the highly cited author is Maness, JM (206 Citations).

Table 4: Comparison between highly productive Vs. highly cited authors

Highly productive					Highly Cited				
Author	Doc.	Cit.	Ln	TLS	Author	Doc.	Cit.	Ln	TLS
Noruzi A	24	68	11	11	Maness JM	1	206	0	0
Li X	6	10	3	3	Fedushko S	3	75	3	5
Mohammadi M	6	7	20	25	Noruzi A	24	68	11	11
Devi TK	4	0	9	11	Bhatti R	1	59	1	1
Jamali HR	4	13	8	8	Khan SA	1	59	1	1

Note: Doc.= Documents; Cit.= Citations; Ln= Links; TLS= Total link strength

Highly cited publications network

In Figure 5, the authors visualized highly cited publications with the help of VOSviewer visualization software. The highly cited publications are "Library 2.0 theory: web2.0 and its implications for libraries" by Maness, J M in 2006 with 206 citations; "Application of social media in marketing of library and information services: a case study from Pakistan" by Khan, S A, and Bhatti, R in 2012 with 59 citations; "Web2.0 as a social movement" by Birdsall, WF in 2007 with 50 citations; "Structure and form of folksonomy tags: the road to the public library catalogue" by Spiteri, L F in 2007 with 48 citations.

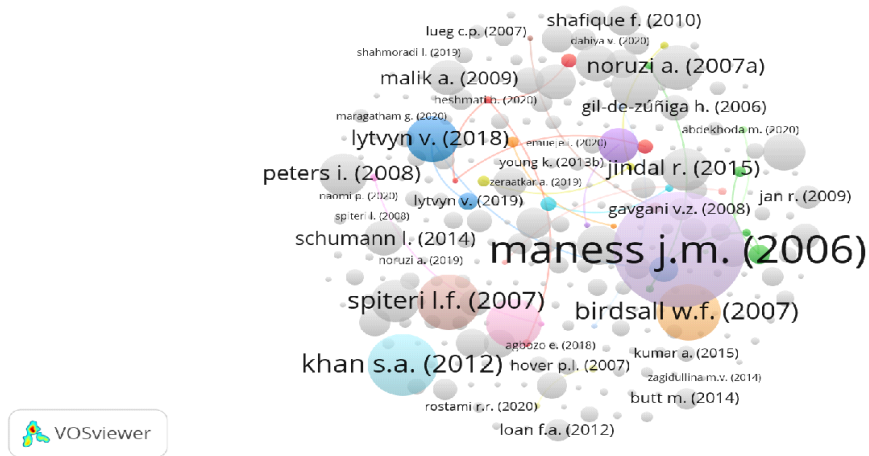


Figure 5: Highly cited publications network

Highly cited sources

In Figure 6, the collaboration network of citation sources is shown by six different clusters with a minimum of 7 number source sizes of clusters denoted in different colors. Among these clusters, cluster 1, represented by a red circle, consists of 50 sources, including "Scientometrics" (124 citations, 59 links, 975 total links strength), "Webology" (105 citations, 93 links, 707 total links strength), "Journal of the American Society for Information Science & Technology" (41 citations, 69 links, 413 total links strength), "Journal of Documentation" (37 citations, 62 links, 356 total links strength), etc. In comparison, cluster 2 consists of 28 sources, represented by the green circle, including "International Research Journal of Management" (18 citations, 11 links, 31 total links strength), "IEEE Access" (13 citations, 36 links, 177 total links strength), "Business Intelligence for Enterprise Internet of Things" (12 citations, 9 links, 93 total links strength). Cluster 3, denoted by a blue circle, consists of 27 sources, including "MIS Quarterly" (21 citations, 36 links, 333 total links strength), "Communications of the ACM" (19 citations, 50 links, 170 total links strength), "IEEE Transactions on Knowledge and Data Engineering" (11 citations, 42 links, 445 total links strength), and

the cluster 4, represented by the yellow circle, consists of 17 sources including "Expert Systems with Applications" (78 citations, 64 links, 3683 total links strength), "Procedia Computer Science" (32 citations, 83 links, 1927 total links strength), "Computers in Human Behavior" (28 citations, 54 links, 1061 total links strength). The purple-colored circle cluster 5 consists of 8 sources, including the Eastern-European Journal of Enterprise Technology" (14 citations, 9 links, 220 total links strength), "CEUR Workshop Proceedings" (13 citations, 9 links, 299 total links strength), Advanced in Intelligent Systems and Computing (11 citations, 9 links, 258 total links strength), and cluster 6 consists 7 sources, including "Information Processing and Management" (17 citations, 34 links, 449 total links strength), "Applied Soft Computing" (12 citations, 49 links, 444 total links strength), Information Retrieval" (8 citations, 15 links, 358 total links strength).

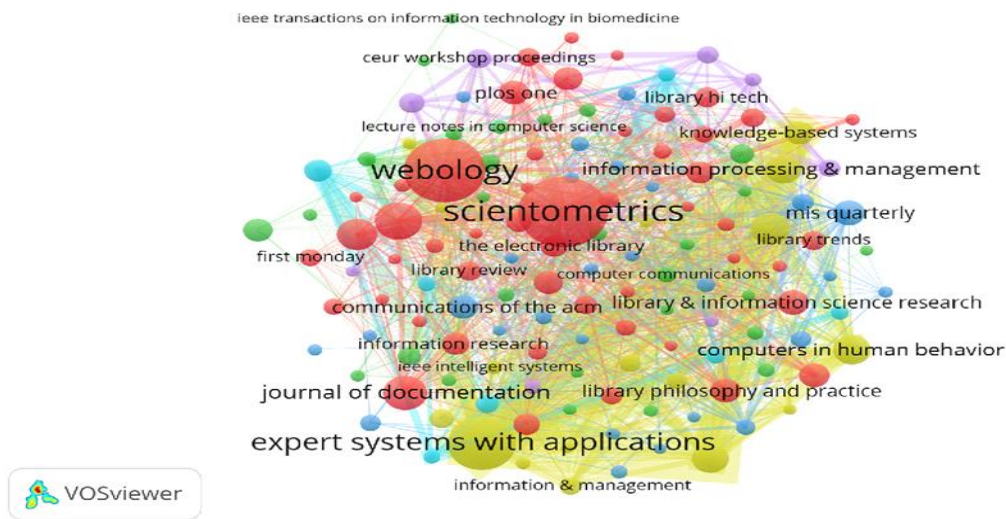


Figure 6: Highly cited sources

Co-authorship analysis of the country

The visualization of co-authorship analysis of countries is shown in Figure 7. The researchers fixed the criteria of a minimum of 2 publications for a country, out of the total 67 countries, 29 countries were under the threshold. Therefore, as indicated in Figure 7, a total of 35 clusters with different colors refer to the Country, including Iran (63 documents, 135 citations, 8 link, 11 total link strength), India (50 documents, 227 citations, 7 link, 9 total link strength), United States (25 documents, 281 citations, 4 link, 5 total link strength), Iraq (18 documents, 4 citations, 4 link, 4 total link strength) and Nigeria (14 documents, 52 citations, 4 link, 5 total link strength).

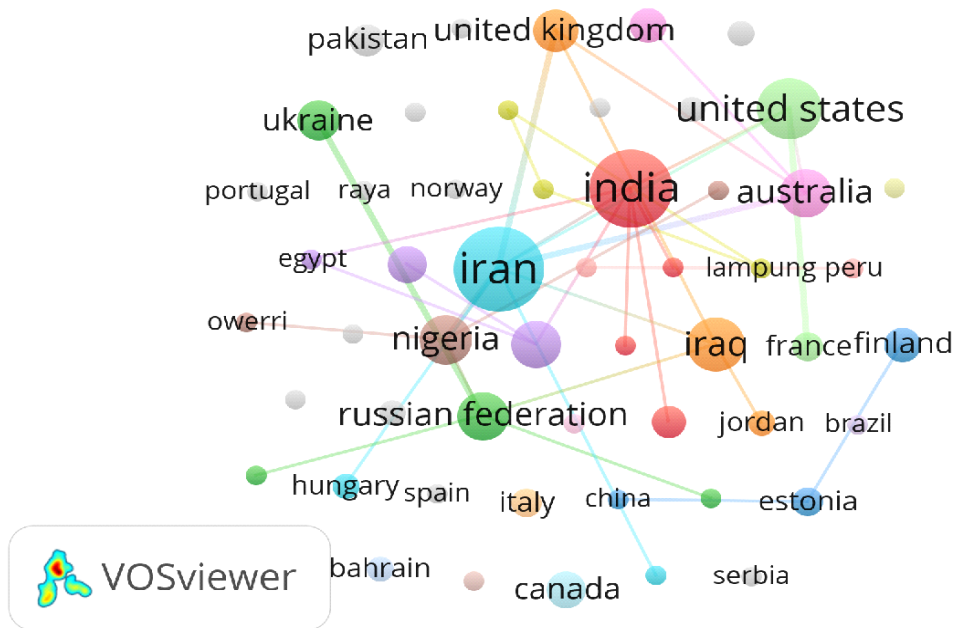


Figure 7: Co-authorship analysis of the country

Institution wise distribution of the publication

Table 5 depicts the status of institution-wise collaboration in research output. The University of Tehran published a maximum number of 19 research publications. On the other hand, the minimum number 5 was published by Delhi Technological University, the University of Tasmania, Iran University of Medical Sciences, and Tabriz University of Medical Sciences.

Table 5: Top ten institution wise distribution of the publication

Affiliation	Documents	Country
University of Tehran	19	Iran
SRM Institute of Science and Technology	11	India
Kharazmi University	9	Iran
Golestan University of Medical Sciences	6	Iran
Tehran University of Medical Sciences	6	Iran
Lviv Polytechnic National University	6	Ukraine
Delhi Technological University	5	India
University of Tasmania	5	Australia
Iran University of Medical Sciences	5	Iran
Tabriz University of Medical Sciences	5	Iran

Co-occurrence analysis of keywords

Keywords play a significant role in any research study. It reflects the core content of the topic in the article. In this analysis, an attempt has been made to analyze the keywords of the published literature to identify the micro-level in terms of subject matter (Patel et al., 2021b). Figure 8 shows the top favorable keywords: 'citation analysis' (16 occurrences), 'Iran' (11 occurrences), 'open access' (11 occurrences), 'internet' (10 occurrences), 'social media' (9 occurrences), 'web2.0' (8 occurrences), 'world wide web' (8 occurrences), 'universities' (6 occurrences), 'Nigeria' (6 occurrences), 'Scopus' (6 occurrences). In Figure 8, the co-occurrence of keywords is shown by 18 different clusters with a minimum of 1 number of keywords, the size of clusters denoted by different colors. Cluster 1, represented by a red circle, consists of 19 keywords, including scientometrics (6 occurrences, 9 links, and 9 total link strength), citation (3 occurrences, 9 links, and 9 total link strength), cybercrime (4 occurrences, 4 links, and 4 total link strength), information service (3 occurrences, 4 links, and 4 total link strength), linked data (2 occurrences, 2 links, and 2 total link strength), and cybersecurity (2 occurrences, 3 links, and 3 total link strength), etc. While cluster 2 consists of 13 keywords, represented by the green circle, including machine learning (4 occurrence, 4 links, and 4 total link strength), Nigeria (6 occurrences, 11 links, and 12 total link strength), semantic web (4 occurrence, 4 links, and 6 total link strength) and ontology (5 occurrences, 8 links, and 14 total link strength). Cluster 3, denoted by blue colored, consists of 13 keywords, including web2.0 (8 occurrence, 14 links, and 20 total link strength), folksonomies (4 occurrences, 5 links, and 9 total link strength), social network (3 occurrence, 9 links, and 9 total link strength), blog (3 occurrences, 9 links, and 11 total link strength) and the cluster 4, represented by the yellow circle, consists of 13 keywords including data mining (5 occurrences, 9 links, and 10 total link strength), text mining (2 occurrences, 3 links, and 3 total link strength), eBook (2 occurrences, 2 links, and 2 total link strength). The purple-colored circle cluster 5 consists of 13 keywords, including Iran (11 occurrences, 19 links, and 24 total link strength), Scopus (6 occurrences, 16 links, and 21 total link strength), bibliometrics (6 occurrences, 9 links, and 11 total link strength), bibliometric analysis (5 occurrences, 11 links, and 14 total link strength), co-authorship (4 occurrences, 11 links, and 15 total links strength). Other clusters are also shown in different colors.

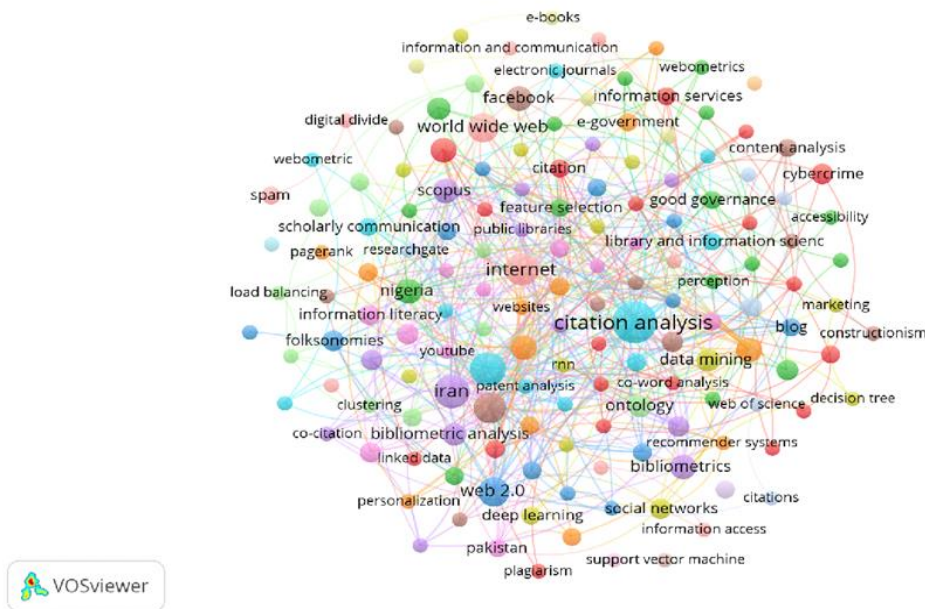


Figure 8: Co-occurrence analysis of keywords

Forms of publications

Figure 9 provides an overview of the forms of publications published in Webology. Out of total 295 publications, the majority, i.e., 272(92.20%), are research articles, while 15(5.08%) papers on editorial, review 5(1.69%), letters 2(0.68%), and only 1(0.34%) publication is published under the form of a note.

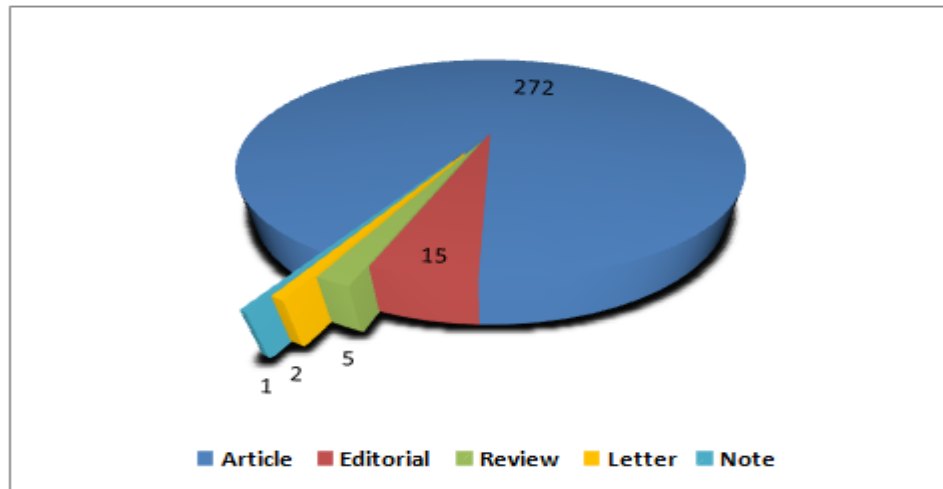


Figure 9: Analysis of the forms of publications

Findings of the study

The significant findings of the study are as follows:

- The highest number, 92(31.19%) papers and 273(20.94%) citations, was found in 2020, and the lowest number, 9(3.05%) research papers published as well as citations 21(1.61%) in 2010.
- The annual growth rate varied from -50.00 to 228.6 during the study period 2006-2020. The average relative growth rate for years of the study period was 0.19, and the relative growth rate varied from 0.09 to 0.69. Doubling time was observed to be increasing from 1 to 9.54 in the study period.
- The average productivity per author is 0.51. The highest number of productivity per author was found with a value of 0.75 in the year 2007.
- The authors measured the average degree of collaboration, collaboration coefficient, and collaboration index in webology were found at a rate of 0.60, 0.34, and 2.72, respectively, between 2006 to 2020.
- It is identified from the study that Noruzi, A (24 documents, 68 citations) is a highly productive and highly cited author among other authors in Webology journal.
- The top-cited publications are "Library 2.0 theory: web2.0 and its implications for libraries" by Maness, J M in 2006 with 206 citations; "Application of social media in marketing of library and information services: a case study from Pakistan" by Khan, S A, and Bhatti, R in 2012 with 59 citations; "Web2.0 as a social movement" by Birdsall, WF in 2007 with 50 citations.
- It indicates that Scientometrics (124 citations), Webology (105 citations), Journal of the American Society for Information Science & Technology (41 citations), and Journal of Documentation (37 citations) are highly cited sources.
- The findings of the study revealed that Iran (63 documents) was a highly productive country, followed by India (50 documents) and the United States (25 documents).
- The finding shows the top favorable keywords: citation analysis (16 occurrences), Iran (11 occurrences), open access (11 occurrences), internet (10 occurrences).

Conclusion

A scholarly journal is a periodical that contains articles written by experts in a specific subject domain of study. It is undoubtedly one of the crucial processes for knowledge exchange. It provides quality articles written systematically and thorough study of a particular topic, regularly providing original research, experimental, and surveys. It helps researchers with recent information related to their field of research.

This study presents a bibliometric overview of the leading trends that have occurred in the Webology journal during the period 2006 to 2020. The study uses the Scopus

database to retrieve the data, and 295 publications were selected for analysis. The results show the strong growth of Webology journal throughout time, being today one of the leading journals in computer science, management, library and information science, and higher education. The study reveals that multi-authors contributed the highest numbers of papers, whereas single authors produced the remaining papers. The preferable form of publication by the researchers in this journal is the article form of publication, with 92.20% of the total research productivity has been published in this category. This journal publishes quality publications and also follows proper publication ethics.

This comprehensive bibliometric analysis and visualization of Webology journal are considered one of the leading journals in the web technology field. The study is favorable to its editorial team for decision-making on its further improvement. Further, this study will also be helpful for researchers and faculty members interested in topics on general subjects and the LIS field in particular to have better contact with and contributions to the journal.

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