

Scientometric Assessment of Digital Library Research Publications during 2008-2017 using SCOPUS Database

¹Dr. N. Siva, ²Mr. S. Vivekanandhan & ³Dr. J.Manickaraj

¹Assistant Librarian, SRM Institute of Science and Technology SRM Nagar, Kattankulathur Kancheepuram, Tamil Nadu (India)

²Assistant Librarian, SRM Institute of Science and Technology SRM Nagar, Kattankulathur Kancheepuram, Tamil Nadu (India)

³Deputy Librarian, SRM Institute of Science and Technology SRM Nagar, Kattankulathur Kancheepuram, Tamil Nadu (India)

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*Corresponding Author

Email: siva.n[at]ktr.srmuniv.ac.in

ABSTRACT

This paper analyses the scientometric analysis of digital library research publications which are indexed in SCOPUS database between 2008 and 2017 with 10345 publications. This study identified the year wise growth publications, the role of top 10 authors, institution and country as well as the type of publication, authorship pattern and citation range. Further analyzing the degree of collaboration, relative growth rate and doubling time of the research publications. During the study it is identified that the highest of 1199(11.59%) publications in the year 2009 with 6905 (14.53%) citations, the average degree of collaboration is 0.78, the relative growth rate is decreasing trend and doubling time is increasing trend. During the study identified that the highest of 6187 (59.81%) publications published in the conference paper. The United States ranked first with 2650 (25.62%) publications, and Giles C.L. stands with highest of 59 (0.57%) publications with 643(1.35%) citations and the h-index is 15. During the study period, 4101 (39.64%) publications did not get any citation and remaining 6244 publications have cited publications.

1. Introduction

Digital Library: It is a collection of books, Journals, magazines, articles and another format of collections like images, pictures, audio/ video files in an organized manner which is available in electronic format. The electronic form may be like CD ROM, Hard Disks, Floppy Disks or available in the server for Intranet/Internet access. Depending on the libraries the data are stored, and they provide digitalized information for instant access. "The digital library is the collection of services and the collection of information objects that support users in dealing with information objects available directly or indirectly via electronic/digital means"¹. Nowadays, DSpace repository is one of the open source digital library software, it serves as a digital archives system, determined on the long-term storage, access and preservation of digital collections. Users can access wherever they are with a large amount of Information whenever they need it.

2. Scientometric Analysis

"Bibliometric methods are used in the studies of properties and behavior of recorded knowledge, for the analysis of structures of scientific research areas, evaluation of research activity and administration of scientific information"² Bibliometrics is a statistical analysis of recorded knowledge in articles and books to provide quantitative and qualitative measures. Citation analysis and content analysis commonly used in bibliometric and scientometric methods. Bibliometric methods are used to explore the impact of a research field, a set of researchers, or a particular article. Bibliometrics became prominent because of the need to manage the huge investments that were going into the science and technology (S&T) sectors, especially into research and development activities³. Journals are the primary communication channel in disseminating research and scholarly information and

publishing papers in high impact and good quality of national as well as international journals has strongly related with gaining prestige, reputation and academic achievement in the higher education environment⁴.

3. Review of Literature

DhimanMondal, Satish Kanamadi and Kingsuk Das (2017)⁵ analyzed the research contribution of Indian authors in foreign origin library and information science journals between 2006 and 2015 for Library Information Science and Technology Abstracts database. They analyzed his paper by year-wise publications, authorship pattern, institutions, preferred journals for communication and subject. They identified the Indian authors contributed 234 publications, and two authors contributed a maximum number of publications. Library Philosophy and Practice has the most preferred journal by the authors for publication.

Vivekanandhan, Sivasamy and Bathrinarayanan (2016)⁶ analysis the literature indexed in SCOPUS database in the field of pollution control research between 1985 and 2014 with a 53844 literature. The study identified the growth of literature, bibliographic distribution, authorship pattern, Citation Index, Collaborative Coefficient, modified collaborative coefficient. The maximum of publications are identified in the 6th block of 2010–2014 has 13692(25.43%) publications and the block year wise average degree of collaboration is 0.72.

Padmamma and Walmiki (2016)⁷ analyzed the research publications on Cancer of uterus indexed in the web of Science database during 2006-2016 with 3,197 publications. They identified that thmajority of the United States researchers contributed journal articles 2652 (83.95%) and among the

Journals "the Gynecologic Oncology "got the first rank and published in the United States.

4. Objectives

The main objectives are

- To identify the year wise contribution
- To analysis the relative growth rate and doubling time of publications
- To categorize the document type of publications
- To analysis the country and institution wise contributions
- To identify the top 10 authors contribution and authorship pattern

6. Analysis And Interpretation

Year Wise Growth of Publications

S. No	Year	Publications	%	Citations	%
1	2008	1175	11.36	8940	18.81
2	2009	1199	11.59	6905	14.53
3	2010	1095	10.58	6725	14.15
4	2011	1092	10.56	6413	13.49
5	2012	1016	9.82	5549	11.67
6	2013	1067	10.31	4253	8.95
7	2014	995	9.62	3682	7.75
8	2015	860	8.31	2430	5.11
9	2016	886	8.56	1923	4.05
10	2017	960	9.28	712	1.50
Total		10345	100.00	47532	100.00

Table-1 Year wise growth of Publications

Table-1 shows that the year wise growth of publications and citations in the field of digital library-related research publications are indexed in the Scopus database between 2008 to 2017 with 10345 publications and 47532 citations. During the study, it is identified that the highest of 1199(11.59%) publications in the year 2009 with 6905 (14.53%) citations. Followed by 1175(11.36%) publications in the year 2008 with a maximum of 8940(18.81%) citations and third placed in the year 2010 with 1095(10.58%) publications.

7. Degree of Collaboration (Dc)

The degree of Collaboration denotes that, the concentration of single-authored publications with multi-authored publications on digital library research during the study period. Subramanyam's (1983)⁸ formula has been

- To analysis the citation range

5. Methodology

The present study describes the scientometric analysis of digital library research publications between 2008 and 2017 from the SCOPUS database. This study used the following search method in the combined field of Title, Abstract and Keywords. The search key was ((TITLE-ABS-KEY ("Digital Library") AND PUBYEAR > 2007 AND PUBYEAR < 2018)). This study extracted a total number of 10345 publications and the collected data have been analyzed using Microsoft Excel.

adopted to examine the extent of research collaboration in the study, and the same whereas used in Sivasamy K (2015)⁹

$$DC = Nm / (Ns + Nm)$$

Where as

DC=Degree of Collaboration in a subject field

Nm=Number of multiple authored papers, Ns = Number of single-authored papers

The degree of collaborations is calculated for the 10 years from 2008 to 2017. During the study period, it is identified from the table 2, the degree of collaboration is 0.73 in the year 2013 and 0.82 in the year 2015. This study confirmed that the degree of collaboration is the fluctuation trend and the average degree of collaboration is 0.78.

S.No	Year	Ns	Nm	DC= Nm/(Ns+Nm)
1	2008	267	908	0.77
2	2009	252	947	0.79
3	2010	273	822	0.75
4	2011	242	850	0.78
5	2012	224	792	0.78
6	2013	290	777	0.73
7	2014	228	767	0.77
8	2015	157	703	0.82
9	2016	171	715	0.81

10	2017	186	774	0.81
Total		2290	8055	0.78

Table 2 Degree of Collaboration

8. Relative Growth Rate and Doubling Time

Table 3 describe that the year wise distributions and relative growth rate of publications in the field of digital library research. During the study, a total of 10345 publications published from 2008 to 2017. The Relative Growth Rate (RGR) counted the increase in the number of articles/pages per unit of time, Mahapatra, M. (1985)¹⁰. The mean Relative Growth Rate R (a) and Doubling time are calculated over the specific period of the interval by the following formula.

$$R(a) = (W_2 - W_1) / (T_2 - T_1)$$

Where,

R (a) = Mean relative growth rate over the specific period of the interval;

W_1 = Log W_1 (Natural log of the initial number of publications/pages);
 W_2 = Log W_2 (Natural log of ending number of publications/pages);
 $T_2 - T_1$ = Unit difference between the initial time and final time.

This study is to analyze the relative growth rate is decreasing trend from 0.703 in the year 2009 to 0.097 in the year 2017.

9. Relative Growth Rate and Doubling Time

S. No	Year	Publications	Cum.	W_1	W_2	$R(a) = (W_2 - W_1)$	$Dt = 0.693/R(a)$
1	2008	1175	1175	0.000	7.069	0	0
2	2009	1199	2374	7.069	7.772	0.703	0.985
3	2010	1095	3469	7.772	8.152	0.379	1.827
4	2011	1092	4561	8.152	8.425	0.274	2.532
5	2012	1016	5577	8.425	8.626	0.201	3.446
6	2013	1067	6644	8.626	8.801	0.175	3.959
7	2014	995	7639	8.801	8.941	0.140	4.966
8	2015	860	8499	8.941	9.048	0.107	6.496
9	2016	886	9385	9.048	9.147	0.099	6.988
10	2017	960	10345	9.147	9.244	0.097	7.116

Table – 3 Relative Growth Rate and Doubling Time

A direct correspondence has occurred between the relative growth rate and the doubling time. The number of articles of subjects doubled within a period. The natural logarithm has used this difference, a value of 0.693. Thus the corresponding doubling time for each specific period of the interval can be calculated by the following formula.

$$Dt = 0.693/R(a)$$

It conforms from the table 3 the doubling time is increasing trend from 0.985 in the year 2009 to 7.116 in the year 2017 in the field of digital library research.

10. Type of Publication

Table 4 shows that, the type of publications in the field of digital library research which indexed in the Scopus database. During the study period, identified that the highest of 6187 (59.81%) publications were published in the conference paper, followed by 3057(29.55%) articles, book chapter with 435(4.20%) publications, etc. During the study period, nearly 90% of the publications on digital library research papers are published in conference paper and articles.

S. No	Document Type	# Publications	%	Cum.	Cum. %
1	Conference Paper	6187	59.81	6187	59.81
2	Article	3057	29.55	9244	89.36
3	Book Chapter	435	4.20	9679	93.56
4	Review	323	3.12	10002	96.68
5	Conference Review	185	1.79	10187	98.47
6	Book	57	0.55	10244	99.02
7	Editorial	41	0.40	10285	99.42
8	Note	29	0.28	10314	99.70

9	Short Survey	18	0.17	10332	99.87
10	Erratum	8	0.08	10340	99.95
11	Letter	4	0.04	10344	99.99
12	Business Article	1	0.01	10345	100.00
Total		10345	100.00		

Table –4 Document Type

11. Top Ten Country Wise Publications

S. No	Country	# Publications	% of 10345	Rank
1	United States	2650	25.62	1
2	China	1142	11.04	2
3	Germany	743	7.18	3
4	United Kingdom	665	6.43	4
5	Italy	563	5.44	5
6	India	446	4.31	6
7	Spain	386	3.73	7
8	France	328	3.17	8
9	Canada	276	2.67	9
10	Brazil	259	2.50	10
Total		7458	72.09	

Table – 5 Country wise publications

Table 5 shows that the Country wise research publications in the field of the digital library research during the study period of 10 years. It was identified, the United States ranked first with 2650 (25.62%) publications, followed by China is the second rank with 1142 (11.04%) publications, Germany stands the third rank with 743 (7.18%) publications. This study identified that India stands the sixth rank with 446 (4.31%) publications in the field of Digital Library research. Top 10 countries contributed 7458 (72.09%) of publications during the study period.

12. Top Ten Institution Wise Publications

Table 6 shows that, Institution wise research publications in the field of the digital library research. It is identified; Universita Degli Studi di Padova in Italy and Nanyang Technological University in Singapore stands first with 107 (1.03%) publications. Followed by University of Waikato, New Zealand contributed 99(0.96%) publications, third place is Pennsylvania State University, the United States with 97 (0.94%) publications. Top ten institutions are contributed 882(8.53%) publications and out of top ten institutions, five institutions are in the United States.

S. No	Name of the Institution	Publications	% of 10345
1	Universita Degli Studi di Padova, Italy	107	1.03
2	Nanyang Technological University, Singapore	107	1.03
3	University of Waikato, New Zealand	99	0.96
4	Pennsylvania State University, United States	97	0.94
5	Virginia Polytechnic Institute & State University, USA	85	0.82
6	The University of Illinois at Urbana-Champaign, USA	82	0.79
7	University of California, Berkeley, United States	80	0.77
8	Wuhan University, China	78	0.75
9	Texas A and M University, United States	74	0.72
10	ConsiglioNazionale delle Ricerche, Italy	73	0.71
Total		882	8.53

Table – 6 Institution wise publications

13. Top Ten Authors Contributions

S. No	Authors	# Publications	% of 10345	Citations	% of 47532	h-index
1	Giles, C.L.	59	0.57	643	1.35	15

2	Nelson, M.L.	56	0.54	241	0.51	8
3	Fox, E.A.	52	0.50	190	0.40	7
4	Bainbridge, D.	47	0.45	178	0.37	7
5	Ferro, N.	39	0.38	168	0.35	8
6	Goh, D.H.L.	37	0.36	107	0.23	6
7	Furuta, R.	36	0.35	137	0.29	7
8	Agosti, M.	35	0.34	185	0.39	8
9	Cunningham, S.J.	35	0.34	148	0.31	5
10	Mayr, P.	33	0.32	165	0.35	7
Total		429	4.15	2162	4.55	

Table –7 Top 10 Authors contributions

Table 7 shows that, top ten authors research publications in the field of the digital library research. It is identified that Giles C.L. stands with the highest of 59 (0.57%) publications with 643(1.35%) citations and the h-index is 15, followed by Nelson M.L. 56(0.54%) publications with 241(0.51%) citations and the h-index is 8. Fox E.A. contributed 52(0.50%) publications with 190(0.40%) citations and the h-index is 7. Top ten authors have contributed 429 (4.15%) publications in the field of digital library research during the study period.

14. Authorship Pattern

Authorship patterns identified in the field of digital library research shown in table 8. This study shows, two authors are contributed the maximum of 2620(25.33%) publications, followed by three authors with 2357(22.78%) publications, single authors with 2290(22.14%) publications. This study also shows that more than nine authors contributed 110(1.06%) publications.

S.No.	Authorship pattern	# Publications	%
1	Single Author	2290	22.14
2	Two Authors	2620	25.33
3	Three Authors	2357	22.78
4	Four Authors	1451	14.03
5	Five Authors	803	7.76
6	Six Authors	381	3.68
7	Seven Authors	182	1.76
8	Eight Authors	93	0.90
9	Nine Authors	58	0.56
10	More than Nine Authors	110	1.06
Total		10345	100.00

Table – 8 Authorship Pattern

15. Citation Range

S.No.	# Citation	# of Publications	%
1	Nil	4101	39.64
2	1	1693	16.37
3	2	1022	9.88
4	3	719	6.95
5	4	497	4.80
6	5	362	3.50
7	6	243	2.35
8	7	204	1.97
9	8	191	1.85
10	9	129	1.25
11	>9	1184	11.45
Total		10345	100.00

Table – 9 Citation Range

From the study analysis, the citations received in the field of digital library research publications during the 10 years study period. From the table 9 shows the citation ranges indicate that 4101 (39.64%) of digital library research publications did not get any citation during the study period and the remaining were get the citations one or many times. From the table 8 shows

that 1693(16.37%) of publications have got the one citations, followed by 1022(9.88%) publications have got the citations two citations, 719(6.95%) publications have got the three times of citations, etc. During the overall study period, 1184(11.45%) publications have received more than nine citations.

16. Major Findings

- During the study period, a total of 10345 publications are identified and the maximum publications are 1199(11.59%) in the year 2009 with 6905 (14.53%) citations.
- This study identified that the degree of collaboration is 0.73 in the year 2013 and 0.82 in the year 2015. It is confirmed that the degree of collaboration is fluctuation trend.
- This study identified the relative growth rate is decreasing trend from 0.703 in the year 2009 to 0.097 in the year 2017 and the same time doubling time is increasing trend from 0.985 in the year 2009 to 7.116 in the year 2017.
- This study identified that the highest of 6187 (59.81%) publications have published in the conference paper. The country wise study identified that the United States is ranked first in with 2650 (25.62%) publications. The institution wise study shows that

Universita Degli Studi di Padova in Italy and Nanyang Technological University in Singapore stands first with 107 (1.03%) publications.

- Giles, C.L. stands with highest of 59 (0.57%) publications with 643(1.35%) citations and the h-index is 15. Two authors have contributed the maximum of 2620(25.33%) publications.
- Overall the study it is identified that 4101 (39.64%) publications did not get any citation and remaining 6244 publications are identified cited publications.

References

1. Leiner, B.M (1998). The NCSTRL approach to open architecture for the confederated digital library. D-Lib Magazine, available at: www.dlib.org/dlib/december98/leiner/12leiner.html. accessed on 28.09.2018
2. Patra, S. K., Bhattacharya, P. and Verma, N. (2006). Bibliometric study of literature on bibliometrics. DESIDOC Bulletin of Information Technology, 26(1), 27-32.
3. Prathap, G. (2015). Bibliometrics – problems and promises. Current Science, 108(2), 147–148.
4. Mondal D, Kanamadi S, Das K. (2017). Contribution by Indian authors in foreign origin library and information science journals during 2006-2015: A scientometrics study. DESIDOC Journal of Library and Information Technology. 37(6), 396-402.
5. Mondal, D., Kanamadi, S. and Das, K. (2017). Contribution by Indian Authors in Foreign Origin Library and Information Science Journals during 2006-2015: A Scientometrics Study. DESIDOC Journal of Library & Information Technology, 37(6), 396-402.
6. Vivekanandhan, S., Sivasamy, K. and Bathri Narayanan, A. L. (2016). Growth of Literature in Pollution Control Research Output during 1985-2014: A Scientometric Study. Journal of Advances in Library and Information Science, 5(2), 170-178.
7. Padmamma S and Walmiki R H (2016). Scientometric analysis of Articles contributions to web of Science on uterus cancer. International Journal of Library and Information Science, 5(2), 57-70.
8. Subramanyam K (1983). Bibliometric Studies of research collaboration: A review. Journal of Information Science, 6(1), 33-38.
9. Sivasamy K and Vivekanandhan S (2015). Environmental education research literature output in Scopus database (2009-2013): A bibliometric study. International Journal of Information Sources and Services, 2(2), 84-93.
10. Mahapatra, M. (1985). On the validity of the theory of exponential growth of scientific literature. In 15th IASLIC conference proceedings, Bangalore, IASLIC, pp 61-70.
11. Vivekanandhan, S. and Bathrinarayanan, A. L. (2014). Authorship Trends and Collaborative Research in Bharathiyar University Research Output: A Scientometric Study. International Journal of Current Research in Life Sciences, 3(12), 91-96.
12. Vivekanandhan s, Sivasamy K and Prabhakar S (2016). Analysis of Pollution Control Research Output from Scopus Database (1985-2014): A Scientometric Study, LIS Today, 3(1-2), 32-41.