September 2019

Authorship Pattern and Citation Level of i10 Cited Research Papers of DESIDOC Journal of Library and Information Technology in Google Scholar

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ABSTRACT

Google Scholar (GS), a freely accessible database of scholarly papers along with its citations data, has an extensive coverage of Library and Information Science (LIS) literature. It is the only available global database for the citation analysis of Indian LIS journals. The present study is an attempt to highlight the authorship pattern and citation level of i10 cited research articles in DESIDOC Journal of Library and Information Technology (DJLIT) based on Google Scholar data. Descriptive and inferential statistical techniques were applied in the study. One hundred and eighty articles published between 1995–2016 were cited 10 or more times (i10 index) in Google Scholar. Based on Google Scholar, this study has established that citations of i10 cited papers are equally distributed in its different authorship patterns; there is no association between authorship pattern and level of citations. Further the study shows that there is an association between period of publication and level of citations.

Key Words: *DESIDOC Journal of Library and Information Technology, Google Scholar, Indexing Services, Citation Analysis, Google Metrics, Bibliometrics, Scientometrics*

1. Introduction

The number of citations received by the papers published in a journal is considered a quantitative indicator of the scholarly impact and influence of that journal in its subject discipline. There are many quantitative indicators which are based on citation-based bibliometrics and which have been worked out to objectively measure the scholarly impact and influence of journals. Nowadays the use of the term informetrics reflects not only the

bibliometric indicators based on publication and citation counts, but also with altmetrics, webometrics, and usage-based metrics derived from a variety of data sources. Scientific scholarly journals can also be assessed by using the above forms of bibliometric indicators. The use of these informetric indicators enables in assessing the quality of research presented in scholarly journals in a systematic way.

Informetric indicators, including the important group of citation-based measures, have become widely available in scholarly literature retrieval tools like Google Scholar. Google Scholar (GS) is a free academic search engine and citation index which indexes full text and metadata of scholarly literature in all disciplines and is used for assessing research impact. Google Scholar is one of the altmetric journal citation-based indicator introduced in 2004. It covers a much wider variety of document types and sources than Scopus and Web of Science (Thelwall & Kousha, 2015). The "Cited by…" link in GS shows the number of times the document under consideration has been cited and the link further displays the bibliographic details of the citing documents. Google Scholar provides two metrics named *h*-index proposed by Hirsch in 2005 and *i*10 index. It is possible to assign an *h*-index to the group of papers published in a specific journal in a specific year; it can be used as a journal metric. This index is calculated using all citations received by the papers published in the specific journal. In the case of a journal, papers are arranged in the order of citations received by them and if *h* papers are cited at least *h* times, then the maximum number of *h* is the *h*-index of that journal.

DESIDOC Journal of Library & Information Technology (DJLIT) formerly (DESIDOC Bulletin of Library and Information Technology Journal) is one of the leading Library and Information Science journals in India, being published by Defense Science Documentation Centre (DESIDOC), DRDO, Government of India, New Delhi since 1981 on a bimonthly basis, each volume having six issues. DJLIT is peer reviewed, indexed in Library and Information Science Abstract (LISA), Library and information Science Technology Abstracts (LISTA), Indian Citation Index (ICI), Indian Science Abstracts (ISA), Scopus, EBSCO Abstracts/Full-text, Library Literature and Information Science Index/Full-text, The Informed Librarian Online, DOAJ, Open J-Gate, Full text Sources Online, World Cat, Proquest, and OCLC. It is also indexed in GS. The *h*-index of the journal as on 26November 2018 was 30, which shows that 30 papers of DJLIT journal are cited at least 30 times. Google Scholar provides another metric

named *i*10 index, which is the total number of papers in a particular journal cited at least 10 times. The *i*10 index of the DJLIT journal as on the same date was 180. This shows that 180 papers were cited at least 10 times. Thus GS is the feasible alternative to the well-known citation databases *Web of Knowledge* and *Scopus.* Hence the present study is carried out on Google Scholar based data of DJLIT journal. The DJLIT is an open-access journal with high visibility and discoverability of authors and papers in Google Scholar. So the present study is undertaken to analyze the *i*10 cited papers irrespective of its authorship pattern and level of citations.

2. Related Studies

Naidu[3] in his study traced out the citation and authorship patterns of DJLIT journal and found that DJLIT has a wide and high visibility in Google Scholar. His study also found that during the 24 year publication period (between 1988-2015) 432 articles were cited 4199 times in the Google Scholar. Singh and Singh[4] in their paper investigated the citation and authorship patterns of International Journal of Library and Information Studies (IJLIS) on the basis of Google Scholar. The study found that during the five years (between 2011-2015) 20 articles are cited 118 times in the Google Scholar.

Swapan Kumar[5] in his study traced general authorship pattern and citation trends of Indian LIS journals. Since Indian LIS journals are not covered in Web of Science (WoS) and coverage in Scopus and ICI database is very limited, the study selected GS data for citation analysis. The study found that Indian LIS journals have low visibility in Google Scholar database. Since multiple authored articles got more citations than single authored ones, the study suggested LIS researchers to increase collaboration for better visibility of their research.

Garg and Bebi[6] anlysed the number of papers published during the period 2010-2013 in the LIS journals DJLIT and Annals of Library and Information Studies (ALIS) and the citations received by the same papers for the period 2010-2014. The study identified highly cited authors/papers and developed immediacy index and impact factor for the journals also. It was revealed that DJLIT published more papers during the period and received more citation for the same. DJLIT has a better immediacy index than ALIS and the impact factor of the two journals fluctuated from less than one to greater than one during the period of study.

Renjith[7] attempted to highlight the citation output of research articles in DJLIT published during the period 2006–2015 based on Google Scholar data. He showed that 406 articles were published during 2006–2015, and were cited 4122 times in Google Scholar. The study also proved that the citation output of articles published in the DJLIT differs significantly with their publication year. The level of citation is not constant throughout the study period. There is also a weak negative correlation between citations of articles and its publication year.

3. Objectives

The primary objective of the study is to analyze the *i*10 cited papers based on the parameters authorship pattern and level of citations. The major objectives of the present study are: (a) to find the number of papers in *'i*10 cited papers' distributed in different range of citations; (b) to find out the *i*10 cited papers' year of publications; c) to trace out the authorship pattern of *i*10 cited papers; d) to assess the distribution of mean citations of *i*10 cited papers in different authorship patterns; e) to trace out the distribution of citation levels in different authorship patterns and publication periods.

4. Hypotheses

For the present study, following hypotheses are framed;

(a) Citations of *i*10 cited papers are not equally distributed among different authorship patterns.

(b) There exists no association between authorship pattern and level of citation of *i*10 cited papers.

(c) There exists no association between period of publication and level of citations of *i*10 cited papers.

5. Method

The data for the present study were collected from the Google Scholar citation web page of DESIDOC Journal of Library & Information Technology available at https://scholar.google.co.in/citations?user=RFLVDYcAAAAJ&hl=en on 26November 2018. Only *i*10 cited papers' citations, number of authors in the cited papers and publication year were collected and entered in the Excel sheet. The statistical analysis was done using SPSS. Since the data was not following normality and included outlier values, inferential analysis was done by

applying non-parametric method. The non-parametric methods used for the present study are Kruskal-Wallis test and the Chi-square test for independence of attributes.

6. Results and Analysis

6.1 Top 20 Authors, their authorship pattern and number of papers having citation of at least 40 or more

Table1 shows the top 20 authors, their authorship pattern (single authored or first authored only) and their number of papers which received 40 or more citations. M B Eisenberg is the top cited author with single authorship in his paper titled "Information literacy: Essential skills for the information age" published in the year 2008 cited 302 times. The next top cited author with single authorship is K N Rao. His paper "Application domain and functional classification of recommender systems—a survey" published in the year 2010 was cited 89 times. S K Patra is the top author with first authorship in his paper titled "Bibliometric study of literature on bibliometrics" published in the year 2003 got 108 citations. B Kaur with his first authorship in the paper "Use of electronic information resources: A case study of Thapar University" positions second in the first authorship paper. B S Kademani authored two papers with first authorship and earned 100 (56 & 44) citations for the two papers. The publication period of top cited papers are in between 1997-2011. The number of citations received ranges from 302 to 40.

Table 1.
Top 20 authors, authorship pattern and number of papers having citation of at least 40 or more times as on 26November2018

Sl.No.	Name of the Author	Single Authored	First Authored	Total No. of Citations Received	No of Articles	Publication Year
1	M B Eisenberg	1	-	302	1	2008
2	S K Patra	-	1	108	1	2003
3	K N Rao	1	-	89	1	2010
4	R P Hulser	1	-	77	1	1997
5	B Kaur	-	1	67	1	2009
6	S R Ghani	1	-	56	1	2009
7	B S Kademani*	-	2	56 & 44 (100)	2	2006 &2007
8	S K Satpathy	-	1	50	1	2010
9	R Sevukan	-	1	50	1	2008
10	H K	-	1	48	1	2011

	Mohamed					
11	M Kumar	-	1	48	1	2011
12	B. R Babu	-	1	46	1	2010
13	B M Gupta	-	1	46	2	2003
14	L S Connaway	1	-	46	1	2003
15	S Thanuskodi	-	1	45	1	2010
16	A Islam	-	1	41	1	2011
17	M Natarajan	-	1	41	1	2009
18	N Ahmad	-	1	41	1	2009
19	S Arunachalam	-	1	41	1	2008
20	K G Sudhier	1	-	40	1	2010
Total		**6**	**15**		**22**	

*56 citations for one paper and 44 citations for the second paper

6.2 Number of Papers having *i*10 or More Cited

Table 2 shows the citation range of *i*10 cited papers in DJLIT journal. The *h* index of the journal as on 26**November**2018 is 30 and *i*10 index is 180. So there are 30 papers having at least 30 citations and 180 papers having been cited at least 10 or more times. The second highest range of citation is ≥20 and in that range there are 66 papers. The number of papers in various citation range patterns shows that as citation range increases there is a decrease in the number of cited papers in that range.

Table 2.
Range of Citations of *i*10 cited Papers.

Citation Range	**No. of Papers Cited**
≥10	180
≥20	66
≥30	30
≥40	21
≥50	8
≥60	5
≥70	4
≥80	3
≥90	2
≥100	2
≥200	1
≥300	1

6.3 Publication Period-wise *i*10cited Papers

The *i*10 cited papers in the DJLIT journal span the period 1995 to 2016. There are no *i*10 cited papers published in the year 2002 & 2004.Overall 180 *i*10 cited papers are published in 20 publication years in the period 1995-2016.Table 3 shows the number of *i*10 cited papers and its corresponding publication periods in the DJLIT journal. Most number of papers (91) earned *i*10 citations were published in the DJLIT journal during the period of 2007-2011. The next highest number of papers(44) that got *i*10 citations were published during the period of 2012-2016.

Table 3.
Publication Year-wise *i*10 Cited Papers.

Publication Years	1995-1999	2000-2006*	2007-2011	2012-2016	**Total**
No. of Papers Cited	17 (9.4%)	28 (15.6%)	91 (50.6%)	44 (24.4%)	**180 (100%)**

*****There is no *i*10 cited papers in the years 2002 & 2004

6.4Authorship Pattern of *i*10 Cited research Papers

The authorship pattern of i10 cited papers in the DJLIT journal were distributed in five authorship patterns (Table 4). Two authored papers were cited more times (77) in the i10 cited papers when compared with single authored papers (66). Four-authored and six-authored i10 cited papers were meager when compared with thei10 cited papers of other authorship patterns.

Table 4.
Authorship Pattern of *i*10 Cited research Papers.

Authorship Pattern	Single Authored	Two Authored	Three Authored	Four Authored	Six Authored	**Total**
No. of Cited Papers	66 (36.7%)	77 (42.8%)	26 (14.4%)	8 (4.4%)	3 (1.7%)	**180 (100%)**

6.5 Mean Citations of *i*10 Cited Papers in Authorship Patterns

The total citations received by each individual paper in the i10 cited papers ranged from 10 to 302. Table 5 shows the mean, 25th, Median (50th), and 75th quartile values of citations distributed in different authorship patterns. The mean value of citations of single authored i10 cited papers

were 25.45 whereas that of six authored papers was 36. The non-parametric Kruskall-Wallis test shows that the distribution of citations is the same across the categories of authorship patterns. Further it shows that citations of i10 cited papers are equally distributed in its different authorship patterns. Thus the hypothesis (a) is rejected ($p>0.05$).

Table 5
Citations of *i*10 Cited Research Papers in Authorship Patterns

Authorship Pattern	Single Authored	Two Authored	Three Authored	Four Authored	Six Authored
Mean Citations Received	25.45	20.71	22.04	20	36
25th Quantile of Citations Received	12	14	13	16	26
Median Citations Received	16	17	15	17	34
75th Quantile of Citations Received	24.75	23	22.25	18.50	45

6.6 Authorship Pattern vs. Level of Citations

Based on row percentage, among *i*10 cited papers, single authored papers have 36.4% citations at low level, same percentage at moderate level and 27.3% at high level, whereas, the two authored papers had 24.7% citations at low level and 51.9% citations at moderate level and 23.4% citations at high level and so on. Single authored and two authored papers got same number of high level citation of 18 each. High numbers of moderate level citations (40 & 24) are also shared by these two authorship patterns. Altogether there are 28.9% low level citations, 46.1% moderate level citations and 25% high level citations distributed among the different authorship patterns. Chi-square test for independence of attributes shows that there is no association between authorship pattern and level of citations (Chi-square value (8, N = 180) = 9.71) $p>0.05$).

Table 6.
Authorship Pattern vs. Level of Citations.

Authorship Pattern	**Level of Citations**			**Total**	**Chi-square**	**p value**
	Low	**Moderate**	**High**			
Single Authored	24 (36.4%) [46.2%]	24 (36.4%) [28.9%]	18 (27.3%) [40%]	**66 (100%) [36.7%]**		

Two Authored	19 (24.7%) [36.5%]	40 (51.9%) [48.2%]	18 (23.4%) [40%]	**77 (100%) [42.8%]**	9.71	0.286
Three Authored	8 (30.8%) [15.4%]	12 (46.2%) [14.5%]	6 (23.1%) [13.3%]	**26 (100%) [14.4%]**		
Four Authored	1 (12.5%) [1.9%]	6 (75%) [7.2%]	1 (12.5%) [2.2%]	**8 (100%) [4.4%]**		
Six Authored	0 (0%) [0%]	1 (33.3%) [1.2%]	2 (66.7%) [4.4%]	**3 (100%) [1.7%]**		
Total	**52 (28.9%) [100%]**	**83 (46.1%) [100%]**	**45 (25%) [100%]**	**180 (100%) [100%]**		

The value within ( ) refers to row percentage
The value within [ ] refers to column percentage

6.7 Publication Periods of i10 cited Papers vs. Level of Citations

Based on row percentage, amongst the publication period of *i*10 cited papers, 58.8% of low level cited papers were published in the period 1995-1999. 29.4% and 11.8% of moderate and high level citations respectively were also published in the same period. There are 17.9% at low level, 57.1% at moderate level and 25% at high level cited *i*10 papers in the period 2000-2006. Chi-square test for independence of attributes shows that there is an association between period of publication and level of citations (Chi-square value (6, N = 180) = 13.93) $p<0.05$).

Table 7.
Period of Publication vs. Level of Citations.

***i*10 Cited papers' Publication Period**	**Level of Citations**			**Total**	**Chi-square**	**p value**
	Low	**Moderate**	**High**			
1995-1999	10 (58.8%) [19.2%]	5 (29.4%) [6%]	2 (11.8%) [4.4%]	17 (100%) [9.4%]	13.93	0.030
2000-2006	5 (17.9%) [9.6%]	16 (57.1%) [19.3%]	7 (25%) [15.6%]	28 (100%) [15.6%]		
2007-2011	22 (24.2%) [42.3%]	40 (43.9%) [48.2%]	29 (31.9%) [64.4%]	91 (100%) [50.6%]		

2012-2016	15 (34.1%) [28.9%]	22 (50%) [26.5%]	7 (15.9%) [15.6%]	44 (100%) [24.4%]		
Total	**52 (28.9%) [100%]**	**83 (46.1%) [100%]**	**45 (25%) [100%]**	**180 (100%) [100%]**		

a) The value within ( ) refers to row percentage
b) The value within [ ] refers to column percentage

7. Discussion and Conclusion

Indian LIS journal coverage in WoS, Scopus and ICI database is very limited. So Google Scholar is the only viable option for citation analysis of Indian LIS journals. Although there is criticism of GS in terms of currency, accuracy and coverage, it is still the only viable option for citation analysis of Indian LIS journals[5]. Based on analysis of the *i*10 cited papers of the DJLIT journal in the GS and based on the authorship pattern and citation level study of *i*10 cited papers of DJLIT journal, the research article entitled 'Information literacy: Essential skills for the information age' by the author M B Eisenberg appears to be the most cited paper (cited 302 times) in GS. As of the time of writing this article it has reached 738 citations (May 2019). An exponential growth of citations can be seen for this article. It means that this paper has achieved a milestone as stated by Tarazona et al[8]. Theoretically the quality of the above paper is reflected by its acknowledgement within the LIS scholarly community through its high number of citations. A research article having more than 400 citations is considered as a classic publication[9]. Thus the above paper is a classic paper in the field of LIS. This emphasizes the impact of the subject of the article, its quality and its relevance to research in LIS subject field. Publications which received 100 or more citations can also be regarded as 'classic paper'[10]. Thus the other classic paper is the 'Bibliometric study of literature on bibliometrics' by SK Patra, P Bhattacharya, N Verma (108 citations).

The number of papers in various citation range patterns shows that as citation range increases there is a decrease in the number of cited papers in that range. The marginal difference is also high in the citation range patterns. Though the journal started publication in 1987, no articles published during the period 1987-1994 were cited more than 10 times. The articles published from the year 1995-2016 only received *i*10 citations.

Multi-authored papers have got 40 or more citations in GS. So it is found that generally two or more-authored articles are cited more than 40 or more times than the single-authored articles. So the finding of the study conducted by Patra[5] is relevant here also. His study found that collaborative research is more cited and perhaps more relevant than the single authored articles. Based on the findings he also recommended that Indian LIS researchers should focus more on collaborative research for better visibility and relevance.

Publication year of the articles has an effect on its citations. It is a general concept that older the publication year better the chances of getting more citations as compared to the recently published papers. Contrary to this there are only 45 papers published during 1995-2006 that are included in the *i*10 cited list. 91 papers published during the period 2007-2011 and 44 papers published during 2012-2016 (total 135 papers) were cited 10 or more times. More number of articles published after 2007 have found a place in the *i*10 cited list. Recently published articles have only a limited chance of getting *i*10 citations. There is no article published in the years 2017 and 2018 cited 10 or more times.

Thus Google Scholar is the only viable possibility for citation analysis of DJLIT journal. Google Scholar is thus a powerful tool to search relevant literature in LIS. It is also a fantastic tool to track one's own citation impact. It is up-to-date and has a broad coverage. Google Scholar has emerged as a third alternative to the two well-known citation databases, the Web of Knowledge and Scopus. The free availability of Google Scholar and its extensive coverage is being looked at by scholars for evaluative studies despite its many limitations.

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