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Ghouse Modin N. Mamdapur Mr.
Synthite Industries Ltd.

Iqbalahmad U. Rajgoli Dr.
Indian Space Research Organisation HQ.

Santosh M. Chavan Mr.
Karnatak University, Dharwad, smchavan14@gmail.com

Kiran S. Khamitkar Mr.
Accenture Services Pvt. Ltd., kiran.khamitkar@live.com

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Bibliometric Portrait of SRELS Journal of Information Management for the Period 2004-2013

Ghouse Modin N. Mamdapur

Scientist – Information & Documentation
Synthite Industries Limited, Synthite Valley,
Kolenchery, Kerala – 682 311
E-Mail: ghouse@synthite.com

Iqbalahmad U. Rajgoli*

Scientist/Engineer – SC, Library & Documentation,
ISRO Headquarters, Antariksh Bhavan, New BEL Road,
Bangalore, Karnataka – 560 094
E-Mail: iqbal786@isro.gov.in

Santosh M. Chavan

Research Scholar
Department of Library and Information Science
Karnatak University, Dharwad,
Dharwad, Karnataka – 580 003
E-Mail: smchavan14@gmail.com

Kiran S. Khamitkar

Associate (Librarian)
Accenture Services Pvt. Ltd., IBC Knowledge Park,
No. 4/1, Bannerghatta Main Road, Bangalore, Karnataka – 560 029
E-Mail: kiran.khamitkar@live.com

Abstract:

Analyse articles in SRELS journal of information management published during the years 2004-2013 and to study the key dimensions of its publication trends. For this study 10 volumes containing 48 issues have been taken up for evaluation. Necessary bibliometric measures are applied to analyse different publication parameters. In all 499 articles are published with an average 49 articles each year. The collaborative measures are calculated as per Ajiferuke et al (0.35), Lawani (2.28) and Subramanyam (0.65). The average author per article is 1.83 for 499 articles. Lotka's law is tested and conforms to a value of $n=2.27$. There are 6224 citations found appended to 499 articles during the period 2004-2013. Journals (44.49%) are the top form of source used by authors followed by books (22.51%) and web pages (15.60%). Ranked list of prolific authors and ranked list of journals is prepared and presented in respective tables. Khaiser Nikam and MP Satija have topped the ranked list of prolific authors with 11 articles each. SRELS Journal of Information Management topped the ranked list of journals with 197 (7.11%) citations. Among different countries contributing to this journal, authors from India (94.75%) have made maximum contributions. Authors from Karnataka (43.59%) have contributed majority of articles among Indian States. Bradford's Law of Scattering is verified through Leimkuhler model and found fitting the data.

Keywords: Bibliometrics, Lotka's law, Bradford's law, Authorship Pattern, Collaboration Measures, Author Productivity

1. Introduction:

Journals are no doubt the most preferred source of information in any field of research due to the nascent information that they carry and faster delivery of research output. But the increasing subscription rates and budget constraints forcing libraries to select and subscribe only the popular journals from the huge number of journals published in different subject fields. Bibliometrics and citation analysis have emerged as the important tools for selection of popular journals in any area of research or subject. As Zafrunnisha (2012) explains, bibliometric techniques are being used for a variety of purposes such as determination of various scientific indicators, evaluation of scientific output, selection of journals for libraries and even forecasting the potential of a particular field. Anyi et al (2009) are of the opinion that bibliometric analysis of single journal creates the portrait of that journal and indicates the quality, maturity and productivity of the journal in any field, in a country or region. It also informs us about the research orientation that it supports to disseminate and its influence on author's choice as a channel to communicate or retrieve information for their research needs. Taking these advantages of presenting bibliometric portrait of journals, SRELS Journal of Information Management is selected for this study. SRELS Journal of Information Management has emerged as one of the highly regarded journal in the field of library and information science in India. In this study an attempt is made to examine the characteristics and present the bibliometric portrait of SRELS Journal of Information Management.

2. Source Journal:

Sarada Ranganathan Endowment for Library Science has been publishing the quarterly journal 'Library Science with a slant to Documentation' since 1964. It was founded by Dr. S. R. Ranganathan. The title of the journal was changed to "Library Science with a slant to Documentation and Information Studies" from Vol.25 in 1988 and to "SRELS Journal of Information Management" from Vol.37 (2000). The journal has been publishing scholarly articles and articles of practical use in the fields of library and information science and services. SRELS Journal of Information Management is published bi-monthly (6 issues per year) since from 2010. Journal has well defined guidelines for authors to submit articles and is peer reviewed by the board of editors. Beginning 2014, the journal is published by Informatics Publishing Limited, Bangalore. From 2015 onwards, manuscripts have to be submitted online and the entire review process will be electronic.

3. Objectives of the Study:

The objectives of the study are as follows:

- To map year-wise distribution of articles
- To find the average length of articles
- To examine the authorship pattern of the contributions
- To study author productivity
- To study the range and percentage of references per article
- To study different types of resources used and number of citations appended
- To study different collaboration measures
- To identify and prepare ranked list of authors and journals

- To identify and prepare geographical list of contributions and State-wise list of Indian contributions
- To study Lotka's law of scientific productivity
- To study Bradford's law of scattering

4. Methodology:

The data required for the study was collected from both print and electronic version of the journal for the period 2004-2013. The references appended to each article were carefully scanned and tabulated in respective tables using Microsoft Excel. The details regarding number of articles published, author names and affiliations are recorded for each article. Citation analysis technique and required bibliometric measures are applied.

5. Analysis of Data:

Following section discusses the analysis of the data collected and presented under different table headings as per the objectives of the study.

5.1 Distribution of Contributions:

Table-1 depicts the number of articles published during the period 2004-2013. In all, 499 articles are published during the period 2004-2013. The study shows that the highest number of 70 papers are published in the year 2013 followed by 65 papers in the year 2012 and 63 papers in the year 2011. The lowest number of 35 papers published in the 2006 followed by 36 papers in the year 2005. The journal on an average published 10 papers per issue. The number of papers published each year is not consistent and there is sudden rise in the number of papers in the years 2010-2013. This could be because of the fact that the journal's frequency is changed from Quarterly to Bi-Monthly from 2010.

Table-1: Volume-wise distribution of contributions				
Year	Vol. No.	Issues	Total Publications	%
2004	41	4	38	7.62
2005	42	4	37	7.41
2006	43	4	35	7.01
2007	44	4	36	7.21
2008	45	4	49	9.82
2009	46	4	44	8.82
2010	47	6	62	12.42
2011	48	6	63	12.63
2012	49	6	65	13.03
2013	50	6	70	14.03
10 Years	10 Volumes	48 Issues	499 Articles	100.00

5.2 Length of Articles:

The length of the articles is shown in Table-2 where it is found that 253 (50.70%) articles had page length in the range of 6-10 pages followed by 130 (26.10%) in the page range of 10-15 pages. There are 4 (0.80%) articles having more than or equal to 31 pages. An article published in the year 2013 has the maximum page length of 42 pages.

Year	0-5	6-10	10-15	16-20	21-25	26-30	>=31	Total
2004	2	19	13	4	0	0	0	38
2005	4	15	3	7	5	3	1	37
2006	1	14	15	4	1	0	0	35
2007	3	16	11	2	2	2	0	36
2008	4	31	10	4	0	0	0	49
2009	2	27	10	4	0	1	0	44
2010	6	31	15	8	1	1	1	62
2011	5	35	12	9	2	0	0	63
2012	4	37	13	10	1	0	0	65
2013	3	28	28	7	0	2	2	70
Total	34	253	130	59	12	7	4	499
%	6.81	50.70	26.10	11.82	2.40	1.40	0.80	100.00

5.3 Authorship Pattern:

The authorship pattern is analysed to determine the percentage of single and multiple authors. From Table-3, it is revealed that single and two-authored contributions have dominated this journal. Single authored contributions accounts for 173 (34.70%), two authors are 258 (51.70%), three authors 54 (10.82%), four authors 9 (1.80%) and more than four authored papers are 5 (1.00%). In all, there are 326 (65.30%) multi- authored contributions during the study period.

Year	Vol. No.	Single	Two	Three	Four	Five	Six	Seven	Total
2004	41	17	19	1	1	0	0	0	38
2005	42	12	22	3	0	0	0	0	37
2006	43	10	18	5	1	0	0	1	35
2007	44	18	14	2	1	0	1	0	36
2008	45	16	27	5	1	0	0	0	49
2009	46	16	25	3	0	0	0	0	44
2010	47	18	31	10	3	0	0	0	62
2011	48	19	36	5	2	1	0	0	63
2012	49	23	32	8	0	2	0	0	65
2013	50	24	34	12	0	0	0	0	70
Total		173	258	54	9	3	1	1	499
%		34.70	51.70	10.82	1.80	0.60	0.20	0.20	

5.4 Author Productivity:

Yoshikane et al (2009) in their paper published in Scientometrics journal have given a formula to calculate Average Author Per Paper (AAPP) and Productivity Per Author. The formula is mathematically represented as below:

$$\begin{aligned} \text{Average Author Per Paper} &= \text{No. of Authors/No. of Papers} \\ \text{Productivity Per Author} &= \text{No. of Papers/No. of Authors} \end{aligned}$$

Table-4 depicts the data pertaining to author productivity and average author per paper. It is revealed from Table-4 that the average authors per article is 1.83 for 499 articles published during the period 2004-2013. It is also clear from above Table-4 that for the years 2008 & 2013 equal average number of authors per article is recorded i.e., 1.82.

The average productivity per author is 0.55 and ranges between 0.49-0.61 for the period 2004-2013. The years 2008 and 2013 have recorded equal productivity per author i.e., 0.55 and it is highest for the year 2004.

Year	Total Number of papers	Total numbers of Authors	AAPP	Productivity per author
2004	38	62	1.63	0.61
2005	37	65	1.76	0.57
2006	35	72	2.06	0.49
2007	36	62	1.72	0.58
2008	49	89	1.82	0.55
2009	44	75	1.71	0.59
2010	62	122	1.96	0.51
2011	63	119	1.88	0.53
2012	65	121	1.86	0.54
2013	70	128	1.82	0.55

5.5 Lotka's Law of Scientific Productivity:

Lotka's Inverse Square Law of Scientific Productivity describes the frequency of publication by authors in any given field/subject. It states that the number of authors producing n contributions is approximately equal to $1/n^2$ of the number of authors that produce only one contribution. For example if Sixty authors out of One Hundred in a subject area produce only one paper, then Fifteen out of One Hundred will produce two papers, Seven out of One Hundred three papers and so on. Lotka's Law is mathematically expressed as:

$$Y_x = \frac{C}{X^n}$$

Where, Y is the number of authors credited with X (1, 2, 3, 4.....) papers

C is the number of authors contributing one paper

And n is rate

$$X^n * Y_x = C \quad (\text{Where } X = 1)$$

$$\text{i.e., } 1 * 397 = C \quad (\text{C} = 397, \text{ number of authors contributing one paper})$$

When $X=2$

$$2^n * 82 = C \quad (\text{C} = 397)$$

$$2^n = 397/82 = 4.84 \quad (\text{by applying log})$$

$$n \log(2) = \log(4.84)$$

$$n = \log(4.84) / \log(2) \quad (\text{Where } \log(4.84) = 0.684 \text{ \& } \log(2) = 0.301)$$

$$n = 2.27$$

Therefore,

When $Y = 1$	$Y_1 = C/X^n$	$397/1^{2.27}$	$= 397/1$	$= 397$
When $Y = 2$	$Y_2 = C/X^n$	$397/2^{2.27}$	$= 397/4.82$	$= 82$
When $Y = 3$	$Y_3 = C/X^n$	$397/3^{2.27}$	$= 397/12.11$	$= 32$
When $Y = 4$	$Y_4 = C/X^n$	$397/4^{2.27}$	$= 397/23.26$	$= 17$
When $Y = 5$	$Y_5 = C/X^n$	$397/5^{2.27}$	$= 397/38.60$	$= 10$
When $Y = 6$	$Y_6 = C/X^n$	$397/6^{2.27}$	$= 397/58.40$	$= 06$
When $Y = 7$	$Y_7 = C/X^n$	$397/7^{2.27}$	$= 397/82.87$	$= 04$
When $Y = 8$	$Y_8 = C/X^n$	$397/8^{2.27}$	$= 397/112.21$	$= 03$
When $Y = 9$	$Y_9 = C/X^n$	$397/9^{2.27}$	$= 397/146.60$	$= 02$
When $Y = 10$	$Y_{10} = C/X^n$	$397/10^{2.27}$	$= 397/186.21$	$= 02$
When $Y = 11$	$Y_{11} = C/X^n$	$397/11^{2.27}$	$= 397/231.19$	$= 01$

In order to study the Lotka's law of scientific productivity, following table is prepared.

No. of Articles, X	No. of Authors (Observed)	Observed %	No. of Authors (Expected)	Expected %
1	397	71.28	397	71.40
2	82	14.72	82	14.75
3	29	5.20	32	5.75
4	18	3.23	17	3.06
5	18	3.23	10	1.80
6	3	0.54	6	1.08
7	2	0.36	4	0.72
8	4	0.72	3	0.54
9	1	0.18	2	0.36

10	1	0.18	2	0.36
11	2	0.36	1	0.18
	557	100.00	556	100.00

In the present study 557 authors have contributed 499 articles during the period 2004–2013. There are 397 (71.28%) authors contributing one article, 82 (14.72%) authors contributing two articles, 29 (5.20%) authors contributing 3 articles, 18 (3.23%) authors contributing 4 & 5 articles and so on.

To calculate the value of n, data from observed authors is used and is found to be 2.27 i.e., n=2.27. It is clear from Table-5 that the observed and expected authors are nearly same with n=2.27. Author productivity pattern of SRELS Journal of Information Management conform Lotka’s law at a value of n=2.27.

5.6 Collaboration Measures:

In order to compare the extent of collaboration in two fields or to show the trend towards multiple authorships, Ajiferuke et al (1983) have proposed a measure called “Collaboration Coefficient” which incorporates the merits of Collaboration Index (CI) of Lawani (1980) and Degree of Collaboration (DC) of Subramanyam (1983).

Suppose, if a paper has a single author, the author receives one credit; if two, each receives ½ credit, and in general, if there are ‘n’ number of authors, each of them receives 1/n credits. Hence, the average credit awarded to each author of a random paper is E [1/n], a value which lies between 0 and 1. If ‘0’ is to correspond to single authorship, then the collaborative co-efficient is defined as:

$$CC = \frac{1 - \frac{f_1 + (1/2)f_2 + (1/3)f_3 + \dots + (1/k)f_k}{N}}{N}$$

Where

F_j = the number of j-authored papers published in a discipline during a certain period of time.

N = the total number of research papers published in a discipline during a certain period of time.

K = the greatest number of authors per paper in a discipline.

Year	Single	Two	Three	Four	Five	Six	Seven	Total	CI	DC	CC
2004	17	19	1	1	0	0	0	38	2.14	0.55	0.28
2005	12	22	3	0	0	0	0	37	2.12	0.67	0.35
2006	10	18	5	1	0	0	1	35	2.48	0.71	0.40
2007	18	14	2	1	0	1	0	36	2.44	0.50	0.28
2008	16	27	5	1	0	0	0	49	1.70	0.67	0.36
2009	16	25	3	0	0	0	0	44	2.11	0.64	0.33
2010	18	31	10	3	0	0	0	62	2.36	0.71	0.40

2011	19	36	5	2	1	0	0	63	2.27	0.69	0.38
2012	23	32	8	0	2	0	0	65	2.33	0.65	0.35
2013	24	34	12	0	0	0	0	70	2.26	0.66	0.36

Note: CI – Collaboration Index; DC – Degree of Collaboration; CC – Collaboration Coefficient

The Collaboration Index of Lawani is mathematically expressed as:

$$\text{Collaboration Index (CI)} = \frac{\text{Total Authors}}{\text{Total Joint Papers}}$$

Hence, Collaboration Index for the period 2004-2013 for SRELS Journal of Information Management is 2.28.

The Degree of Collaboration of Subramanyam is mathematically expressed as:

$$\text{Degree of Collaboration (DC)} = \frac{Nm}{Nm+Ns}$$

Where,

Nm = No. of Multi-author publications during a specific period in a discipline

Ns = No. of single-authored publications in a discipline during a given period of time

Hence, Degree of Collaboration for the period 2004-2013 for SRELS Journal of Information Management is 0.65.

The Collaboration Coefficient for the period 2004-2013 for SRELS Journal of Information Management is 0.35.

5.7 Year-Wise Appearance of Citations:

During the publication period of 2004-2013, in all 6,224 citations were found appended to 499 articles. From Table-7 it is clear that highest number of 1156 (18.57%) citations were appended in the year 2013, followed by 880 (14.14%) citations in the year 2010. The year 2005 recorded least number of citations i.e., 323 (5.19%). The average number of citations per paper is more than 12 (i.e., 12.47). This also shows that authors have used and cited different types of resources in their articles.

Year	No. Citations	%
2004	376	6.04
2005	323	5.19
2006	387	6.22
2007	461	7.41

2008	539	8.66
2009	492	7.90
2010	880	14.14
2011	817	13.13
2012	793	12.74
2013	1156	18.57
	6,224	

5.8 Distribution of Citations:

Table-8 presents data on the range and percentage of references per articles. It is clear from Table-8 that, out of 499 articles published during the period 2004-2013, 11 (2.20%) articles didn't have any cited references. The articles having references ranging from 6-10 form the largest group i.e., 175 (35.07%) and articles having references ranging from 31-35 form the lowest group i.e., 10 (2.00%). An article published in the year 2013 had 174 cited references.

Year	0	1-5	6-10	11-15	16-20	21-25	26-30	31-35	>=36	Total
2004	2	11	13	2	6	2	1	1	0	38
2005	2	10	12	8	4	1	0	0	0	37
2006	0	6	16	5	4	2	2	0	0	35
2007	0	7	11	7	4	4	1	1	1	36
2008	1	18	11	7	4	4	1	0	3	49
2009	1	14	14	9	3	0	0	0	3	44
2010	1	8	21	13	9	2	1	3	4	62
2011	1	14	19	13	5	4	2	2	3	63
2012	2	10	29	8	8	2	2	1	3	65
2013	1	6	29	13	6	5	3	2	5	70
Total	11	104	175	85	53	26	13	10	22	499
%	2.20	20.84	35.07	17.03	10.62	5.21	2.61	2.00	4.41	

5.9 Form-Wise Distribution of Citations:

Table-9 gives the year-wise break-up of various forms of resources used by the authors. Among the cited references, journals 2,769 (44.49%) are the heavily used resources followed by books 1401 (22.51%). Journal articles carry nascent information which could be the reason for highly preferred source of information among the authors contributing to this journal. Many of the bibliometric studies on single journals have proved journal articles as the most preferred choice of resource by the authors. Web pages 971 (15.60%) are also increasingly used by the authors. There are 7.73% of conference papers and 2.92% of reports cited by the authors. The other type of resources such as thesis and dissertations, reference materials, blogs, standards, newspapers etc. have least attracted the attention of the authors and accounted only 6.75% of total citations.

Table-9: Form-wise distribution of citations

Type	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	Total	%
Journals	112	110	127	179	259	162	409	389	344	678	2769	44.49
Books	119	76	120	153	107	140	124	138	217	207	1401	22.51
Web Pages	92	69	70	60	77	86	177	146	79	115	971	15.60
Conf. Proc.	21	34	48	35	37	55	63	52	56	80	481	7.73
Reports	9	14	10	7	9	20	41	20	30	22	182	2.92
Others	23	20	12	27	50	29	66	72	67	54	420	6.75
Total	376	323	387	461	539	492	880	817	793	1156	6224	100.00

5.10 Ranked List of Prolific Authors:

Table-10 depicts the list of prolific authors who have contributed at least 5 or more articles during the study period. There are 915 authors (each author is given one point, thus multiple authorship articles were given multiple data entries) contributing 499 articles to SRELS Journal of Information Management during the period 2004-2013. The most leading authors are Khaiser Nikam and MP Satija with 11 articles each followed by KM Krishna with 10 articles and Mahesh V Mudhol with 9 articles. There are 4 authors contributing 8 articles each and 2 authors have contributed 7 articles each followed by 3 authors contributing 6 articles each. Five articles have been contributed by 18 authors. As many as 29 authors have contributed 3 articles each, 82 authors have contributed 2 articles each and 397 authors have contributed 1 article each during the period 2004-2013.

Table-10: Ranked list of prolific authors

Sl. No.	Name of the Author	Total Papers	Rank
1	Khaiser Nikam	11	1
2	Satija M P	11	1
3	Krishna K M	10	2
4	Mahesh V Mudhol	9	3
5	Amritpal Kaur	8	4
6	Chandrashekara M	8	4
7	Kannappanavar B U	8	4
8	Lalitha K Sami	8	4
9	Mallinath Kumbar	7	5
10	Tadasad P G	7	5
11	Kademani B S	6	6
12	Sarasvathy P	6	6
13	Sen B K	6	6
14	Ally Sornam S	5	7
15	Anil Kumar	5	7
16	Balasubramanian P	5	7
17	Biradar B S	5	7
18	Harinarayana N S	5	7
19	Konnur P V	5	7

20	Kumar S	5	7
21	Mulla K R	5	7
22	Panda K C	5	7
23	Pijushkanti Panigrahi	5	7
24	Ramasesh C P	5	7
25	Ramesh Gandhi R T D	5	7
26	Raymond Wafula Ongus	5	7
27	Saravanan T	5	7
28	Suresh Jange	5	7
29	Swapna Banerjee	5	7
30	Thirumagal A	5	7
31	Vijai Kumar	5	7
32	18 authors contributing 4 each	72	8
33	29 authors contributing 3 each	87	9
34	82 authors contributing 2 each	164	10
35	397 authors contributing 1 each	397	11
		915	

5.11 Geographical Distribution of Contributions:

An attempt has been made to study the geographical distribution of contributions. It is revealed from Table-11 that majority of contributors are from India with 867 (94.75%) contributors followed by Kenya and USA with 10 (1.09%) contributions and Sri Lanka with 4 (0.43%) contributions. Authors from Canada, Germany, Thailand, UAE, West Indies, Iran, UK, Italy, Belgium, Saudi Arabia, Bangladesh, France and China have also contributed articles to this journal. Authors from 17 countries have published their research in SRELS Journal of Information Management.

Country	Total	%	Rank
India	867	94.75	1
Kenya	10	1.09	2
USA	10	1.09	2
Sri Lanka	4	0.43	3
Canada	3	0.33	4
Germany	3	0.33	4
Thailand	2	0.22	5
UAE	2	0.22	5
West Indies	2	0.22	5
Iran	2	0.22	5
UK	2	0.22	5
Italy	2	0.22	5
Belgium	2	0.22	5

Saudi Arabia	1	0.11	6
Bangladesh	1	0.11	6
France	1	0.11	6
China	1	0.11	6
Total	915	100.00	

5.12 State-Wise Distribution of Indian Contributions:

An attempt is also made to study the contributions made by the authors of different States of India. It is revealed from Table-12 that majority of contributors are from Karnataka with 378 (43.59%) contributions followed by Tamil Nadu with 80 (9.23%) and West Bengal with 72 (8.31%) contributions. Least number of papers have been contributed by Himachal Pradesh with 1 (0.12%) contribution followed by Assam, Pondicherry and Uttaranchal with 2 (0.23%) contributions each.

State	Total	%	Rank
Karnataka	378	43.59	1
Tamil Nadu	80	9.23	2
West Bengal	72	8.31	3
Maharashtra	64	7.38	4
Kerala	43	4.96	5
Punjab	38	4.38	6
Uttar Pradesh	33	3.81	7
Delhi	30	3.46	8
Madhya Pradesh	24	2.77	9
Andhra Pradesh	22	2.54	10
Gujarat	18	2.08	11
Rajasthan	13	1.50	12
Orissa	11	1.27	13
Jammu & Kashmir	10	1.15	14
Haryana	6	0.69	15
Chandigarh (UT)	6	0.69	15
Chhattisgarh	4	0.46	16
Uttarakhand	4	0.46	16
Jharkhand	4	0.46	16
Assam	2	0.23	17
Pondicherry	2	0.23	17
Uttaranchal	2	0.23	17
Himachal Pradesh	1	0.12	18
Total	867	100.00	

5.13 Ranked List of Journals:

Table-13 provides the rank list of top 20 journals preferred by the authors during the publication phase of 2004-2013 of SRELS Journal of Information

Management. The 2769 articles in journals are scattered in 643 journals. The top 20 journals accounted for almost 50.52% of total 2769 journal citations. SRELS Journal of Information Management has emerged as the most preferred journal among the authors contributing to it with 197 (7.11%) citations. There are three Indian journals among top five journals.

Table-13: Ranked list of journals

Sl. No.	Name of the Journal	No. of Articles	%	Rank
1	SRELS Journal of Information Management	197	7.11	1
2	Annals of Library and Information Studies	152	5.49	2
3	Scientometrics	121	4.37	3
4	Journal of Documentation	83	2.99	4
5	DESIDOC Journal of Library and Information Technology	82	2.96	5
6	IASLIC Bulletin	73	2.63	6
7	Journal of the American Society for Information Science	58	2.10	7
8	Library Trends	55	1.98	8
9	Journal of Information Science	52	1.88	9
10	Information Studies	43	1.55	10
11	The Electronic Library	43	1.55	10
12	D-Lib Magazine	37	1.33	11
13	Library Management	37	1.33	11
14	Library Philosophy and Practice	36	1.30	12
15	ILA Bulletin	35	1.26	13
16	Library Herald	35	1.26	13
17	Library Review	35	1.26	13
18	The Journal of Academic Librarianship	35	1.26	13
19	College and Research Libraries	33	1.19	14
20	Malaysian Journal of Library and Information Science	31	1.12	15
21	ASLIB Proceedings	27	0.97	16
22	Information Research	22	0.79	17
23	COLLNET Journal of Scientometrics and Information Management	21	0.76	18
24	Herald of Library Science	20	0.72	19
25	Bulletin of the Medical Library Association	18	0.65	20
26	Library Hi Tech	18	0.65	20
	2 Journals with 17 Articles	34		
	2 Journals with 16 Articles	32		
	5 Journals with 15 Articles	75		
	4 Journals with 14 Articles	56		
	3 Journals with 12 Articles	36		

1 Journal with 11 Articles	11		
5 Journals with 10 Articles	50		
6 Journals with 9 Articles	54		
3 Journals with 8 Articles	24		
7 Journals with 7 Articles	49		
11 Journals with 6 Articles	66		
12 Journals with 5 Articles	60		
34 Journals with 4 Articles	136		
35 Journals with 3 Articles	105		
95 Journals with 2 Articles	190		
392 Journals with 1 Article	392		
643 Journals	2769		

5.14 Bradford's Law of Scattering:

Bradford's law of scattering was first formulated by Samuel Clement Bradford and coined so by BC Vickery is a bibliometric law. Bradford's law of scattering states that one could assume "that the bulk of the papers on a specific subject would be published in a few journals specially devoted to that subject or to the major subject of which it forms a part, together with certain border-line journals and some more general periodicals." Bradford's law of scattering indicating three productive zones where the number of journals published increased from one zone to the next according to the expression $1:n:n^2:n^3$ Accordingly considering this expression into the present study, the total 2769 journal citations are divided into three groups as presented in Table-15.

Table-14: Citation trend of journals

Rank	No. of Citations	No. of Journals	Cumulative Journals	Cumulative Journal %	Cumulative Citations	Cumulative Citations %
1	197	1	1	0.155	197	7.11
2	152	1	2	0.311	349	12.60
3	121	1	3	0.466	470	16.97
4	83	1	4	0.622	553	19.97
5	82	1	5	0.777	635	22.93
6	73	1	6	0.933	708	25.57
7	58	1	7	1.088	766	27.66
8	55	1	8	1.244	821	29.65
9	52	1	9	1.399	873	31.53
10	86	2	11	1.711	959	34.63
11	74	2	13	2.022	1033	37.30
12	36	1	14	2.177	1069	38.60
13	140	4	18	2.799	1209	43.66
14	33	1	19	2.955	1242	44.85
15	31	1	20	3.110	1273	45.97
16	27	1	21	3.266	1300	46.95

17	22	1	22	3.421	1322	47.74
18	21	1	23	3.577	1343	48.50
19	20	1	24	3.732	1363	49.22
20	36	2	26	4.043	1399	50.52
21	34	2	28	4.354	1433	51.75
22	32	2	30	4.665	1465	52.91
23	75	5	35	5.443	1540	55.61
24	56	4	39	6.053	1596	57.64
25	36	3	42	6.532	1632	58.94
26	11	1	43	6.687	1643	59.33
27	50	5	48	7.465	1693	61.14
28	54	6	54	8.398	1747	63.09
29	24	3	57	8.864	1771	63.96
30	49	7	64	9.953	1820	65.73
31	66	11	75	11.664	1886	68.11
32	60	12	87	13.530	1946	70.28
33	136	34	121	18.820	2082	75.19
34	105	35	156	24.261	2187	78.98
35	190	95	251	39.036	2377	85.84
36	392	392	643	100.00	2769	100.00
	2769	643				

Zone	No. of Journals	No. of Citations	% of Citations	k
1	11	959	34.63	-
2	64	927	33.48	5.82
3	568	883	31.89	8.90
	643	2769	100.00	Mean \approx 7.36

It is clear from Table-15 that the first zone contained 11 journals with 959 citations which is the nuclear zone and journals falling in this zone are called core journals. The second quantum of 927 citations forming the second zone are contained in approximately in next 64 journals which is the first peripheral zone around the nucleus and journals falling in this zone are known as allied journals. The third or last quantum of 883 citations forming the third zone are contained in next 568 journals, which is second peripheral zone around the first peripheral zone and journals falling in this zone are known as alien journals. The summary of division of zones is as below:

- Zone 1: Top 11 journals that produced 959 (34.63%) citations
- Zone 2: Next 64 journal that produced 927 (33.48%) citations
- Zone 3: Next 568 journals that produced 883 (31.89%) citations

According to Bradford's law, the zones, thus identified will form an approximately geometric series in the form 1:n:n². The relationship of each zone in

the present study is 11:64:568. Here, 11 denote the number of journals in the nucleus and the mean Bradford multiplier is 7.36.

$$\text{Hence, } 11:11*7.36:11*(7.36)^2 \\ 11:80.96:595.86 >> 687.82$$

$$\text{The Percentage of Error} = \frac{687.82-643}{643} * 100 = 6.97\%$$

It is clear that Percentage of Error is high and hence the data will not fit Bradford's Law.

5.15 Verification of Bradford Law through Leimkuhler Model:

The Leimkuhler (1967) model is applied to verify Bradford's Law of scattering. In this study both Bradford's as well as Leimkuhler's models are tested to verify the scattering of literature in SRELS Journal of Information Management. Leimkuhler model expressed in the form of verbal formulation of Bradford's law as:

$$R(r) = a \log(1+br) \quad \text{where, } R(r) = \text{cumulative number of articles contributed by journals of rank } 1, 2, 3, \dots, r$$

Egghe⁸ explained Leimkuhler model as:

$$a = Y_0 / \log K$$

$$b = k-1 / r_0$$

r_0 = number of journals in Bradford's first group

k = Bradford's multiplier

a and b are the constants appearing in Leimkuhler model.

For calculating Bradford Multiplier, Egghe (1990) has given a mathematical expression as:

$$k = (e^\gamma * y_m)^{1/p}$$

$$\gamma = 0.5772 \text{ (Euler's number)}$$

$$e = 2.718 \text{ (constant)}$$

$$e^\gamma = 1.781$$

$$p = 3$$

$$y_m = \text{number of articles in the most productive journal (197 in this study)}$$

$$k = (1.781 * 197)^{1/3}$$

$$k = 7$$

$$r_0 = T(k-1) / (k^p-1) \quad r_0 = \text{number of journals in Bradford's first zone}$$

$$T = \text{Total number of journals in Bradford zone}$$

$$r_0 = 643(7-1) / (7^3-1)$$

$$r_0 = 11.30$$

$$r_1 = r_0 * k = 11.30 * 7 = 79.10$$

$$r_2 = r_0 * k^2 = 11.30 * 7^2 = 553.70$$

$$y_0 = A / p \quad y_0 = \text{number of articles in every Bradford zone}$$

$$y_0 = 2769 / 3 = 923$$

$$a = y_0 / \log(k) = 923 / \log(7) = 923 / 0.845 = 1092$$

$$b = (k-1) / r_0 = (7-1) / 11.30 = 6 / 11.30 = 0.53$$

Therefore, the Bradford's distribution is written as:

Table-16: Scattering of journals and citations over Bradford's zones			
Zone	No. of Journals	No. of Citations	% of Citations
1	11	959	34.63
2	79	999	33.48
3	553	811	31.89
	643	2769	100.00

Hence, $11.30:11.30*7:11.30*7^2 = 11.30:79.10:553.70 >> 644.10$

Or, $11:79:553 >> 644$

$$\text{Percentage Error} = \frac{644-643}{643} * 100 = 0.15\%$$

Hence, it can be noted from above calculations that the percentage of error is very negligible and the Bradford's law fits very well in this data set. It can also be noted from Table-16 that the three zones are not exactly the $1/3^{\text{rd}}$ of total citations.

6. Findings and Conclusions:

In this study majority of bibliometric indicators have been studied and results are discussed and presented under different table headings. From the above discussions it can be concluded that SRELS Journal of Information Management has published papers mostly from Indian authors with few exceptions. During the publication phase of 2004-2013, total 499 articles have been published with 6224 citations appended to them. The journal self citation is 7.11% which brings it to the 1st rank in the ranked list of journals preferred by the authors. Authors have mainly depended on journals (44.49%) and books (22.51%) as their preferred choice of information sources. The shift from print to electronic and the authors' choice of

electronic resources has made Web Pages (15.60%) as other important source of information. Nearly 51.00% of articles have a page range of 6-10 pages. Pattern of authorship of articles indicates that the highest contributions are two-authored (51.70%) followed by single authored (34.70%). The collaborative measures are calculated as per Ajiferuke et al (0.35), Lawani (2.28) and Subramanyam (0.65). The distribution of journal citations confirms to Bradford's law of distribution through Leimkuhler model. This study has also highlighted the variety of bibliometric measures that can be used to understand the characteristics and present the portrait of a journal which in turn reflect the characteristics of the literature and the communication behaviour. Over a period of time, SRELS Journal of Information Management has emerged as one of important journal in the field of library and information and information science and a great communication tool for the library science professionals to publish their research.

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