Growth and Development of LIS Research in India during 1999-2013: A Bibliometric Analysis

Rabindra K. Maharana
National Institute of Science Education & Research
India
maharana.rabindra@gmail.com

Ashok Kumar Das
Utkal University
India
ashoook.139@gmail.com

ABSTRACT: The present study analyzes the growth and development of library and information science (LIS) research carried out by Indian researchers based on the publications indexed in Social Science Citation Index (SSCI) and analyses 140 documents with h-index of 7. It is found that the annual publications of Indian researchers range from 9 to 10 papers with 0.64 degree of collaboration. The most papers were published within the range between 6 to 10 pages and the majority of the publications were articles (125, 89.29%). Lotka's law of scientific productivity was used to determine authors' productivity during the period under study.

I. Introduction

India has witnessed a slow and steady growth of library and information science (LIS) education. The foundation of LIS education in India dates back to 1911 when W. A. Bordern started a short-term training program in Library Science. Since then, more than a hundred years have been passed. And LIS education at the university level has existed for more than six decades and built strong roots. More than fifty universities in India are currently offering LIS education at the university level. However, the growth and development in terms of research output by Indian LIS researchers is quite low.

The basic purpose of the present study is to analyze the LIS research output by Indian researchers which were indexed in *Social Science Citation Index (SSCI)* during the period of 1999-2013.

II. Objectives of the Study

The objectives of the study are as follows:

- To examine the growth and development of LIS research in India from 1999 to 2013;

- To calculate the *h-index* for LIS research in Asian countries;
- To determine the degree of collaboration and authorship patterns among Indian LIS researchers;
- To find out the most favored research journals in the Indian LIS research community;
- To identify the most prolific Indian contributors; and
- To reveal the geographical distribution of Indian LIS publications.

III. Literature review

Lahiri (1996) analyzed doctoral dissertations in LIS in India written in the period of 1957-1995. His research focus is on the types of work, growth patterns, and productivity in Indian universities.

In her study library and information science research trends in India, Mittal (2011) analyzed 1,408 papers published in the period of 1990-June 2010. Her study was limited to journal articles published by Indian researchers in English language only.

Ngulube (2010) explored the use of mixed methods research (MMR) in articles published in library and information science (LIS) journals in Sub-Saharan Africa (SSA) from 2004 to 2008.

In a bibliometric analysis of LIS research in India, Patra and Chand (2006) analyzed 3,396 records listed in LISA from 1967 to 2004 and found that *Herald of Library Science* was the most prolific journal and P. N. Kaula was the most prolific contributor.

Rana (2011) studied the research trends in library and information science in India with a focus on Punjab University, Chandigarh. He attempted to provide a comprehensive review of research works in the library and information science (LIS) discipline in India during the period of 1957-2009 in order to identify trends and patterns in doctoral research both at the national level and within the Department of Library and Information Science, Punjab University, Chandigarh.

Satija (1998) traced the history of LIS research in India. Apart from listing the major centers of research and research output, he discussed the research work done in different sub-fields in library and information science.

Wagh (2011) conducted an analytical study of Ph.D. programs in India. His study was confined to the Ph.D. dissertations in library and information science, accepted by India universities from 2004 to 2008. He found out that a total of 183 Ph.D. degrees in LIS were awarded during the period, that Dr. D. Rajayalakshmi advised most doctoral students (i.e., 10 in total), and that bibliometrics was the most favored research area among Indian LIS researchers.

IV. Research Methodology

For the purpose of the present study, data have been collected from *Social Science Citation Index (SSCI)*. *SSCI* is an interdisciplinary citation database and a product of Thomson Reuters Healthcare and Science Division. It was developed by the Institute for Scientific Information (ISI), Philadelphia from the *Science Citation Index*. *SSCI* database covers nearly 2,474 of

world's leading journals of Social Sciences across more than 50 disciplines and is made available online through the *Web of Science (WoS)* database. For retrieval of information, the advance search options of the *Web of Science* were used. "TS=library science*" was used as topic/subject, "CU=India" as authors address/affiliation, and "1999-2013" as the time span of the study. Further, it was refined to English language only. As a result, 140 documents that matched with the query were retrieved. These documents were entered into MS Excel in a logical and statistical order for further analysis.

V. Data Analysis and Discussion

1. Global LIS research during 1999-2013

Table 1 provides a detailed list of top 22 countries that have produced 85 or more LIS literature from 1999 to 2013 which were indexed in *Social Science Citation Index (SSCI)*. A total of 12,655 documents were published in English. Geographically, USA authors have contributed nearly half (5,921, 46.79%), followed by England (1,501, 11.87%), Canada (700, 5.54%), Australia (619, 4.89%), Scotland (243, 1.93%), China (233, 1.85%), Netherlands (228, 1.81%), Germany (200, 1.59%), Taiwan (178, 1.41%), and New Zealand (176, 1.39%). India stood at the 13th place in the list with 140 contributions (1.11%). China, Taiwan, and India were the only three Asian countries/regions among the top 22 country list.

Table 1. Global LIS Research during 1999-2013

Rank	Country	No. of Contributions	Percentage (%)
1	USA	5,921	46.79
2	England	1,501	11.87
3	Canada	700	5.54
4	Australia	619	4.89
5	Scotland	243	1.93
6	China	233	1.85
7	Netherlands	228	1.81
8	Germany	200	1.59
9	Taiwan	178	1.41
10	New Zealand	176	1.39
11	South Africa	160	1.27
12	Spain	156	1.23
13	India	140	1.11
14	Italy	131	1.04
15	Denmark	122	0.97
16	Wales	116	0.92
17	Sweden	103	0.82
18	Nigeria	89	0.71
19	Brazil	88	0.69
20	Finland	86	0.68
21	Belgium	85	0.67

21	South Korea	85	0.67
	Total	12,655	100.00

2. Publication details of Asian countries

The publication details of the three most productive LIS Asian countries/regions were listed in Table 2, which shows that China is the most prolific Asian country with 233 documents and *h-index* of 15, followed by Taiwan with 178 documents and *h-index* of 14. India stood at the 3rd place with 140 documents and h-index of 7 during the period under study.

Table 2. Publication Details of Asian Countries

Publication Details	China	Taiwan	India
Total results	233	178	140
Sum of times cited	2,254	780	279
Sum of times cited without self-citations	2,195	714	223
Citing articles	2,171	708	233
Citing articles without self-citations	2,133	662	203
Average citations per item	9.67	4.38	1.99
h-index	15	14	7

3. Distribution of LIS publications in India by year

The present study found a total of 140 publications contributed by Indian LIS researchers from 1999 to 2013. Table 3 provides a brief overview of LIS research published by Indian researchers, which shows that 2010 was most productive with 18 publications (12.86%) and that 2000 was least productive with 2 publications (1.43%). In 1999, only 3 (2.14%) documents were published but it has grown up more than four times in 2013. The highest annual growth percentage occurred in 2005 (75%) and the lowest in 2004 (-166.67%). The total annual average growth percentage is -3.71%.

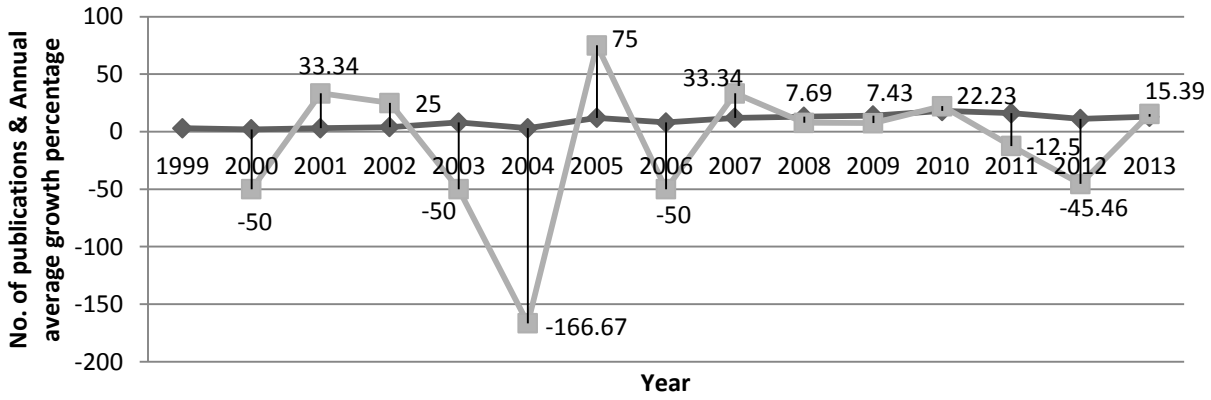
Table 3. Distribution of LIS Publications in Asia by Year

Year	No. of Publications	Percentage (%)	Annual Average Growth Rate (%)
1999	3	2.14	--
2000	2	1.43	-50
2001	3	2.14	33.34
2002	4	2.86	25
2003	8	5.71	50
2004	3	2.14	-166.67
2005	12	8.57	75
2006	8	5.71	-50
2007	12	8.57	33.34
2008	13	9.29	7.69
2009	14	10	7.15

2010	18	12.86	22.23
2011	16	11.43	-12.5
2012	11	7.86	-45.46
2013	13	9.29	15.39
Total	140	100	-3.71

Figure 1 illustrates the fluctuation of LIS literature published in India from 1999 to 2013. It shows a positive growth in 2001, 2002, 2003, 2005, 2007, 2008, 2009, 2010, and 2013; and a negative growth in 2000, 2004, 2006, 2011, and 2012.

Figure 1. Deatils of Publications



4. Publication types

Table 4 shows that the 140 publications contributed by Indian LIS researchers between 1999 and 2013 as identified in *WoS* belong to 4 document types. Journal articles were the most dominant document type, comprising of 125 (89.29%) of the total publications, followed by Reviews (8, 5.71%), Book Reviews (5, 3.57%), and Proceeding Papers (2, 1.43%).

Table 4. Publication Types

Document Type	**No. of Publications**	**Percentage (%)**
Journal Article	125	89.29
Review	8	5.71
Book review	5	3.57
Proceeding Paper	2	1.43
Total	140	100

5. Authorship patterns by year

Table 5 shows the details of the authorship patterns during the period under study. Publications by two authors (57, 40.71%) were most common, followed by single authors (51, 36.43%), three authors (26, 18.57%), and then four or more authors (6, 4.29%).

Table 5. Authorship Patterns by Year

Year	Single Author	Two Authors	Three Authors	≥Four or More Authors	Total
1999	3	--	--	--	3 (2.14)
2000	2	--	--	--	2 (1.43)
2001	2	--	--	1	3 (2.14)
2002	2	1	--	--	3 (2.86)
2003	5	1	2	--	8 (5.71)
2004	3	--	--	--	3 (2.14)
2005	6	5	1	--	12 (8.57)
2006	6	2	--	--	8 (5.71)
2007	6	3	3	--	12 (8.57)
2008	3	9	1	--	13 (9.29)
2009	3	7	3	1	14 (10)
2010	5	9	4	1	19 (12.86)
2011	3	6	6	1	16 (11.43)
2012	1	5	4	1	11 (7.86)
2013	1	9	2	1	13 (9.29)
Total	51 (36.43)	57 (40.71)	26 (18.57)	6 (4.29)	140 (100)

Note: Figures in parentheses denote percentage.

6. Lotka's law of scientific productivity

Lotka's inverse square law of scientific productivity has been widely used in bibliometric mapping of research output to determine the author's productivity. Lotka's law describes the frequency of publications by authors in any given field.

According to Wikipedia, Lotka's law

> describes the frequency of publication by authors in any given field. It states that the number of authors making n contributions is about $1/n^a$ of those making one contribution, where a nearly always equals two. More plainly, the number of authors publishing a certain number of articles is a fixed ratio to the number of authors publishing a single article. As the number of articles published increases, authors producing that many publications become less frequent. There are 1/4 as many authors publishing two articles within a specified time period as there are single-publication authors, 1/9 as many publishing three articles, 1/16 as many publishing four articles, etc. Though the law itself covers many disciplines, the actual ratios involved (as a function of 'a') are very discipline-specific.
>
> The general formula says:
>
> $$X^n Y = C$$
>
> or

$$Y = C/X^n,$$

where X is the number of publications, Y the relative frequency of authors with X publications, and n and C are constants depending on the specific field ($n \approx 2$).

Putting the value of X=1 and Y=51 (see Table 6), the calculation obtained was:

$1^n.51 = C$
$\Rightarrow 51 = C$

Putting the value of X=2, Y=57 and C=51, the calculation obtained was:

$2^n.57 = 51$
$\Rightarrow 2^n = 51/57$
$\Rightarrow n \log 2 = \log 0.894$
$\Rightarrow n(0.301) = 0.049$
$\Rightarrow n = 0.049/0.301$
$\Rightarrow n = 0.17$

Table 6 shows that 51 authors have contributed one publication, 57 authors have two, 26 authors have three, 4 authors have 4, and 1 author has 6 and 8 publications respectively. There are no publications written by 5 or 7 authors.

Table 6. Lotka's Law of Scientific Productivity

No. of papers	**No. of Authors (observed)**	**No. of Authors (expected with n=2)**	**No. of Authors (expected with n=3)**	**No. of Authors (expected with n=0.17)**
1	51	51	51	51
2	57	13	6	45
3	26	6	2	42
4	4	3	1	40
5	0	2	--	39
6	1	1	--	38
7	0	--	--	37
8	1	--	--	36

7. Author productivity

Table 7 shows that 273 authors contributed a total of 140 publications with an average of 1.95 authors per publication and 0.52 productivity per author. Further, it shows that out of 276 authors, 226 were geographically affiliated to India with an average of 1.62 authors per publication and 0.62 productivity per author.

Table 7. Author Productivity

Year	No. of Publications	No. of Authors	Total AAPD	Total PPC	Authors Affiliated to India	AAPD (India)	PPC (India)
1999	3	3	1	1	3	1	1
2000	2	2	1	1	2	1	1
2001	3	6	2	0.5	5	1.67	0.6
2002	4	7	1.75	0.58	6	1.5	0.67
2003	8	13	1.64	0.62	11	1.38	0.73
2004	3	3	1	1	3	1	1
2005	12	19	1.59	0.64	15	1.25	0.8
2006	8	10	1.25	0.8	9	1.13	0.89
2007	12	21	1.75	0.58	17	1.42	0.71
2008	13	24	1.85	0.55	20	1.54	0.65
2009	14	30	2.15	0.47	24	1.72	0.59
2010	18	36	2	0.5	29	1.62	0.63
2011	16	37	2.32	0.44	32	2	0.5
2012	11	29	2.64	0.38	23	2.1	0.48
2013	13	33	2.54	0.4	27	2.08	0.49
Total	140	273	1.95	0.52	226	1.62	0.62

Note: Average Authors Per Document (AAPD) = Number of authors/Number of documents. Productivity per contributor (PPC) = Number of documents/ Number of contributors.

8. Degree of collaboration

The degree of collaboration is calculated by using the following formula, which shows that the degree of collaboration "C" for the present study is 0.64. There are no collaborative publications in the year 1999, 2000, and 2004. And in 2012 and 2013, the degree of collaboration is maximum and nearly equals to 1, which means that there are few or negligible contributions by single authors (Table 8).

The extent of collaboration in research can be measured with the help of the formula:

$$\textbf{\textit{Degree of collaboration}}\ (\boldsymbol{C}) = \frac{\boldsymbol{N_M}}{\boldsymbol{N_M + N_S}}$$

Where, C= Degree of Collaboration
N_M = Number of multiple authors
N_S = Number of single authors

Table 8. Degree of Collaboration

Year	Single authored documents (N_S)	Multiple authored documents (N_M)	N_M+N_S	Degree of Collaboration (C)
1999	3	--	3	--
2000	2	--	2	--
2001	2	1	3	0.34

2002	2	2	4	0.5
2003	5	3	8	0.38
2004	3	--	3	--
2005	6	6	12	0.5
2006	6	2	8	0.25
2007	6	6	12	0.5
2008	3	10	13	0.77
2009	3	11	14	0.79
2010	5	13	18	0.73
2011	3	13	16	0.82
2012	1	10	11	0.91
2013	1	12	13	0.93
Total	51 (36.43)	89 (63.57)	140 (100)	0.64

Note: Figures in parentheses denote percentage.

9. Length of publications

Table 9 shows that 49 (35%) publications were in the range of 6-10 pages, followed by 40 (28.57%) in the range of 11-15 pages, 19 (13.57%) in the ranges of 1-5 pages and 16-20 pages respectively, and 13 (9.29%) were 21 or more pages in length.

Table 9. Length of Publications

Year	**1-5**	**6-10**	**11-15**	**16-20**	**≥21**	**Total**
1999	2	1	0	0	0	3 (2.14)
2000	0	2	0	0	0	2 (1.43)
2001	0	2	0	1	0	3 (2.14)
2002	2	2	0	0	0	3 (2.86)
2003	3	3	1	1	0	8 (5.71)
2004	1	1	0	1	0	3 (2.14)
2005	1	6	3	0	2	12 (8.57)
2006	0	1	5	0	2	8 (5.71)
2007	3	5	3	1	0	12 (8.57)
2008	1	5	2	2	3	13 (9.29)
2009	1	4	6	2	1	14 (10)
2010	0	7	7	4	0	19 (12.86)
2011	2	4	7	1	2	16 (11.43)
2012	2	1	5	2	1	11 (7.86)
2013	1	5	1	4	2	13 (9.29)
Total	19 (13.57)	49 (35)	40 (28.57)	19 (13.57)	13 (9.29)	140 (100)

Note: Figures in parentheses denote percentage.

10. Most prolific authors in WoS

Table 10 lists the authors who have contributed 2 or more publications during the period under study. It shows that M. P. Satija ranked as no. 1 with 7 (5%) publications, followed by R. Mittal (5, 3.58%). There were six authors who contributed 4 publications, eight contributed 3, and ten contributed 2.

Table 10. Most Prolific Authors in *WoS*

Rank	Contributor	No. of Contributions (n=140)	Percentage (%)
1	M. P. Satija	7	5
2	R. Mittal	5	3.58
3	R. Chandrakar	4	2.86
3	V. K. J. Jeevan	4	2.86
3	M. Krishnamurthy	4	2.86
3	S. Kumar	4	2.86
3	M. Madhusudhan	4	2.86
3	K. C. Panda	4	2.86
4	J. Arora	3	2.15
4	S. Deb	3	2.15
4	B. T. S. Kumar	3	2.15
4	G. Mahesh	3	2.15
4	B. Mukharjee	3	2.15
4	C. Patra	3	2.15
4	S. S. Rao	3	2.15
4	P. K. Upadhyay	3	2.15
5	K. T. Anuradha	2	1.43
5	P. Chand	2	1.43
5	T. K. Ghosh	2	1.43
5	K. Kapoor	2	1.43
5	D. C. Kar	2	1.43
5	V. Kumar	2	1.43
5	A. Nagaraja	2	1.43
5	S. K. Patil	2	1.43
5	S. Ramaratnam	2	1.43
5	V. G. Talwar	2	1.43

11. Geographical distribution of authors

Table 11 shows the geographical distribution of LIS research output, which illustrates the collaboration of foreign authors with Indian authors during the period under study. A total of 273 authors from 19 foreign countries were geographically affiliated to India, contributing a total of 140 LIS publications. The collaboration of authors from England (9, 3.3%) with Indian authors is

higher than other foreign countries. It was followed by USA (8, 2.93%), Brazil (6, 2.2%), Bangladesh (5, 1.83%), Iran (4, 1.47%), and South Africa (2, 0.73%). One author from 13 countries each had collaborated with Indian authors.

Table 11.Geographical Distribution of Authors

Rank	Country	No. of Authors	Percentage (%)
1	India	226	82.78
2	England	9	3.3
3	USA	8	2.93
4	Brazil	6	2.2
5	Bangladesh	5	1.83
6	Iran	4	1.47
7	South Africa	2	0.73
8	13 countries with single contributions	13	4.76
	Total	273	100

VI. Conclusion

The present study on LIS research by Indian researchers is based on the data collected from *Social Science Citation Index (SSCI)* during the period of 1999-2013. Of the 140 publications by Indian authors, most are journal articles. Indian researchers have collaborated with researchers from 19 foreign countries, including England and USA. The most productive Indian researcher is M. P. Satija.

Lotka's law of scientific productivity has been applied in the study. It was observed that the author's contribution pattern during the period is not ideal as the "observed" authors and their respective productivity frequency differ from "expected" frequency of authors and their productivity.

References

Lahiri, R. (1996). Research in library science in India (1957-1995): An account of PhD programme. *Annals of Library Science and Documentation, 43*(2), 59-68.

Mittal, R. (2011). Library and information science research trends in India. *Annals of Library and Information Studies, 58* (6), 319-325.

Ngulube, P. (2010). Mapping mixed methods research in library and information science journals in Sub-Saharan Africa 2004-2008. *The International Information & Library Review, 42*, 252-261. doi:10.1016/j.iilr.2010.10.005

Patra, S. K.; & Chand, P. (2006). Library and information science research in India: A bibliometric study. *Annals of Library and Information Studies, 53*(6), 219-223.

Rana, R. (2011). Research trends in library and information science in India with a focus on Punjab University, Chandigarh. *The International Information & Library Review, 43*, 23-42. doi: 10.1016/j.iilr.2011.01.006

Satija, M. P. (1998). Forty years of doctoral research in classification and indexing in India, 1957-1997. *Library Herald, 36*(2), 80-87.

Wagh, S. N. (2011). Research in library and information science in India (2004-08): An analytical study of Ph.D. programme. *International Referred Research Journal, 1*(17), 78-79.

Authors:
Rabindra K. Maharana, Technician (Library), National Institute of Science Education & Research (NISER), (An Autonomous Institution of Dept. of Atomic Energy, Govt. of India), IOP Campus, Sachivalaya Marg, Bhubaneswar- 751005. E-mail: maharana.rabindra@gmail.com

Ashok Kumar Das, Seminar Library Assistant, P.G. Department of Library & Information Science, Utkal University, Vani Vihar, Bhubaneswar-751004. E-mail: ashoook.139@gmail.com

Submitted to CLIEJ on 27 January 2014.

Maharana, Rabindra K.; & Das, Ashok Kumar. (2014). Growth and development of LIS research in India during 1999-2013: A bibliometric analysis. *Chinese Librarianship: an International Electronic Journal*, 37. URL: http://www.iclc.us/cliej/cl37MD.pdf