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Abstract:

The current study attempts to find out the research productivity and trends in Library and Information Science (LIS)subject in India during 1944 to 2017 by using bibliometric and content analysis methods. The publication data for the study was extracted from the Scopus database which consists of 1944 publications published by Indian authors.Thebibliographic data were analyzedby different bibliometric indicators which include most preferred journals, most prolific author, author collaboration trends, most prolific institutions and highly cited papers. The study reveals many important facets of LIS research in India. Gupta, B. M. the as recognized as the most prolific author with57papers; whereina context toa totalnumber of citations received Garg, K. C. topped in term of 406 citations. DESIDOC Journal of Library and Information Technolgy was identified as the most preferred journal with highest publications followed by Scientometrics Journal. The content analysis of the publications shows three major clusters in LIS research includes "Use and User study,""Bibliometric/Scientometrics" and "Digital Library Research."

Keywords: Bibliometric Study, LIS Research, Library and Information Science Research, Research Trends, Scopus

1. Introduction

Research has been an integral part of the growth of any subject, libraryand information science (LIS) is not an exception.The founding stone of LIS research in India can be traced back throughtwo earlyevents in 1950. The first, initiation of the research programme which was taken by Dr. S. R Ranganathan in the department of library and information science at the University of Delhi(Singh & Babbar, 2014, Chadrashekara et al. 2009). The second event waslaunched of library and information science journal called Annals of Library Science by NISCAIR (earlier INSDOC) in 1954 with Dr.

Ranganathan as the first editor. Since then many landmarks have been made by LIS researcher from India by contributing new theory and technique to LIS domain. Specifically, if we look, the contribution of Ranganathan who regarded as the father of library science in India where exceptional.The, Five Laws of Library Science and Colon Classification is an important milestone in the development of LIS subject internationally. Since then the Library and Information Science education and researchhas been growing by leaps and bound. There are many states,and central universities are providing Master Degree in LIS including Documentation Research and Training Center.Similarly,the research output from India has been steadily increasing with the increase of LIS Schools, Researchers,and enrollment doctoral students into University[3]. There are 1754 LIS theses, 28 active LIS journal from India in Ulrich periodical directory and 14 LIS journal in Indian Citation Index(Singh & Babbar,2014; Dora and Kumar,2017; Singh et al, 2014).

It is important to track the growth of LIS research from time to time to understand current trends in the subjects and contribution of LIS researcher into the domain. The purpose of the paper is to get insight into the LIS research in the context of publication productivity and subject trends. The Bibliometric and Content analysis methodwas used to achieve the objective.

2. Literature Review

The literature in the study was divided into two parts (1) bibliometric study of LIS research articles and (2) the publications that dealt with research trends in library science in India.

One of the earliest studies was by Patra and Chand (2006)where the authoranalyzed LIS research published in library and information science abstract (LISA) in between 1967 to 2014. The paper analyzed3396 records and found that a single author has the largest share of publication which is 74.63% where collaboration among author was found very poor. The most prolific journals were those who published from India and very few numbers of LIS researcher published in international journals. To understand contribution of Indian authors in international journal particularly index in Social Science Citation Index (SSCI), Pradhan and Chandrakar (2011)analyzedarticle published in between 2000-2009. The result revealed that the contributions of Indian authors in International journals were found steadily increasing with the highest number of publication in 2009 which was 38 publications. The study further revealed that the international collaboration of Indian authors found less representation (0.23%) compare to foreign authors per contribution.The journal with the highest publication was scientometrics where most prefer research domains were Bibliometrics, webometrics, and informetrics. The paper by Barik and Jena(2014)presented a bibliometric study of Indian LIS researchers articles published in the Scopus database in between 2004-2013. The study analyzed 385 articles on different bibliometric parameters. The study revealed that the authorship pattern was dominatedby two authors papers which were43.89%. The collaboration trend witnessed that

collaborative research among authors in the LIS field at the international level found as very poor (5.74%). Library Philosophy and Practice was the most preferred LIS journal having 69 (17.92%) articles publication out of 385 LIS research articles. The most recent paper was by Garg and Sharma(2017) which examine 2428 LIS papers indexed in Indian Citation Index (ICI) during 2004-2015. The study found that the growth of LIS research is consistent throughout the period. The most prolific journal was SRELS Journal of Information Management published the highest number of publications. The popular research areaswere Bibliometrics and Scientometrics followed by User Studies.

The research trends in Indian LIS were depicted in many studies regarding majortopics, sub-topics of research.The majority of the studies used the Ph.D. thesis as a source to understand research trends in LIS. For instance, Kannappanavar and Vijayakumar (2000)analyzedPh.D. thesis awarded in between 1950 to 1992 to find out the major research areas. The result of the study found that most productive year of LIS research is 1992 and planning and management is most preferred andpopular research areas among researchers, followed by User Studies and Bibliometric. The paper by Madasamy and Alwarammal (2009)studied the most recent years, the doctoral degrees awarded between 2003 to 2008. The results were not much different from earlier studies, Bibliometrics and User Studies were the most popular research areas including topics like Information Sources and Services andLibrary Management. The study by Singh & Babbar (2014)was the most comprehensive one which covered Ph.D. thesis awarded in between 1950 to 2012.The result revealed that Bibliometrics and Scientometrics Study, Information Seeking Behaviours, Information Services were the most researched topics. The author also reported emerging research areas which were Electronic Resources, IT Application in Libraries, Library Management Software and Webometrics. Apart from Ph.D. thesis, journals articles are another important source to understand the LIS research trends. Mittal(2011) applied the co-word analysis technique to journal articles indexed in LISA (Library and Information Science Abstracts) in between 1990 to 2010. The co-word analysis of 4735 descriptor term revealed that LIS research in India concentratesona topic likeBibliometrics, Citation Analysis, User Studies, Cataloging, Information Retrieval University Library, Digital Library, Institutional Repositories. The recent study by Dora and Kumar(2017)on LIS research trends which review 3713 articles published in 14 LIS journal in India in between 2004-2015. The study reveals that Bibliometric/Scientometric was one of the most popular subjects among researchers. The paper further examines and found that other topics which indicate upward growth were mostly technology-oriented topics, which include a DigitalLibrary, Electronic Resources, andElectronic Journals.

3. Data and Methodology

The research articles for this study was extracted from the Scopusdatabase, the world largest databases that provide abstract,andcitation of peer-reviewed research articlesat the global level. The database coverage is comprehensive and covers many Indian journals include journals from library and information science subject. We followed the following steps for extracting data from Scopus

- In advance search box a search query was formed which include ISSN number of all LIS periodical and Author Affiliation Country "INDIA."
- The search generates 1944 articles published between 1944 to 2017.
- The resultwas exported as CSV file for further evaluation.

In this study, the authors used bibliometric and content analysis techniques tofulfill the objectives of the research. The bibliometrictechniques were used to find out the research productivity of LIS researcher. The analysis includes growth of publication, most prolific author, authorship pattern and most preferred journals. The content analysis technique was used to understand the research trends in LIS. The co-occurrence analysisand keyword analysis were the two important technique of content analysiswhich used in this study.The co-occurrence analysis was done by using the VOSviewer software. The VOSviewer software was found useful for displaying a co-occurrence network and has been used by many researchers to find out the subject trends(Gonzalez-Valiente, 2015;Olijnyk, 2015). The software also produces a map and subject cluster depicting the intellectual structure of LIS research.

4. Analysis and Discussion

The whole spectrum of analysis of this study was divided into two parts. The first part focus on bibliometricanalysis which includes trends in the growth of LIS publication, prolific author,and authorship pattern, most preferred journals and highly cited articles. The second part focuses on the trend analysis where keyword analysis and co-occurrence analysis discussed in details.

4.1 Bibliometric Analysis

4.1.1 Year Wise Growth in Publications

The year-wise growth of publications showed in Figure-1 reveals that from the 1944 publications, 994 (51%) publications were indexed in the last five year, i.e., 2012-2017. The main reason of

theexponential growth of Indian LIS publication in Scopus database was the inclusion of two Indian LIS journal into Scopus which were DESIDOC Journal of Library and Information Technology since 2012 and Annals of Library and Information Studies since 2011.

Figure-1: The Year-wise growth of publications
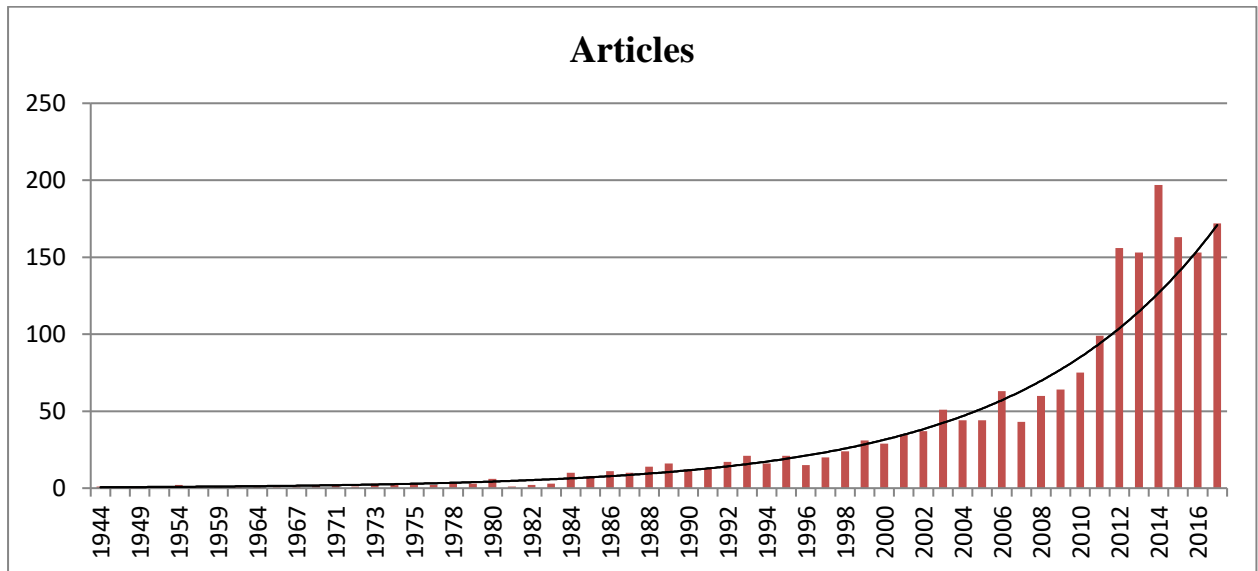
4.1.2 Most Prolific Authors

The author data of LIS research reveal that there were 3848 total authors contributed 1944 articles from which 2024 were unique authors. As shown in Table-1, the most prolific author on the basis number of publications.Gupta BM topped the list with total (57) publications, followed by Kumar S (51) and Garg KC with(40) publications.However, the result would be quite different, if the listing done by H-index or Total Citation (TC) received by authors.It may be interesting to note that if rank by TotalCitations and H Index, Garg KC with (406, 13) will topped in the listfollowed by Arunachalam S (351, 13).

Table-1. Most prolific authors (N>13)

Sr. No	Author	H index	G index	NP	TC
1	GUPTA BM	11	14	57	334
2	KUMAR S	10	17	51	339
3	GARG KC	13	18	40	406
4	PRATHAP G	7	14	32	233
5	KUMAR V	8	11	29	146
6	GHOSH M	5	6	26	54
7	ARUNACHALAM S	13	18	25	351
8	SEN BK	6	10	23	113
9	KADEMANI BS	9	12	23	165

10	JEEVAN VKJ	4	5	22	50
11	SATIJA MP	3	5	21	42
12	KUMAR A	6	9	18	94
13	MADHUSUDHAN M	6	12	18	144
14	MAHAJAN P	3	5	18	32
15	RAM S	4	7	18	55
16	KALYANE VL	8	11	17	135
17	PANDA KC	6	8	16	87
18	BHATTACHARYA S	7	15	16	232
19	GUL S	4	6	16	49
20	TRIPATHI M	4	10	16	115
21	SUBBARAO S	5	11	16	123
22	GUPTA R	3	7	16	59
23	GUPTA DK	4	7	15	55
24	KHAN AM	3	5	15	32
25	BHARDWAJ RK	4	4	14	26
26	MUKHERJEE B	6	8	14	66
27	ARORA J	4	5	13	40
28	BASU A	6	11	13	133

(TC= Total Citation, NP= Number of Publications)

4.1.3 Authorship Patterns

Author collaboration is an important trigger for the growth of publications, but the data shows that around 38% (743) papers were noncollaborative. Table-2, reveals the authorship pattern of 1944 papers which includes3848 authors.Two authors contributed the largest group of 40% (786) of papers, while three authors contributed papers were around16% (303). More than three authors paper were mere 3% which usually rare in social science and humanities research.

Table-2. Authorship patterns

No. Of Authors	No. Of Papers	Total No. Of Authors	% of Papers
One	743	743	38.22
Two	786	1572	40.43
Three	303	909	15.59
Four	80	320	4.12
Five or more	32	304	1.6
Total	**1944**	**3848**	**100**

4.1.4 Most Preferred Journals

The data from the 1944 publications revealed that around 25% of all publications were shared between two Indian journals as depicted in table-3. The DESIDOC Journal of Library and Information Technology which comprises of 320 (16.46%) was dominated as most prefer journal for Library and Information Science followed by "Scientometrics" having 247 (12.71%) research papers. Annals of Information Studies was the third prefer sources constitute 175 publications (9%) followed by International Information Library Review and Electronic Library. The choice of journals by Indian researcher shows that Indian authors focused on two primary subjects of LIS research which was Bibliometric and Electronic Resources.

Table -3. Most preferred Journals

Sr.No.	Most Relevant Sources	Articles	(%)
1	DESIDOC JOURNAL OF LIBRARY AND INFORMATION TECHNOLOGY	320	16.46
2	SCIENTOMETRICS	247	12.71
3	ANNALS OF LIBRARY AND INFORMATION STUDIES	175	9.00
4	INTERNATIONAL INFORMATION AND LIBRARY REVIEW	121	6.22
5	ELECTRONIC LIBRARY	86	4.42
6	LIBRARY HI TECH NEWS	79	4.06
7	LIBRARY REVIEW	74	3.81
8	PROGRAM	66	3.40
9	MALAYSIAN JOURNAL OF LIBRARY AND INFORMATION SCIENCE	56	2.88
10	JOURNAL OF INFORMATION AND KNOWLEDGE MANAGEMENT	50	2.57
11	JOURNAL OF ENTERPRISE INFORMATION MANAGEMENT	49	2.52
12	JOURNAL OF INFORMATION SCIENCE	34	1.75
13	IFLA JOURNAL	31	1.59
14	LIBRI	30	1.54
15	COLLECTION BUILDING	28	1.44
16	KNOWLEDGE ORGANIZATION	27	1.39
17	INFORMATION DEVELOPMENT	23	1.18
18	NEW LIBRARY WORLD	23	1.18
19	ONLINE INFORMATION REVIEW	21	1.08
20	INTERNATIONAL JOURNAL OF METADATA SEMANTICS AND ONTOLOGIES	20	1.03
21	LIBRARY HI TECH	20	1.03
22	LIBRARY MANAGEMENT	20	1.03
23	VINE	18	0.93

24	INTERNATIONAL JOURNAL OF INFORMATION MANAGEMENT	17	0.87
25	ASLIB PROCEEDINGS	16	0.82
26	INFORMATION SYSTEMS RESEARCH	16	0.82
27	SCIENCE AND TECHNOLOGY LIBRARIES	14	0.72
28	INTERNATIONAL JOURNAL OF GEOGRAPHICAL INFORMATION SCIENCE	12	0.62
29	Two publication has elevenpaper each	22	1.13
30	Four publication have ten paper each	40	2.06
31	Two publication havenine paper each	18	0.93
32	Three publication haveeight paper each	24	1.23
33	Two publication have sevenpaper each	14	0.72
34	Four publication hassixpaper each	24	1.23
35	Two publication have fivepapereach	10	0.51
36	Eleven publication have four paper each	44	2.26
37	Five publication hasthree paper each	15	0.77
38	Twelve publication hastwo paper each	24	1.23
39	Sixteen publication have one paper each	16	0.82

4.1.5Most Prolific Institutions

The distribution of publication by institutes were listed in table-4.The University of Delhi was top in the list which produced 61 publications followed by Documentation Research and Training Centre (DRTC) and University of Mysore and University of Kashmir. The publication in international journals by Indian researcher were very less compare to Indian journals, the University of Delhi had (107),andthe University of Mysore had (110) publications found by Garg and Sharma (2017) in between 2004-2015.

Table4. List of top institutes ranked by publication (N>10)

Sr. No.	Institution	Total
1	University of Delhi, New Delhi	61
2	Documentation Research and Training Centre	56
3	University of Mysore, Karnataka	28
4	University of Kashmir, Srinagar	28
5	Panjab University, Chandigarh	26
6	Karnataka University, Dharwad	24
7	Sambalpur University, Jyotivihar, Burla, Odisha	24
8	Guru Nanak Dev University, Amritsar	24
9	Banaras Hindu University, Varanasi	21
10	University of Pune, Pune, Maharashtra	17

4.1.6 Highly Cited Papers

A list oftop12 highly cited paperwas presented in the Table - 5. As shown in the Table-5, It was interesting to note that many highly cited papers were from the journals which are purely deal with information science subject. The second distinctly popular topic was Bibliometrics.The Scientometrics journal was found not only the most preferred foreign journal by Indian LIS researcher but also one highly cited.

Table. 5. Highly cited papers

Sr. No.	Authors	Title	Year	Source title	Cited by	TC per Year
1	Gupta M.P., Jana D.	E-government evaluation: A framework and case study	2003	Government Information Quarterly	286	19.07
2	Sharma S., Thomas V.J.	Inter-country R&D efficiency analysis: An application of data envelopment analysis	2008	Scientometrics	77	7.7
3	Harinarayana N.S., Raju N.V.	Web 2.0 features in university library websites	2010	Electronic Library	74	9.25
4	Anuradha K.T., Usha H.S.	Use of e-books in an academic and research environment: A case study from the Indian Institute of Science	2006	Program	70	5.83
5	Tripathi M., Kumar S.	Use of Web 2.0 tools in academic libraries: A reconnaissance of the international landscape	2010	International Information and Library Review	69	8.62
6	Bhattacharya S., Basu P.K.	Mapping a research area at the micro level using co-word analysis	1998	Scientometrics	67	3.35
7	Cyr D., Kindra G.S., Dash S.	Website design, trust, satisfaction,and e-loyalty: The Indian experience	2008	Online Information Review	61	6.1
8	Mitra M.	Information retrieval from documents: A survey	2000	Information Retrieval	60	3.33
9	Prathap G.	The Energy-Exergy-Entropy (or EEE) sequences in the bibliometric assessment	2011	Scientometrics	55	7.85
10	Ranganathan C., Kannabiran G.	Effective management of information systems function: An exploratory study of Indian organizations	2004	International Journal of Information Management	53	3.78
11	Garg K.C., Padhi P.	A study of collaboration in laser science and technology	2001	Scientometrics	53	3.11

12	Narayanan S.	Power law relations in science bibliography—a self-consistent interpretation	1971	Journal of Documentation	52	1.1

4.2 Content Analysis

4.2.1 Keyword Analysis

Keywords given by all the authors were extracted and standardize to get the precise results. Based on the frequency of keywords, a list of highly used keywords where the frequency was ten or more than ten depicted in the Table-6. If we exclude "India" and "Libraries" keywords which were themore generic term, "Bibliometric" and "Scientometric" were the top keywords in Indian LIS research.The keyword can be dissected in to broadly four subject categories.The first group wasBibliometric research (Bibliometric, Scientometrics, Citation Analysis), the second group was Library Technology (Digital Library, World Wide Web, The Internet, Search Engine, Communication Technology, Web 2.0 and Electronic Media). The third groups of research consist ofLibrary Collection (Electronic Resources, Electronic Journals) and the fourth group wasLibrary and User Study (University Library, Academic Library, and UserStudy).

Table-6. List of highly used keywords (N>17)

Sr. No.	Author Keywords	Articles	Sr.No.	Author Keywords	Articles
1	INDIA	329	19	DIGITAL LIBRARY	21
2	BIBLIOMETRICS	88	20	INFORMATION SERVICES	21
3	SCIENTOMETRICS	75	21	COLLECTION DEVELOPMENT	20
4	LIBRARIES	68	22	LIBRARY SERVICES	20
5	ACADEMIC LIBRARIES	50	23	H-INDEX	19
6	INTERNET	49	24	OPEN SOURCE SOFTWARE	19
7	DIGITAL LIBRARIES	44	25	PUBLIC LIBRARIES	19
8	INFORMATION RETRIEVAL	44	26	WORLD WIDE WEB	19
9	CITATION ANALYSIS	43	27	E-JOURNALS	18
10	UNIVERSITY LIBRARIES	41	28	INFORMATION MANAGEMENT	18
11	KNOWLEDGE MANAGEMENT	36	29	INFORMATION TECHNOLOGY	18
12	E-RESOURCES	31	30	PUBLICATION PRODUCTIVITY	18
13	USER STUDIES	31	31	RESEARCH	18
14	WEB 2.0	29	32	AUTHORSHIP PATTERN	17

15	OPEN ACCESS	26	33	ELECTRONIC RESOURCES	17
16	LIBRARY AUTOMATION	25	34	INSTITUTIONAL REPOSITORIES	17
17	ELECTRONIC JOURNALS	24	35	ONTOLOGY	17
18	COMMUNICATION TECHNOLOGIES	21			

4.2.2 Co-occurrence analysis of title and abstract word

There are many methods to map the research data, one of the commonly used technique is clustering. In this paper author used VOSviewer software to construct a cluster map based on the co-occurrence matrix. There were 25985 terms found in title and abstract of 1944 articles from which 527 were selectedbythe co-occurrence of each word at least ten times. As shown in figure-2, each circle represents a term (word). The size of the circle represents the number of publications that had the term in that publication. A term that co-occursin the map tends to be close to each other. What thecolor represents in the map was the cluster affiliation of the term. There were threeclusters in the map;each cluster represents a broad subject area of library and information science.

The cluster-1 (Red Colour) the cluster was formed with a topic like which included 272 terms represent the subject topics "User study" and "Library Information Services," "Social Aspect of Libraries" and "|Information Organization and Retrieval" and "Information Technology in Libraries."The highly influential subject keywords in the cluster includeServices, User, Access, Resources,Survey, Questionnaire,Librarian, Internet, Software, Information Technology, Usage, Library Facilities, Awareness, Infrastructure and University Library.

Cluster-2 (Green Colour) which included 200 terms serve as the board area "Scholarly Communication," "Bibliometric," 'Scientometrics," "Citation Analysis,""Research Collaboration," "ResearchTrends." The highly influential subject keywords in the clusters were Journal, Country, Publication, Author, Citation, Collaboration, Research Output, Productivity, Authorship Pattern, Indicators, Impact factor, Scientometric Analysis, Bibliometric Analysis.

Cluster-3 (Blue Colour) which was the third and smallest cluster which included 55 terms only.This cluster represents the topics like 'Electronic Resources", "Digital Library," "Consortium." The highly influential subject keywords in the cluster were Digital Library,Electronic Resources,Electronic Journal,Consortium,IndianLibrary,Digitization, and Preservation.

The clustering result of the co-occurrence analysis shows that the LIS research dividedinto three major subject areas. The first cluster was built on subject topics like "User Study," "Use Study" and "Information Organization and Retrieval." The second cluster was mostly rolled around Bibliometric/ScientometricsStudy which includesterms like Citation, Collaboration, and productivity. The thirdcluster represents the Digital Library and Electronic Resources subject areas. The Bibliometric, Digital Library,and User Study were the three major types of research which dominant the LIS research space in the current era, the similar result also found in the study done by Dora and Kumar (2017).

Figure-2.Visualization of LIS research

5. Conclusion

The idea of the study was to provide an insight into thepublication productivity and finding the research trends in Indian LIS. The study used simple bibliometric technique and co-occurrence analysis method to get the desired result. The result shows that there was a constant growth in publications;however, the last five years were exponential which constitute more than 51% of overall publications. The major reason for this growth was the inclusion of DESIDOC Journal of Library and Information Technology and Annals of Library and Information Studies as indexed inthe Scopus database. The authorship pattern indicates that although 60% of the publications were collaborative, the major chunk of LIS research in India was still the single author publications. The result from the keyword analysis reveals that topic like Bibliometrics, Scientometrics, Academic Libraries, Digital Libraries, Information Retrieval, Electronic Resources;User Studies werethe most popular research areas. The co-occurrence analysis depictsthe subject trends in three clusters; the cluster one represent the Bibliometrics and allied topics, the cluster two constitutes Digital Library and allied topics while cluster three reports the Use and User Studies. The finding of both the keyword and co-occurrence analysis showsIndian LIS research dominated by major subject areas like Bibliometrics/Scientometrics, Electronic Resources/Digital Library, Use and User Studies. The terms like "Ontology," "Institutional Repository" "Open Source Software "Bibliometric Indicators" werea new entrant in the Indian LIS research domains which may play a dominant role in future LIS

research. The result of the paper can provide an effective tool to assess the development of LIS research and help further to analyze the strength and weakness of LIS research in India. The further research can be done by taking the entire universe including Scopus, Indian citation index to get the overall characteristics of LIS research in India.

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