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Library and Information Science Research in India during the Last Four Decades (1980-2019): A Brief Analysis

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ABSTRACT

The present paper has attempted to highlight published research in Library and Information Science discipline contributed by LIS researchers in India during the last four decades, 1980-2019. The secondary data for the study was extracted from Incites, a web based analytical tool, of Clarivate Analytics. The study has observed that there were 4304 publications by Indian authors, which received 17523 citations. It has spotlighted the research themes of the top 100 papers; having the highest numbers of citations. The study has analysed citations, publication avenues and authorship of all 4304 papers. Research themes of highly cited 100 research papers in the areas of applications of bibliometrics, knowledge management and information seeking behaviour on social media received 6110 citations. Bibliometrics/scientometrics/informetrics were the preferred research themes followed by information seeking behaviour and other areas.The study has also presented the analysis with respect to collaboration. The practice of solo research changed with authors collaborating in projects and producing papers. Percentage of co-authored articles grew from 5.61 per cent to 12.66 per cent in India. Journal impact, author impact, core journals and most productive authors in the discipline have also been studied.

Keywords: Core journals; Authorship; Research trends in library and information science; Bibliometrics; Research areas of highly cited papers.

1. INTRODUCTION

The first PhD in India was awarded in 1957 to Mr. D.B. Krishna Rao under the supervision of S.R. Ranganathan. Much before that, Ranganthan had published his first book Five Laws of Library Science in 1931. His contribution to LIS literature continued in the form of books, journal articles, research monographs etc. He provided a platform for literature production by organizing seminars/conferences and initiating publication of journals in the discipline. The setting up of Documentation Research and Training Centre (DRTC) for research in the discipline, also a brainchild of Ranganthan helped growth of literature. The second PhD in the discipline was awarded after a long gap in 1971 but individual research and its reporting started gaining momentum. Research was initially focused on library classification and cataloguing, documentation and user studies. Literature on information systems, library and information services was added later on. LIS professionals in India started applying ICT in libraries in late 1970s. Their experiences were reported in literature. It overtook all other areas and became dominant in literature. Management techniques and their application in libraries was another focus of professional in the literature reported by them. Bibiometrics/ scientometrics/ webometrics took over from other subjects and the majority of literature was reported in this category.

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In this context, the present paper attempts to highlight with the help of bibliometric indicators, how Library and Information Science has evolved in India during the last four decades. The study has analysed citations, publication avenues and authorship of all 4304 papers. Furthermore, it has identified research areas of top 100 papers of Information science and library science, with the highest number of citations and analysed them in terms of their themes, publication avenues and authorship. User studies are an integral part of Library and Information Science. The importance and relevance of user studies has been highlighted in various studies[1-3].

2. LITERATURE REVIEW

Bibliometrics involves the use of statistical tools and techniques for analysing the published literature in a discipline. The application of bibliometric indicators has become very widespread, bibliographic and citation databases like Web of Science and Scopus facilitate with their services. The universities and ranking bodies also consider bibliometric indicators to evaluate the research impact of individual researchers, faculty members and institutions. The application of bibliometrics is very much justified to measure the level and impact of publicly funded research. Almetrics, another useful tool, measures the impact of research as reflected through social media[4] .

One of the early bibliometric studies was done on comparative anatomy, activities of anatomists from the

16th century to 1860 and published in 1917. Thompson and Walker (2015)[5] have used bibliometric indicators in medical sciences and have discovered new information about academic trends in pharmaceutical diseases and health science needs. Bibliometric tools and techniques have been used in software engineering to identify trends and status in the discipline[6-7]. Waltman *et al.* 2014[8] have used bibliometric methods to highlight the interdependence of many disciplines in general and in particular the dependence of Health and Life sciences (HLS) on research in Engineering and Physical sciences(EPS). The study showed that the EPS research contributes to HLS in 5 different ways new materials and their properties; chemical methods for analysis; imaging of body parts and biomaterial surfaces; medical engineering; mathematical and statistical methods for data analysis. The authors analysed 16 clinical and 5 life sciences fields through term maps and visualisation to identify EPS related terms in HLS area and found that 10 per cent of all the publications (of 10.2 million analysed) could be classified as common to EPS-HLS interface.

The authors used co-word maps to show the link between the related concepts; and citation relations were used to identify topics which were common to EPS and HLS.

Tripathi *et al.* 2018[9] have studied the bibliometrics of social sciences and humanities (SSH) and have underlined that the Indian researchers publish in Indian journals; multi authorship in SSH is on the rise and attracts more citations. Garg and Sharma 2017[10] have analysed 2428 papers published during 2004-2015 and have found that the growth of Library and Information science was very inconsistent during the reported period; the University of Mysore contributed the maximum number of publications; bibliometrics and scientometrics were the much sought after research areas by the Indian researchers. During 2006-2015, Indian researchers contributed 234 articles in *Library and Information Science* journals published overseas, indexed in *Library Information Science and Technology* abstracts. *Library Philosophy and Practice* was the most preferred journal[11]. Tripathi *et al.* 2018 [9] studied the LIS research output of BRICS nations during 2004-2015 and found that China contributed the maximum number of publications followed by Brazil, South Africa, India and Russia. The focus areas were information and library science, information systems, interdisciplinary applications and management, as per the categorisation of Web of Science (WOS). Ronda-Pupo et al. 2018[12] analysed 28,131 articles in *Information Science and Library Scien*ce journals, which received 215693 citations; 69 per cent of these articles were published in collaboration. The multi-authored papers increased over time. The study highlighted that the citations to multi-authored articles increased to 2.53 times each time the number of multi-authored papers doubled. The citations to multi-authored articles increased to 2.55 times each time the number of domestic multi-authored articles doubled. It shows that multi authorship results in addition to the value of an article.

Meadows, 2008[13] analysed the articles published in *Journal of Information Science* and *Journal of Documentation* to identify their central themes and found that the themes of information retrieval, information seeking communication and bibliometrics predominated the research in Library and information science. Järvelin and Vakkari (1993) surveyed 40 LIS journals published over 1965-85 found that the maximum number of articles was on information retrieval, followed by articles on Library and information Science[14].

3. OBJECTIVES

The present study highlights the research done in Library and Information science in India during the last four decades, 1980-2019. The study was undertaken with an aim to analyse the trends in published research

The objectives of the study were to

- Study the research output in LIS research
- Find out the collaboration pattern in LIS research
- Study the pattern of authorship in 4304 papers
- Find out the pattern of citations in 4304 papers
- Identify top journals in which researchers frequently published their research findings.
- Highlight research themes of top cited papers.

4. METHODOLOGY

The data was extracted through Incites. InCites Benchmarking and Analytics is a web based research evaluation tool and helps analyze institutional productivity, collaboration, influential researchers; it showcases the strong research areas and helps identify areas which need to be strengthened. It covers bibliographic details of published research from 1980 till date from the following sources.

- Social Sciences Citation Index
- Arts & Humanities Citation Index
- Conference Proceedings Citation Index (SCI & SSH)
- Book Citation Index (SCI & SSH)
- Emerging Sources Citation Index

The authors selected the tab of "Analysis " on the platform of InCites, under that, analyze by "research areas" was selected. The InCites dataset with ESCI (Emerging Science Citation Index) was adopted. The time period was selected from 1980 to 2019 in 4 blocks of 1989-90, 1991-1999, 2000-2009, and 2010-2019 as the Incites datasets are available for the said period (1980-2019).

Under the tab of "By attributes", research area of Information Science and Library Science was selected. This query was run which gave the global output of 426928 records in the research area of Information Science and Library Science.

Under "by research output", "location" of India was selected. This resulted in 4304 records which were downloaded and analysed for the present study. The data was extracted and downloaded in the month of April 2020.

Category Normalised Citation Impact (CNCI) is compilation of works of an individual, institution or country/ region. It is the average of the CNCI values for all the documents in the set. It is a valuable and unbiased indicator of impact irrespective of age of publications, subject focus or document type. Therefore, it allows comparisons between entities of different sizes and different subject mixes. A CNCI value of one represents performance at par with world average

Table 1. LIS research output worldwide

Decade	Web of Science Documents	CNCI	Times Cited	Docs Cited (%)	Documents in Q1 Journals (%)	Documents in Q2 Journals (%)	Documents in Q3 Journals (%)	Documents in Q4 Journals (%)	Impact Relative to World	Citation Impact
1980-1989	47227	0.994	137759	31.97	NA	NA	NA	NA	0.189	2.917
1990-1999	107015	0.997	319024	20.92	12.46	12.14	69.29	6.098	0.151	2.981
2000-2009	129655	0.999	839862	28.77	9.86	10.14	30.08	49.92	0.31	6.48
2010-2019	143031	0.974	533146	35.04	19.53	13.37	22.75	44.34	0.45	3.7
Total	426928		1829791							

Table 2. LIS research output from India

Decade	Web of Science Documents	CNCI	Times Cited	Docs Cited (%)	Documents in Q1 Journals (%)	Documents in Q2 Journals (%)	Documents in Q3 Journals (%)	Documents in Q4 Journals (%)	Impact Relative to World	Citation Impact
1980-89	214	1.16	602	53.27	0	0	0	0	0.18	2.81
1990-99	243	2.47	1799	62.14	61.84	11.84	5.26	21.05	0.37	7.4
2000-09	846	0.62	6186	60.52	30.04	28.33	19.11	22.53	0.34	7.31
2010-19	3001	0.76	8936	54.82	38.14	20.47	31.96	9.43	0.35	2.98
Total	4304		17523							

i.e. values above or below world average. A CNCI value of two is considered twice world average. The category normalised citation impact (CNCI) of a document is calculated by dividing the actual count of citing items by the expected citation rate for documents with the same document type, year of publication and subject area. When a document is assigned to more than one subject area an average of the ratios of the actual to expected citations is used. The category expected citation is calculated by dividing the total citations received in a year in a particular kind of document by the number of publications in that particular category of document[15]. A wide range of bibliometric indicators are available in the literature to assess the impact of the research output of countries, institutions and authors. In the present study, authors have used three relative indicators. These are citation per Paper (CPP), relative citation impact (RCI) and co-authorship index (CAI).

5. RESULTS AND DISCUSSION

5.1 Research Output in LIS

There were 426928 documents worldwide in the category of Information science and Library science in the last four decades. Approximately 30 per cent of the research publications were cited 1829791 times; rest of documents, 301,681 in number approximately (or 70.66 %) did not gain any citation. Journal Citation Report categorises journals into four quartiles based on their impact factor and ranks in the subject categories. The quartiles Q1, Q2, Q3 and Q4 rank the journals from the highest to lowest impact factor. The majority of the journals in which the publications appeared were in Quartile 4.The same is reflected through Table 1.

The most prestigious journals with high impact factors are categorised under Q1. The prestige of the journals diminishes down through the quartiles. In the first decade (1980-1989), the table 1 shows 'NA' for all the quartiles because Journal Citation Report (JCR) has not been integrated for 1980-1989 data with Incites as yet.

5.1.1 LIS Research Output of India

The total output from India is given in Table 2. India contributed 4304 publications; 56 per cent of the total publications of the country were cited 17523 times; 37.59 per cent of the publications appeared in Q1 journals.

- Table 1 and Table 2 show that 30 per cent of the total global output was cited, whereas 56 per cent of the Indian output was cited.
- The Category Normalised citation Impact of the global output was 0.991 whereas for India it was 1.25
- The majority of the global output was published in Q4 journals whereas the majority of the Indian contributions were published in Q1 journals.
- The citation impact of the global output was 4.0195 whereas for India it was 5.125.

5.2 Collaboration Pattern in LIS research

There is an exponential growth in the international collaborations in research publications[16]. There are various reasons, the smooth and inexpensive availability of technologies which facilitate researchers to connect worldwide. Teamwork has become essential in research to address the problems which require expertise from different cultural settings and fields. International collaborations may collectively improve the capacity to address the challenges faced by humanity.

Table 3. International collaboration of LIS research worldwide

Year	Web of Science Documents	International Collaboration (%)
1980-1989	47227	263 (0.6)
1990-1999	107015	851 (0.8)
2000-2009	129655	4227(3.3)
2010-2019	143031	12866 (9.0)
Total	426928	18207 (13.7)

Table 4. International collaboration of LIS research in India

Name	Web of Science Documents	International collaborations (%)
1980-1989	214	12 (5.6)
1990-1999	243	22 (9.1)
2000-2009	846	103 (12.1)
2010-2019	3001	380 (12.7)
Total	4304	517 (39.5)

Table 5. Top 10 countries with which Indians collaborated for research in LIS discipline in the last four decades.

Country	Number of publications
USA	192
UK	138
Germany	32
China	31
Canada	28
Australia	25
Singapore	23
Belgium	22
Netherlands	19
Saudi Arabia	18
Total	528

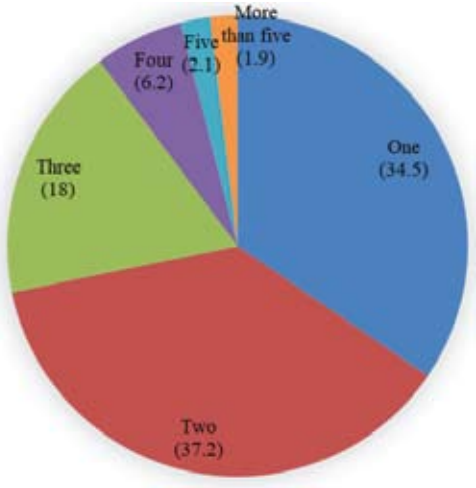

Figure 1. Authorship pattern of LIS research in India.

It improves scholarship worldwide by offering varied perspectives, insights and options; generates new theoretical questions, objectives, hypotheses and inputs. It has been very succinctly observed that if researchers do not collaborate internationally, they remain frogs in their respective wells as there is no outside view to challenge their thoughts. Ideas transcend across universities and countries by collaboration. No university or institution can control the market of ideas. Further, research requires huge, expensive resources which no single country can afford. So collaboration is required to afford science and research[17].

Trans-disciplinary collaborative approach may help all the stakeholders to address and resolve problems which pose challenges to the mankind[18]. The internationally co-authored papers have a significantly higher impact as compared to the papers written in collaboration within the country[11]. Collaboration enhances the overall impact of the research output of institutions.

The international collaborations indicator shows the number of publications that have been found with at least two different countries among the affiliations of the co-authors. There were 18,207 publications in the last four decades in the LIS disciplines written by authors from different countries. International collaborations are considered to be a way to develop and disseminate scientific knowledge and a driver of scientific impact (number of citations). Internationally co-authored documents gain more visibility in the global scientific community and tend to receive more citations [19]. The percentage of papers written in collaboration grew from 0.6 per cent to 9 per cent in last four decade period (Table 3). It consistently improved with the advent of ICT revolution.

Table 4 depicts the international collaboration of LIS research in India. In India, 517 publications were written in international collaborations out of 4304 total LIS research publications (Table 4). The percentage of papers written in collaboration grew from 5.6 per cent to 12.7 per cent which is better than the collaboration at the global level, which grew from 0.56 per cent to 9 over the last four decades.

Table 5 depicts the top ten collaborating countries with which Indian scholars collaborated frequently. USA topped the list with 37.1 per cent of the total documents published in collaboration, followed by UK (26.7 %), Germany (6.2 %), China (5.8 %), Singapore (4.4 %), Belgium (4.3 %), etc. It is important to mention here that in case of multi country collaboration, InCites gives equal credit to all the countries involved; as a result, it may project more number of papers than the actual number.

5.3 Pattern of Authorship

Multi authorship is general trend of science research. Studies have analysed the articles published in LIS journals to highlight the pattern of authorship and level of collaboration among the researchers[11]. They have reported that two authored papers dominated the research landscape. Mondal and Jana, 2018[11] have recommended that interdepartmental collaboration should be encouraged across the country and research on emerging and innovative topics be promoted. The easy availability of technologies facilitates collaboration across institutions and countries. Co-authorship may also serve as a

Table 6. Co-Authorship Index (CAI) of LIS research of India in different decade.

Year	1-Author (CAI)	2-Author (CAI)	3-Author (CAI)	4-Author (CAI)	5-Author (CAI)	>5 Author (CAI)	Number of authors	No of research papers	Average numbers of authors per papers
1980-89	126 (173.2)	71(89.7)	13(33.7)	01(7.8)	01(23.4)	02(46.7)	329	214	1.54
1990-99	135(163.4)	67(74.5)	36(82.3)	04(27.4)	00(0.0)	01(20.6)	400	243	1.64
2000-2009	354(123.1)	285(91)	121(79.5)	52(102.4)	23(135)	11(65)	1686	846	1.99
2010-2019	867(85)	1178(106.1)	608(112.6)	210(116.6)	69(115)	69(115)`	6736	3001	2.24

Table 7. Prolific authors of LIS research in India

Authors	TNP (%)	TNC (%)	CPP	RCI
Satija, MP	118(2.7)	61(0.35)	0.52	0.13
Prathap, Gangan	70(1.63)	375(2.18)	5.36	1.34
Gupta, B. M.	76(1.77)	233(1.35)	3.07	0.76
Dhawan, S. M.	29(0.67)	72(0.42)	2.48	0.62
Arunachalam, S	24(0.56)	388(2.25)	16.17	4.04
Bhardwaj, Raj Kumar	22(0.51)	36(0.21)	1.64	0.41
Bhattacharya, Sujit	20(0.46)	61(0.35)	3.05	0.76
Das, Anup Kumar	20(0.46)	21(0.12)	1.05	0.26
Sub total	379(8.81)	1247(7.25)	3.29	0.82
Others	3925(91.19)	15962(92.75)	4.07	1.02
Total	4304	17209	4.00	1.00

form of mentorship and provide support to the uninitiated in the initial stage of research and career. It also helps the senior and experienced professional[20].

Figure 1 depicts the authorship pattern of LIS research in India during last four decades (1980-2019). It indicates that multi authored papers dominated throughout the different decades. Single author papers were around one third of total publications(1482 % or 34.5 %). Double and triple authors (2 and 3 author) acquired 37.2 per cent, 18.0 per cent share of total publications respectively. Research publications with more than 3 authors had a share of around 11 per cent of the total publications. It is clear that multi authored papers dominated the LIS research.

The Co-Authorship Index (CAI) is important to understand the multi-authorship pattern of research through different time periods [21]. The co-authorship pattern of LIS research in India is reflected in Table 6. It indicates the increasing multi authorship trends with time in LIS research. The CAI value for single author was 173.2 in 1980-89 which decreased to 85 in 2010-2019 (Table 6). Whereas, the CAI value for more than five authors was 46.7 in 1980-1989 which increased up to 115 in 2010-2019. The average number of authors per publication also increased from 1.54 in 1980-89 to 2.24 in 2010-19. Thus Co-Authorship Index reflects that number of citations consistently improved with number of collaborators.

Table 8. Citation pattern in LIS research of India

Number of Authors	Number of Publications (%)	Number of Citations (%)	Mean number of times cited
1	1479(35)	3974(23)	2.69
2	1593(37)	6481(38)	4.07
3	772(18)	4473(26)	5.79
4	265(6)	1571(9)	5.93
5	91(2)	336(2)	3.69
>5	104(2)	374(2)	3.60
Total	4304	17209	4.02

5.3.1 Output of Prolific Authors and Its Impact

Table 7 lists 8 most prolific authors who published more than 20 research papers on LIS in last four decades. These 8 authors published 379 (8.8 %) papers of the total output. Remaining 91.19 per cent of publications were contributed by other authors, which indicates a highly scattered output among the authors. Impact of individual authors in terms of CPP and RCI indicates that among the listed 8 authors, the value of CPP and RCI is more than average for two authors, namely, Gangan Prathap, and S. Arunachalam. The value of CPP and RCI was lower than the average value for rest of the authors.

5.4 Pattern of Citations

Citations represent a means by which knowledge is transferred among the researchers and scientists both within a field and between fields. They are linked to the impact factor of journals. Studies have shown that the researcher perceptions of journal prestige correlate with impact factor. The educational and research institutions evaluate scientists and faculty members for recruitment and promotions according to their publications in impact factor journals. Table 8 represents the citation of LIS research in India. Single author papers got 23 per cent of total citations in last four decades whereas two and three author- papers got 38 per cent and 26 per cent of total citations respectively. When we turn our attention to mean number of citations received for different number of authors then interestingly multi-author papers got more average number of citations.

5.5 Communication Behaviour and Identification of Core Journals in LIS

There were 359 unique journals and conference proceedings

Table 9. The top10 journals (sources) frequently published research works of Indian authors in LIS discipline

Source Name	TNP (%)	TNC (%)	CPP	RCI	% Docs Cited	Quartile	CNCI
Desidoc journal of library & information technology	598(13.09)	987(5.7)	1.65	0.41	59.19	N/A	0.21
Scientometrics	274(6.4)	3087(17.9)	11.27	2.82	88.68	Q1	0.83
Journal of information & optimization sciences	253(5.9)	400(2.3)	1.58	0.4	56.12	N/A	0.54
Annals of library and information studies	159(3.7)	158(0.9)	0.99	0.25	45.28	N/A	0.23
Journal of scientometric research	140(3.3)	92(0.5)	0.66	0.16	30.71	N/A	1.03
Collnet journal of scientometrics and information management	113(2.6)	158(0.9)	1.4	0.35	60.17	N/A	0.18
Electronic library	103(2.4)	686(4.0)	6.66	1.67	79.61	Q3	0.53
Journal of information & knowledge management	70(1.6)	114(0.7)	1.63	0.41	57.14	N/A	0.24
5'th international conference on information technology and quantitative management, itqm 2017	67(1.6)	100(0.6)	1.49	0.37	62.68	N/A	2.05
Knowledge organization	66(1.5)	69(0.4)	1.05	0.26	37.87	Q3	2.27
Sub-Total	1843(42.8)	5851(34)	3.17	0.79			
Others	2461(57.2)	11358(66)	4.62	1.15			
Total	4304	17209	4.00	1.00			

Table 10. Journals which published top 100 research papers with highest numbers of citations

Source	No of Publications
Scientometrics	20
Journal of enterprise information management	8
Information processing & management	7
Information technologies & international development	7
International journal of information management	7
Information & management	5
Information systems research	5
Others	41
Total	100

in which 4304 publications appeared. Table 9 summarises the top sources in LIS in India. The maximum number of articles, 598 was published in DJLIT and received 987 citations. This was followed by Scientometrics which had 274 contributions of Indian researchers and attracted 3087 citations in research papers. It is important to underline here that 88 per cent of the articles, published in Scientometrics, contributed by Indian researchers received citations. The journal was in Quartile1. The other journals listed in the Table 10 have not been assigned any quartile. The journals indexed in ESCI do not have Impact Factors and so they are not assigned any quartile. ESCI was launched in 2015 and has a collection of 7800 journal titles from all disciplines and range from international and broad scope publications to those which provide deeper regional or speciality area coverage.

There were 34 unique journals which published 99 articles and one conference proceedings which published one article.

Table 10 shows the sources which published the top 100 papers having the highest numbers of citation have been analysed. 'Scientometrics' published most top ranked papers (20) on LIS followed by 'Journal of Enterprise Information Management' with 8 papers with high citations. The Table 10 reflects that 59 articles were published in 7 journals and, 27 other journals published 40 articles.

5.6 Trends of LIS Research in India

The 4304 records were sorted by number of citations, in descending order. Researchers conducted contents analysis of abstracts of top 100 articles with the highest number of citations to identify research areas and research trends in the field of Library and information science. The list of 100 bibliographical records is enclosed at Annexure A.

5.6.1 1980-89

The top 100 articles included one article (Annexure A) which was published in 1981. It accrued 39 citations and dwelt on the scientific productivity of middle level countries, Australia, Canada, India and Israel through 95 national, regional and international journals. Most of these journals did not contribute to mainstream research of international level and did not attract citations.

5.6.2 1990-99

The top 100 articles included 13 articles (which were published during this decade and attracted 810 citations. They focused on the Bibliometrics, Infometrics, Scientometrics and Librametrics. The different factors which lead to obsolescence in literature were studied.

Co-authorship, co-inventorship and co-word analysis – bibliometric tools were used to highlight publication trends in different fields. Factor analysis was used to identify 11

Table 11. Major themes of the hundred top cited papers

1980-89		1990-99		2000-2009		2010-2019	
Topics	**NP**	**Topics**	**NP**	**Topics**	**NP**	**Topics**	**NP**
Scientometrics	01	Information Retrieval	02	Use of mobile phones	07	Sentiment Analysis	03
		Digital Libraries	01	Knowledge Management	10	Social networking and e-commerce	08
		Scientometrics	10	E-commerce	02	Knowledge Management	06
				ICTs and their applications in various sectors	21	ICTs and their applications in various sectors	10
				Digital Libraries	02	Scientometrics	06
				Scientometrics	09	Miscellaneous (Statistics/ Information seeking	02

different determinants which influence research productivity of scientists.

5.6.3 2000-2009

During 2000-2009, 51 articles gained 3176 citations, predominantly focused on the following topics**:**

Scientometrics studies in different subject areas- international collaboration, co-authorship, patent and co- word analysis were carried out. Relation between expenditure on R& D and patents granted was highlighted.

5.6.4 Information Retrieval

A composite feature which includes shape and colour properties, based on a clustering technique was proposed for retrieving images from image databases. The effectiveness of several shape measures for matching and retrieving content from multimedia and images database was studied.

5.6.5 Information Communication Technologies (ICTs in Governance

Use of mobile phones has accelerated economic and social development, removing information asymmetries, bridging digital divide. Text free user interfaces in mobile and computer applications facilitate their use among people irrespective of educational levels. The private sector should target the vast untapped rural markets in the developing countries with low cost services and appropriate business models. The deployment of virtual teams and web based decision support system for informed decision making has been recommended.

5.6.6 E-Commerce

The study of 4514 bay auctions has revealed that consumer surplus levels are different across currencies and item categories.

The role of top management, organisational culture, skills of information systems influence the adoption of e- commerce technologies

5.6.7 Knowledge Management

The Indian manufacturing firms must integrate IT based Information system(IS) in their overall functioning in order to achieve a world class status and deliver superior services to their customers. At present, the Indian firms have a fragmented Information management system.

A morphology of the research literature on knowledge transfer in organisations was described. There are eight dimensions to characterise the literature on knowledge transfer .The approach of morphology may be used by the researchers to identify strong and less worked areas in a subject field.

5.6.8 2010-2019

Out of the top 100 articles, 35(were published in the fourth decade, 2010-2019, and received 2085 citations. These articles dealt with the following themes:

The area of scientometrics was explored by text mining and co word analysis. Word-co word pairs were analysed to understand relation or links between concepts and sub concepts. A new indicator called p index, performance index was used to rank 100 economists of the world. The p-index shows balance between the quantity, total number of citations and quality, citations per publication. A mock H index was introduced to complement H index and address its limitations, the self-citation tendency of the researchers was also dealt upon.

5.6.9 Web 2.0 Social Networking Sites and E-Commerce

The application of Web 2.0 feature in library websites was studied and analysed. The libraries used RSS feeds, blogs, instant messaging to provide enhanced services to the users.

Table 11 summarises the themes of the top cited papers published during the last 4 decades.

The content analysis also highlights that journals in WOS may be assigned to more than one category. The same journal may be assigned to Library and Information science, management and computer science.

6. CONCLUSIONS

The study analysed LIS research during the last four decades, 1980 to 2019. InCites, a research analysis tool of Clarivate Analytics was used in the study for data extraction. It was found that 4304 articles were contributed by Indian LIS professionals out of a total of 426928 global contributions.

The papers by Indians received 17209 citations. Majority of the world output belonged to the fourth quartile (Q4) lowest down in order of quality. However, 37.59 per cent of Indian contributions were in the highest category quality (quartile Q1). Analysing the Indian literature qualitatively, it was found that 37.59 per cent Indian literature occupied the first quartile (Q1). In comparison, majority of the global output was placed in the lowest quartile (Q4).

Indian literature was qualitatively higher can also be seen in the higher citation impact (5.125) compared to global 4.0195. Likewise the Normalised Citation impact for Indian literature was 1.25 compared to the global figure 0.991. The results speak for the quality of Indian literature produced during the four decades.

Solo research and single author articles was the practice in the first decade. It changed with time as avenues for collaboration grew as well as its importance was realised. Percentage of co-authored articles grew from 5.61 per cent to 12.66 per cent in India compared to world ratio of 0.6 per cent to 9 per cent. The co-authorship index for single-author papers changed from 173.2 in the first decade to 85 in the last decade. Diametrically opposite it increased from 46 to 115 for more than 5 authors. Highest collaboration of Indians was found to be with US authors.

The most productive authors were identified to belong to scientometrics. Qualitatively they were placed above the average capacity of two authors as indicated in their citations per paper and relative citation impact values.

Trends in LIS research showed that Bibliometrics/ Scientometrics/Informetrics/Altmetrics occupied the top position having the maximum contributed papers.

The other favourite areas of researchers were Information Seeking Behaviour which has always been one of the most studied areas. Knowledge Management has also been popular in view of its growing importance all over.

Such studies evaluate the research giving a direction for new areas to be explored. It also helps to compare with research globally and learn. For instance, the studies on information seeking behaviour should focus on how users differentiate misinformation, disinformation, fake and authentic information, and how lack of such skills affect informed decision making.

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