

A scientometric analysis of international LIS journals: Productivity and characteristics

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This paper presents a quantitative study of productivity, characteristics and various aspects of global publication in the field of library and information science (LIS). A total of 894 contributions published in 56 LIS journals indexed in SSCI during the years of 2000–2004 were analyzed. A total of 1361 authors had contributed publications during the five years. The overwhelming majority (89.93%) of them wrote one paper. The average number of authors per paper is 1.52. All the studied papers were published in English. The sum of research output of the authors from USA and UK reaches 70% of the total productivity. Most papers received few citations. Each article received on an average 1.6 citations and the LIS researchers cite mostly latest articles. About 48% of citing authors had tendency of self-citation. The productive authors, their contribution and authorship position are listed to indicate their productivity and degree of involvement in their research publications.

Introduction

Journals¹ play an important role in scholarly communication. Periodicals are sensitive indicators of the emerging new ideas in any discipline. They reveal the existing problems requiring solution, research pattern to solve these problem, the

¹ We use “journal” and “periodicals” synonymously.

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practices fixed to various areas etc. “A scientific paper or text not only reveals the world building strategy of its authors, but also the nature and force of the building blocks derived from the domain of science from which it draws and to which it contributes” [GUPTA & KUMAR, 2001]. A scientific publication is a kind of written material containing information with respect of scientific activities, either in its physical form or its electronic equivalent in a computerized databases. In assessment of scientific performance, bibliometric and citation indicators are among the most important impact measures of scientific literature.

The bibliometric approach to science and technology is based on quantitative characteristics, attributes or objects of documentary flows. It is primarily based on the analysis of the bibliographic data on publications.” A principal assumption underlying the use of bibliometric indicators is that scholars publish their research findings in the publicly available literatures and that one may obtain pictures of scholarly activities from a quantitative analysis of scholarly documents [GARFIELD, 1979]. A careful evaluation of periodical literature may indicate a complete picture of the discipline, the profession with which it repents and everything connected with them.

Literature review

There have been content analysis of journals that focused on issues in library and information science. In the following just some very related studies are mentioned. NOUR [1985] analyzed research articles published during 1985 in 41 core LIS journals, and reported data for each source article based on variables such as: journal, research methodology, subject, total number of references and number of references to journal articles. This study identified the research methodologies and classified them by subject. KUMPULAINEN [1999] surveyed 30 LIS journals and analyzed the research according to eight variables: organization context, library and information science topic, phase of information dissemination process, aspect of activity, social level, method, method of selecting the data, and type of analysis. KHAN & AL. [1998] conducted a bibliometric study on library and information science literature in Bangladesh from 1966 to 1997. The result showed that, during 1966–1997 a total of 308 articles were authored by 116 professionals in 32 years, that is on average 9.62 articles per years, and 2.6 articles per author in 32 years. LIPETZ [1999] analyzed the author productivity of JASIS over the five decades from 1950 to 1999 through reviewing one volume out of each decade: 1955, 1965, 1975, 1985, and 1995. Lipetz found that the percentage of authors with more than one article exceeded 20% in 1995, while a different pattern of authors with more than one article began in 1995 with a ratio of 2% and it had increased in each decade since, to more than 9% in 1995. ROCHESTER & VAKKARI [2003] studied international and national trends in LIS research based on research articles in a core collection of journals. They described the trends in LIS research by comparing

distribution of topics, subtopics, approaches and methods in national LIS studies in Australia, China, Finland, Spain, Turkey and the United Kingdom and relate them to international trends. The comparison has shown a remarkable variation of emphases and trends in research in the countries examined. GINN [2003] has conducted citation analysis of authored articles in library and information science research, 2001–2002, and found that citations of articles published in scholarly journals would be greater in number than citations of any sources. From 2001 to 2003, journal article citations increased both in quantity and percent. Journals were cited most, followed by books, chapters in books, annuals, and web sites. More than 50 percent of the cited works would be ten years old or less. KOUFOGIANNAKIS & AL. [2004] conducted a content analysis of library and information studies (LIS) research articles published in 91 journals in 2001. They identified 10 top journals for research published in 2001. For the period studied, descriptive research was published far more frequently than any other type. The domain Information Access & Retrieval had the highest number of research articles, followed by Collections, Management, Education and Reference. SCHLOEGL & STOCK [2004] have compared 40 international and 10 German-language LIS journals. They found that the mean regional impact factor of the 10 German LIS periodicals amounted to 0.25, which is significantly lower than the mean impact factor of the international journals. The average citing half-life of international LIS journals amounted to 5.1 years. German language LIS journals had a very short half-life of references. LIS journals have on average 15.9 references per article, but this indicator is more than twice as high for international (18.8) as for German language periodicals (8.7). The rate of journal self references amounted to an average of 5.9% in the LIS journals. The review of literature on content analysis studies of LIS research convey that many of which focused on a particular specialty or subject area within LIS, other studies focused upon geographic areas, and some studies analyzed the content analyses of LIS journals. The review showed no studies done on the articles indexed in SSCI during the 2000–2004. Therefore, there is a need for such a study to be conducted to review research trends and scientometric analysis in LIS.

Objectives of the study

The objectives of the study are to determine the following:

- Language distribution of the literature
- Subject scatter
- Average number of references
- Geographical distribution
- Institution distribution of contributors
- Authorship pattern
- Active authors name

- Distribution of citations
- Highly cited authors
- Author self-citation
- Age-wise distribution of citations

Methodology

The present study adopts a descriptive research approach by means of bibliometric analysis, because of its nature as an exploratory investigation to describe the quantity, characteristics, and productivity of global publication in field of Library and Information Science (LIS). The present study is limited to LIS journals indexed in Social Science Citation Index (SSCI) produced by the Institute for Scientific Information (ISI). The basis of ISIs products are the bibliographical descriptions of articles and their references from academic journals in various subject areas. Also, the materials published in LIS journals in SSCI come from every nation in the world. Researchers from around the world choose to publish their research in these journals. At the time of our study (2005/11–2006/1), the SSCI database listed a total of 56 LIS unique title journals. The lists of journals were collected from journal subject category of the database.

The time period considered in this study is 2000–2004. In this survey only the articles published in the 56 journals have been considered. Letters, short notes, reports, meeting abstracts, and reviews were not included (see Appendix 1 for the list of journal titles). In fact in the search process the document type field has been limited to article. At the time this study was conducted, the SSCI database contained about 8940 contributions during the five years included in the 56 journals. Out of this by using systematic sampling method a sample of 894 (10 percent) contributions were chosen to cover all the journals issues during the five years. At an early stage of the analysis, bibliographic data of each article or record was collected. Next, was the development of checklist for collecting information on articles characteristics. Collected data, then, were coded and analysed using statistical package for social sciences (SPSS) to obtain frequently distribution and percentages.

Findings of the study

Language of articles

For each 894 articles the publication language were surveyed. After analysis of the articles it was observed that 100 percent of the articles were in English. This may be because the source journals are in English. We analyzed the LIS journals by country,

taking the publishers country as the point of origin of each journal (Table 1). As it is clear from the table 51.80 % of the journals belong to USA and 32.14% to UK. In other words 83.94% of the journals are published in these two countries.

Table 1. Country distribution LIS journals of SSCI

Countries	USA	UK	Germany	Canada	Netherlands	Japan	Total
No. of journals	29	18	4	2	2	1	56
Percentage	51/80	32/14	7/14	3/57	3/57	1/78	100

Subject scatter

In order to decide the subject field, the keywords, and in some cases abstract of the contributions were surveyed and then were categorized according to LISA Broad Subject Headings. The abstracts in LISA (Library and Information Science Abstract) has been arranged within a scheme involving 19 Broad Subject Headings and a number of subheadings. Table 2 reveals the distribution of articles in various fields of the subject.

Table 2. Subject scatter*

Subject categories	Frequency	Percentage (%)	Rank
Communication and Information Technology ^a	455	29.87	1
Computerized Information Storage and Retrieval	177	11.62	2
Library Use and User	144	9.45	3
Materials and Bibliometrics, Scientometrics	111	7.28	4
Organizations	105	6.89	5
Knowledge and Learning	89	5.84	6
Media	77	5.05	7
Libraries and Resource Centres	66	4.33	8
Information Communication ^b	58	3.8	9
Bibliographic Records	44	2.88	10
Library Technology	43	2.82	11
Other Subjects ^c	38	2.49	12
Profession	32	2.10	13
Technical Services	24	1.57	14
Librarianship and Information Science	19	1.24	15
Records Management	18	1.18	16
Reading (Information Literacy)	16	1.05	17
Bibliographic Control	7	0.45	18
Total	1523	100	-

* The data indicates that some articles dealt with more than one subject.

^a Communication and Information Technology: Computer Industry, Networks ,Computer Science, Computers, Software, Imaging Technology, Online System, Disc Stored Systems, Telecommunications and Broadcasting Technology, Computer Applications.

^b Information Communication: Information work, Social Sciences Business Information Work, Humanities Information Work, Science Technology Medicine Information Work, Information Services, Reference Work.

^c Other Subjects: Those subjects that cannot be categorized under other 18 Broad Subject Headings.

It indicates that the highest number i.e. 455 (29.87%) is related to communications and Information technology and the lowest number i.e. 7 (0.45%) is on bibliographic control.

Reference distribution

The frequency distribution of references per articles showed that out of 894 articles 158 (about 18%) of the articles have no references. The maximum references were 100 while minimum was one. Nearly 66% of the articles were having references between 10–30 while 44% of the articles have references above 40 references. As a whole, the average number of references in the sample articles is 22 references per article. The most of articles with no reference have been published in three journals i.e., library journal, Econtent, Online, that the second and the third ones are open access journals. This means that 3.57% of LIS journals covered by SSCI are Open Access (OA). MCVEIGH' [2004] study showed that 2.6% of the journals in the web of science are OA. This study also revealed that as a group, journals that have adopted on OA distribution model have not achieved significantly greater citation impact.

Geographical distribution

It was feasible to analyse the articles under sample according to geographical distribution. The needed data were collected from the address field of the authors. Table 3 shows the geographical distribution of published articles in 56 journals. Out of 894 articles, the highest number i.e. 519 (58.5%) has been contributed by USA professionals that is followed with approximately 10% by England authors. During the study period the sample articles were produced by 45 countries. These countries have been categorized in five groups on their portion participant. USA and England are in group one, and can be called as Pioneers in LIS. The second group with three countries including: Canada, Australia and Netherlands are the fast followers. The third and fourth groups of 20 countries are the upcomer countries. The fifth groups with 20 countries are the Beginners, and other countries in the world may be called Laggards in publishing articles on journals covered by ISI. As the table indicates about 68% of the articles are produced by two countries, 4.3% by 3 countries, 10% by 8 countries 8.34% by 12 countries and just 3.74% by 20 countries. It should be noted that article and journal coverage of the SSCI database differs form country to country.

Table 3. Geographical distribution

Countries grouping	Countries	No. of articles	Percentage	Rank
Group one	USA	519	58.05	1
	UK	93	10.40	2
Group Two	Canada	39	4.36	3
	Australia	25	2.79	4
	Netherlands	19	2.12	5
Group Three	Germany	14	1.56	6
	Scotland	14	1.56	6
	Denmark	13	1.45	7
	France	11	1.23	8
	South Africa	10	1.11	9
Group Four	South Korea	10	1.11	9
	Finland	9	1.01	10
	Taiwan	9	1.01	10
	Italy	8	0.89	11
	Belgium	8	0.89	11
	Israel	8	0.89	11
	Singapore	7	0.78	12
	India	7	0.78	12
	Spain	7	0.78	12
	Poland	7	0.78	12
	New Zealand	6	0.67	13
	Austria	5	0.56	14
	Japan	4	0.44	15
	Norway	4	0.44	15
	Sweden	4	0.44	15
Group Five	Other Countries*	1-3	3.74	16
Total	45	894	100	-

* Ireland, Kuwait, Portugal, Pakistan, Croatia, Russia, Nigeria, Brazil, Switzerland, Turkey, Romania, Thailand, Slovakia, Slovenia, Algeria, Colombia, Greece, Quebress, Mexico, Bulgarian.

Institution distribution

Table 4 indicates institution distribution of the authors in the studied journals. Out of 1361 authors the highest number i.e. 900 (67%) are university members or in precise word teaching faculty of various library schools and university and college library staff. Next to this is 387 (28%) authors affiliated with other institutions.

Table 4. Institution distribution

Affiliations	Academic institutions	Non-academic institutions	Unknown	Total of authors
Distribution				
Frequency	900	387	74	1361
Percentage	67	28	5	100

Table 5. List of major institutions

Rank	University name	No. of articles	Percentage	Rank
1	Univ Missouri	19	2.13	1
2	Indian Univ	18	2.02	2
3	City Univ London	17	1.91	3
4	Penn State Univ	17	1.91	3
5	Univ Calif Los Angeles	17	1.91	3
6	Univ Loughbrough	16	1.79	4
7	Univ Pittsburg	16	1.79	4
8	Harvard Univ	15	1.68	5
9	Florida State Univ	14	1.57	6
10	Nanyang Technol Univ	14	1.57	6
11	Univ Washington	14	1.57	6
12	Drexel Univ	13	1.46	7
13	Texas A & M Univ	12	1.34	8
14	MC Gill Univ	11	1.23	9
15	Columbia Univ	10	1.12	10
16	Univ N Carolina	10	1.12	10
17	Yale Univ	9	1.01	11
18	Tampere Univ	8	0.89	12
19	Univ Sheffield	8	0.89	12
20	Yonesi Univ	8	0.89	12
21	Colorado State Univ	7	0.78	13
22	N Carolina State Univ	7	0.78	13
23	Univ Arizona	7	0.78	13
24	Univ Minnesota	7	0.78	13
25	Vanderbilt Univ	7	0.78	13
26	Arizona State Univ	6	0.68	14
27	Australian Natl Univ	6	0.68	14
28	Cornell Univ	6	0.68	14
29	Napier Univ	6	0.68	14
30	Stanford Univ	6	0.68	14
31	Univ Alberta	6	0.68	14
32	Univ Colorado	6	0.68	14
33	Univ Illinois	6	0.68	14
34	Univ Western Ontario	6	0.68	14
35	Wolverhampton Univ	6	0.68	14
36	Dalhousie Univ	5	0.56	15
37	Hebrew Univ Jerusalem	5	0.56	15
38	Kuwait Univ	5	0.56	15
39	Stanford Univ	5	0.56	15
40	Univ Calif Irvine	5	0.56	15
41	Univ Connecticut	5	0.56	15
42	Univ Lyon	5	0.56	15
43	Univ Nebraska	5	0.56	15
44	Univ Strathclyde	5	0.56	15
45	Univ Texas	5	0.56	15
46	Univ Utah	5	0.56	15
47	Univ Wisconsin	5	0.56	15

A total of 47 institutions contributing 5 or more articles in the period 2000–2004 were included in the list of major institutions (Table 5). For each article the institutional affiliations of contributing authors were noted. For the articles with *n* co-authors, each author's institution assumed to get a credit article without regard to order of authorship and in case of a single author with two institutional affiliations, the article is credited to the institution where the research was carried out. Universities such as: Missouri, Indiana, City Univ London, Penn State Univ, California, Loughbrough, Pittsburg, and Harvard are the most productive institutions in the field. From the table, one can easily figure out that the most number of articles are from the institutions in the USA and UK.

Authorship pattern

The collected data showed that out of 894 articles, 457 (51.11%) have been contributed by single author, and 437 (48.89%) by two or more authors. The authorship pattern does not show remarkable difference between the number of single author, and co-authors.

Ranking of authors

There were a total of 1361 authors contributing the 894 articles in the journals during the five years. The average number of authors per paper in LIS is 1.52. It was interesting to know, who has been the most productive author among library professionals. Table 6 ranks authors by number of publications. Among them only 12 (0.88%) as the most prolific contributors had written 4 to 9 articles during the period, 25 authors with 30 articles, followed by 100 with 2 works, while 1224 (89/93%) with single paper ranked the fourth place, authoring or co-authoring publications respectively. It can be seen from the ranked list that Constans A ranked first with 9 articles while Thelwall M second, Nicholas D, Perkel JM, Spink A and Tenopir third, Williams P fourth, Bunk S, Chung YM, Huntington P, Vinkler P, and Watanabe ME ranked fifth and so on.

Table 6. List of authors by number of publication

Series	Authors	No. of articles	Percentage	Rank
1	Constans A	9	1.01	1
2	Thelwall M	7	0.79	2
3	Nicholas D	6	0.67	3
4	Perkel JM	6	0.67	3
5	Spink A	6	0.67	3
6	Tenopir	6	0.67	3
7	Williams P	5	0.56	4
8	Bunk S	4	0.45	5
9	Chung YM	4	0.45	5
10	Huntington P	4	0.45	5
11	Vinkler P	4	0.45	5
12	Watanbe ME	4	0.45	5
13	Adamo M	3	0.34	6
14	Agres T	3	0.34	6
15	Bates DW	3	0.34	6
16	Bates ME	3	0.34	6
17	Cortese JD	3	0.34	6
18	Davenport E	3	0.34	6
19	Dilevko J	3	0.34	6
20	Fitzgerald DA	3	0.34	6
21	Lewis R	3	0.34	6
22	Maganda G	3	0.34	6
23	Maher BA	3	0.34	6
24	Miller RA	3	0.34	6
25	O'Leary M	3	0.34	6
26	Oppenheim C	3	0.34	6
27	Pack T	3	0.34	6
28	Palevtiz BA	3	0.34	6
29	Roberts JP	3	0.34	6
30	Russo E	3	0.34	6
31	Sherman C	3	0.34	6
32	Smith CM	3	0.34	6
33	Steinberg D	3	0.34	6
34	Tennant R	3	0.34	6
35	Tillotson J	3	0.34	6
36	Torchio M	3	0.34	6
37	White HD	3	0.34	6
38	100	2	11.24	7
39	1224	1	73.03	8

As it is obvious from the table the general author article distribution fits Lotka's law, leading to the expression that "the number of authors making n contributions is about $1/n$ of those making one contribution, where α is often nearly 2" [BLACK, 2004].

Distribution of citations

A total of 1613 citations, including self-citations, were collected from the sample articles during the years 2000 to 2004. The collected data indicates that out of 894 articles, 458 (51.23%) articles were cited and 436 (48.77%) were not cited, but the differences does not seem remarkable. Table 7 presents the number of citations. It indicates that out of 458 cited articles those with one citations has the highest number (182; about 40%) and other 60 percent has got citations between 2 to more than 10 times. The average number of citations for 458 cited articles is 3.14, but as a whole for all cited and not cited articles is 1.60 per article.

Table 7. Citation distribution

Number of citations	Number of articles	Percentage
1	182	39.73
2	97	21.17
3	58	12.74
4	36	7.91
5	17	3.73
6	15	3.29
7	11	2.41
8	12	2.63
9	8	1.75
10	9	1.97
11-32	13	2.85
Total	458	100

The articles with more than 10 citations may be known as the significant articles during the study period. These 13 titles are arranged according to their decreasing order of the number of citations in Table 8 . High cited articles are from 10 journals.

Author self-citations

While analyzing, citations tendency in authors was found. To find out the percentage of author self-citation (the percentage of citing ones previous publications in a new publications, either first author or co-author) all 458 cited articles were checked. The collected data indicates that out of 458 cited articles in 218 articles self-citation were seen. This is 47.60% of the cited articles. The rate of self-citations ranges between 1 to 7 citations but a highest number of articles (148; 67.89%) have one self-citation (Table 9).

Table 8. Highly cited articles

Series	Title	Author	Journal title	Times cited	Publication year
1	Information technology assimilation in firms: the influence of senior leadership and IT infrastructures	C. P. Armstrong V. Sambamurthy	<i>Information Systems Research</i>	32	2000
2	Webometric analysis of departments of librarianship and information science	T. Owen	<i>Journal of Information Science</i>	31	2001
3	Results from a web impact factor crawler	M. Thelwall	<i>Journal of Documentation</i>	27	2001
4	Evidence of the effect of trust building technology in electronic markets: price premiums and buyer behavior	Sulin, Ba	<i>MIS Quarterly</i>	22	2002
5	Authors as citers over time	H. D. White	<i>Journal of the American Society for Information Science and Technology</i>	19	2001
6	Reproduced and emergent genres of communication on the World-Wide Web	K. Crowston	<i>The Information Society</i>	18	2000
7	Using Mentoring and Storytelling to Transfer Knowledge in the Workplace	W. Swap, D. Leonard, M. Shields & L. Abrams	<i>Journal of Management Information Systems</i>	15	2001
8	Developing and validating as instrument for measuring user-perceived web quality	A. M. Aladwani, P. C. Palvia	<i>Management information system</i>	12	2002
9	Using graded relevance assessments in IR evaluation	J. Kekäläinen, K. Järvelin,	<i>Journal of the American Society for Information Science and Technology</i>	12	2002
10	Multitasking information seeking and searching processes	A. Spink, H. C. Ozmutlu & S. Ozmutlu	<i>Journal of the American Society for Information Science and Technology</i>	11	2002
11	Engineering a multi-purpose test collection for Web retrieval experiments	P. Bailey, N. Craswell, D. Hawking	<i>Information Processing and Management</i>	11	2003
12	Usability testing of an academic library website: case study'	B. Battleson, A Booth & J. Weintrop	<i>Journal of academic librarianship</i>	11	2001
13	Information systems as a reference discipline	R. Baskerville, & M. Myers	<i>MIS Quarterly</i>	11	2002

Table 9. Author self-citation distribution

Number of self-citations	Number of articles	Percentage
1	148	67.89
2	42	19.29
3	10	4.58
4	5	2.3
5	7	3.21
6	4	1.83
7	2	0.91
Total	218	100.00

Age-wise distribution of citations

Table 10 shows age-wise distribution of citations. The data indicates that the most citation of the articles are at the first four years after publishing. As it is obvious from the table, 5% of the LIS papers has got immediate citation at the first year. An Immediacy Index considers only one year of data and can be calculated after a journal has been indexed and cited for one full year. The immediacy index is an indication of the speed with which items published in the journals are incorporated into other literatures references [MCVEIGH, 2004]. The rate of immediacy index suggests, that just 5% of the journals content is quickly noticed, highly valued and topical within the field (LIS).

Table 10. Age-wise distribution of citations

Citing year	2000	2001	2002	2003	2004	2005	Total
Publication year							
2000	28	72	90	118	82	56	446
2001		14	80	96	120	80	390
2002			12	72	96	124	304
2003				9	92	113	214
2004					11	71	82

The maximum citation to an article belong to the fourth year of publishing. The proportion of citations reveals that citing to an article during the first four years after publishing increase and after that the number of citations will be decrease.

Discussion and conclusion

Summing up the present study of publication productivity including 894 (10%) of the articles published during the study period (2000–2004) in the field of LIS it can be conclude that:

It has been observed that 100 percent of the articles were in English language. Majority of the journals are published from USA and UK and a few title are published

from Canada, Germany, Netherlands and Japan. Moreover the source journals were in English. The dominant language of the global information infrastructure in LIS is English. Hence in citation behavior, the articles written in English must have cited English articles only. Further, it is to note that when lot of literature is available in English language there is no necessity to search for literature in any other languages. Visibility and accessibility of an article, by any path, is a necessary pre condition for citation [GAMI & AL., 2004; GARFIELD, 1998]. Also SEGLEN [1997] expresses that the preference of the ISI databases for English language journals will contribute to a low impact factor for the few non-English journals that are included. Therefore countries, especially developing countries, should create scientific contents in their own language so as to maintain their local identities, but also accept English as the universal tool that can make connection in a world of different languages or multilingualism.

The analysis of subject areas showed that communication and information technology with 29.87%, Computerized information storage and Retrieval with 11.62% and library use and users with 9.45% all together constitute 50.94% are the most popular research area among the authors. In fact, recently information technology have attracted the attention of many researchers all over the world. Researchers have a curiosity to explore the role of IT facilities in the library environment, its effect on library services and staff. Therefore, it is normal to find such topics the most popular area among the authors.

As a whole, the papers in LIS cite 22 references on average. About 66% of the articles had 1–30 references. Out of 894 articles 158 articles (18%) have no references. This may be due to the fact that some of the library science journals because of their nature publish many state-of-the-art papers. The references in research papers provide empirical data on knowledge flows within and between scientific disciplines. Also references play vital role in framing /making new article/ further studies. Therefore, the editor has to incite the authors to provide reference for their articles. This would not only providing base to their study but also give credit to the authors of citing articles.

Most of the contributors (approximately 70%) are from USA (58.50%) and UK (10%). About 30% of the contributors are form 43 countries. In fact, two countries produced more than two-third of the 894 total in the period. The combined share of these two countries in LIS scientific publications is similar to their combination number of LIS journals indexed in SSCI which is about 84 percent. It is observed that developed countries with near about 95% have the global LIS publication productivity. In scholarly communication system, publishing is fundamental for the domain of formal communication of science. Scholars in all countries (developed or developing countries) could publish their articles on the ISI journals.

The number of publications brought out by the universities is much higher than that of non-academic institution. Most productive institutions in the field for the period 2000–2004 were 47 institutions. These institutions emerged as the premier institutions

conducting LIS research as here defined. American and England institutes of LIS plays very crucial role in dissemination of scholarly information in the field of Library and Information Science.

About 48% of citing authors had tendency of self-citation. Here, the question arose to what extent citations might reflect the quality of research and if so, whether those measures are also reliable in the sense that the authors themselves might deliberately influence or even manipulate the measurable impact of their publications. As GLÄNZEL & AL. [2006] states, in particular, this might be possible by forming of so-called citation cliques or by exaggerating citing of the authors own work. What we should noted here is that, although author self-citations are highly problematic and suspect in determining the quality of scientific journals, but citing of scientific literature has to be considered part of social processes in the science system. If the citation expresses reward, self-citations distort necessarily the system as such. However, Glänzel express that, the macro studies show that there is no reason for condemning self-citations in general or for removing them from citation statistics. He emphasize that, supplementary indicators based on self-citations are useful to understand communication patterns.

About half of the library scientists prefer to contribute their papers individually. Collaboration is often a critical component of research in the world of "big science" which involves large-scale projects dominated by complex problems, rapidly changing technology, dynamic growth of knowledge, and highly specialized expertise [HARA & AL., 2003; RUSSEL, 2001]. Possible reasons and explanations included the increasing specialization of researchers necessitating collaboration, more access to electronic means of communication, more competition for research funds, larger research teams, variable of absent journal criteria for defining authorship, and the increased awarding of "gift" authorships [GU, 2004].

Data shows that the observed ratios of authors with two or more articles are low. It appears that more authors made only one contribution while fewer authors made two or more contributions in the five years surveyed. The study by SEN & AL. [1996] based on the annual name Index of Library and Information Science Abstracts (LISA) for 1992 and the annual author index of LISA for 1993 confirm the result of this study.

The strong increase of citations during the four years after publication will happen. It reveals that the LIS researchers cite mostly latest articles. Further analyses have shown that citation indicator become quite stable in a period of 3–5 years after publication. A citation window of five years is thus sufficient for citation studies in LIS. Therefore, the use of an extremely short term index (citations to articles published only in the past two years) in calculating the impact factor introduces a strong temporal bias in LIS.

Most papers receive few citations. Each article received on an average of 1.6 citations. The percentage of articles not cited during the time period considered is 48.77 percent. The fact that a document is less frequently cited or even (still) uncited several

years after publication provides information about its reception by colleagues but does not reveal any thing about its quality or the standing of its author(s) in the community. Uncited papers by Nobel Prize winners may just serve as a example [GLÄNZEL & AL., 2006]. According to SCHLOEGL & STOCK [2004] the situation is different for no publishing readers who were inspired by an article they read and who may latter even be able to translate some new ideas from it successfully into practice. Here, the impact of an article is not documented by a reference, making it impossible for a scientometrician to realize any effect. Most of the several thousands of journals covered by the ISI have been considered as core international journals and highest quality literature. If a citation rate of a given paper set is low, we can not be conclude on the quality of underlying research. It can be conclude that citation data cannot fully display the quality of a paper. Therefore, when analyzing scientific journals, both citation analysis and expert surveys are to be used.

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Appendix 1
56 journal titles included in the study

1	<i>Annual Review of Information Science and Technology</i>
2	<i>Asist Monograph Series</i>
3	<i>Aslib Proceedings</i>
4	<i>Canadian Journal of Information and Library Science-Revue Canadienne des Sciences de L Information et de Bibliotheconomie</i>
5	<i>College & Research Libraries</i>
6	<i>Econtent</i>
7	<i>Electronic Library</i>
8	<i>Government Information Quarterly</i>
9	<i>Information & Management</i>
10	<i>Information Processing & Management</i>
11	<i>Information Research – An International Electronic Journal</i>
12	<i>Information Society</i>
13	<i>Information Systems Journal</i>
14	<i>Information Systems Research</i>
15	<i>Information Technology and Libraries</i>
16	<i>Interlending & Document Supply</i>
17	<i>International Journal of Geographical Information Science</i>
18	<i>International Journal of Information Management</i>
19	<i>Journal of Academic Librarianship</i>
20	<i>Journal of Documentation</i>
21	<i>Journal of Government Information</i>
22	<i>Journal of Health Communication</i>
23	<i>Journal of Information Ethics</i>
24	<i>Journal of Information Science</i>
25	<i>Journal of Information Technology</i>
26	<i>Journal of Librarianship And Information Science</i>
27	<i>Journal of Management Information Systems</i>
28	<i>Journal of Scholarly Publishing</i>
29	<i>Journal of the American Medical Informatics Association</i>
30	<i>Journal of the American Society For Information Science And Technology</i>
31	<i>Journal of the Medical Library Association</i>
32	<i>Knowledge Organization</i>
33	<i>Law Library Journal</i>
34	<i>Library & Information Science Research</i>
35	<i>Library and Information Science</i>
36	<i>Library Collections Acquisitions & Technical Services</i>
37	<i>Library Journal</i>
38	<i>Library Quarterly</i>
39	<i>Library Resources & Technical Services</i>
40	<i>Library Trends</i>
41	<i>Libri</i>
42	<i>MIS Quarterly</i>
43	<i>Online</i>
44	<i>Online Information Review</i>
45	<i>Portal–Libraries and the Academy</i>

Appendix 1 (cont.)

46	<i>Proceedings of the ASIST Annual Meeting</i>
47	<i>Program-Electronic Library and Information Systems</i>
48	<i>Reference & User Services Quarterly</i>
49	<i>Research Evaluation</i>
50	<i>Restaurator-International Journal for the Preservation of Library and Archival Material</i>
51	<i>Scientist</i>
52	<i>Scientometrics</i>
53	<i>Social Science Computer Review</i>
54	<i>Social Science Information sur les Sciences Sociales</i>
55	<i>Telecommunications Policy</i>
56	<i>Zeitschrift für Bibliothekswesen und Bibliographie</i>
