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The hyperlinking pattern of open-access journals in library and information science: A cited citing reference study

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ABSTRACT

Using 17 open-access journals published without interruption between 2000 and 2004 in the field of library and information science, this study compares the pattern of cited/citing hyperlinked references of Web-based scholarly electronic articles under various citation ranges in terms of language, file format, source and top-level domain. While the patterns of cited references were manually examined by counting the live hyperlinked-cited references, the patterns of citing references were examined by using the *cited by* tag in Google Scholar. The analysis indicates that although language, top-level domain, and file format of citations did not differ significantly for articles under different citation ranges, sources of citation differed significantly for articles in different citation ranges. Articles with fewer citations mostly cite less-scholarly sources such as Web pages, whereas articles with a higher number of citations mostly cite scholarly sources such as journal articles, etc. The findings suggest that 8 out of 17 OA journals in LIS have significant research impact in the scholarly communication process.

1. Introduction

The term *citation*, in the literary sense, means a reference to a text that has been quoted, or the verbatim words of another speaker or writer that have been used in a write-up. In library and information science (LIS), a citation either means referencing another author's work in an endnote or footnote, or being referenced in another author's work. The former is defined as cited reference and the latter as citing reference. With the increasing involvement of technology in the scholarly communication process, the style of the traditional cited/citing reference has changed. In scholarly texts, authors are now using hyperlinks either inside the text or in the reference list to cite sources they have consulted. Research on the popularity of electronic journals has shown that features like full-text searching and hyperlinks from the bibliographic description to the full text of an article are highly useful for an electronic journal (Voorbij & Ongering, 2006). Some earlier studies also pointed out that the introduction of hyperlinks into scholarly electronic environments might bring about changes not only in traditional citation style (Li & Crane, 1996; Walker, 1995) but also in scholarly e-article citation practice (Kim, 2000). Since open-access (OA) journals are always in electronic form, the use of hyperlinks may be more predominant. Yet it is not well understood what kind of hyperlinked information sources scientists and scholars actually include in their scholarly articles for OA journals. This study focuses on one particular aspect of this use by analyzing the formal cited/citing hyperlink references in articles of OA journals.

The citation indexes accessible through the Institute of Scientific Information's (ISI) Web of Science or Scopus are assumed to be authentic sources for scientometric and citation studies. However, most OA journals, particularly LIS OA journals, are yet to be included in these databases. Hence these databases are neither reliable nor valid if one wishes to analyze the cited/citing references in the case of LIS OA journals. The Google Scholar search engine has emerged as a popular and alternative tool for measuring citations, but no research involving citing references of OA journals found in Google Scholar has been reported. Additionally, in spite of the fact that OA articles are more visible than non-OA articles and that they get more citing references (Lawrence, 2001; Brody, Stamerjohanns, Harnad, Gingras, Vallieres, et al., 2004), the pattern of citing references to OA journal articles in LIS has yet to be discussed in detail. Recently, a considerable body of webometric research has used hyperlinks to scholarly texts as an indicator for measuring the impact of Web documents. Most of these studies used the Google or AltaVista search engines as tools for citation extraction.

Hyperlinks that are generated from various Internet-based documents and that point to an OA journal-article may be comparable with formal citations but are not functionally equivalent to traditional citations. Inlinks may come from journal articles, conference papers, research reports, etc., as well as from an author's personal Web site, Web CVs, or simply from a Web page. In terms of citation analysis, it is not fair to consider all such inlinks for the measurement of scholarly impact. Therefore, there is a need to understand the pattern of citations to OA articles and whether these inlinks are used for formal reasons or for informal reasons. Moreover, the pattern of citing reference of OA articles may be different from that of traditional print-

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journals. No research has been done yet to compare the pattern of citing references with cited references for articles having received different amount of citations.

The motivation for writing this paper is to answer the following three research questions in the LIS field:

1. In what distribution do OA articles cite/get citations to/from another article?
2. Do authors refer more to electronic information sources than to print information sources in their scientific publications for OA journals?
3. What are the patterns of hyperlinked-cited/citing references of OA articles?

These questions address the relationship between cited and citing references, as well as the difference between hyperlinked-cited and citing references of articles that have received different numbers of citations.

The following indicators were developed to answer these questions:

- Relative share of references to Web-based sources (as a percentage of the total number of references) and relative share of references to live Web sources up to December 2006.
- Distribution of articles under various cited/citing reference ranges.
- Pattern of articles' cited/citing references (hyperlinked) in terms of language, top-level-domain, source, and file format.

These indicators were measured for the articles published in OA journals from 2000 to 2004 in LIS. LIS has different social and cognitive patterns that govern research practices and the relationships among researchers (Whitley, 1984). Thus, an analytical study of LIS journals could shed light on the underlying mechanism of knowledge networking and exchange.

2. Review of the literature

2.1. Hyperlinking in citation

During the last few years, a considerable body of research in bibliometrics has been devoted to finding out why authors cite papers, and there is an emerging parallel body of research into why Web authors create hyperlinks. Electronic Press (EP), one of the first commercial publishers to commit to publishing on the Web, plans to extend the practice of citation linking, which is aimed at linking a document not just to a cited source but also to all other documents that contain relevant information (Hitchcock, Quek, Carr, Hall, Witbrock, et al., 1997). Hyperlinks, particularly inlinks, have been examined and contrasted against citations from various perspectives (Bjorneborn & Ingwersen, 2001; Chu, 2005; Smith, 2004). Some researchers have pointed out the advantages of hyperlinking (Okerson, 1991; Hickey, 1995; Van Brakel, 1995; Quarterman, 1997; Tomney & Burton, 1998; Vaughan & Shaw, 2005), while others have pointed out the disadvantages, such as pages which shift from one server to another and broken links (Crawford, 2002; Ho, 2005). Casserly and Bird (2003) used 500 link-citations from LIS journals to look at the issue of the availability of URLs cited in scholarly papers. They found that about 10% of the links were broken, even after searching the Internet Archive, which captures large numbers of Web pages at regular intervals. Even this relatively small percentage is a cause of concern, since the loss of one reference could be critical.

2.2. Motivation for the creation of hyperlinks

Several studies have reported on the motivation for hyperlinking in electronic articles. In a study conducted by Kim (2000), 15 authors were interviewed, and 180 outlinks in e-articles were manually examined to cross-check expressed motivations. 19 different hyperlinking motivations were classified into three motivational groups: scholarly, social, and technological. Kim concluded that in scholarly electronic environments, scholars use hyperlinks for a variety of scholarly and non-scholarly purposes, and that hyperlinking is a multidimensional behavior involving different levels of motivations. In another study, Vaughan and Shaw (2003) created a classification of 854 Web citations indicating that many "represented intellectual impact, coming from other papers posted on the Web (30%) or from class readings lists (12%)" (p. 1313). Kousha and Thelwall (2007a) analyzed 1530 citations to 492 research articles that were extracted through the Google search engine. These articles were published in 44 OA journals of education, psychology, sociology, and economics in 2001. About 19% of the Web citations represented the formal impact equivalent of journal citations, and 11% were more informal indicators of impact. The average was about three formal and two informal impact citations per article. Although the proportions of formal and informal online impact were similar in sociology, psychology, and education, in economics there was six times more formal impact than informal impact. In another study, Kousha and Thelwall (2007b) gathered data based on a sample of 1577 Web citations of the URLs or titles of research articles in 64 OA journals from biology, physics, chemistry, and computing. Of the total Web citations, 25% were equivalent to intellectual impact (23% came from Web documents and 2% came from other informal scholarly sources). Many of the Web/URL citations were created for general or subject-specific navigation (45%) or for self-publicity (22%). Analyses also revealed significant disciplinary differences in the types of unique Web/URL citations as well as some characteristics of scientific OA publishing on the Web.

Smith (2005) studied 10 OA LIS e-journals. He examined conventional citation and links and calculated the Web impact factor by using the AltaVista search engine. He concluded that 60% of the links to these e-journals were journal articles, and 30% of the links were to a journal as a whole. Kousha and Thelwall (2006a) identified and classified apparent creation motivations for 3045 URL citations to 15 peer-reviewed, scholarly OA LIS e-journals published in 2000. According to their findings, 43% of URLs were created for formal reasons and 18% for informal scholarly reasons. Of the sources of URL citations, 82% were in English, 88% were full-text papers, and 58% were non-HTML documents. Of the URL citations, 60% were text URLs and 40% were hyperlinked. This study also showed that about 50% of URL citations were created within 1 year after the publication of the cited e-article. A slight correlation was found between average numbers of URL citations and average numbers of ISI citations for the journals in 2000. Almost all these earlier studies have used the novel hyperlink-based methods based on the whole Web, leveraging analogies with citations and using commercial search engines for extracting link data (Thelwall, Vaughan, & Bjorneborn, 2005; Kousha & Thelwall, 2006b). The search engines that are widely used in these studies are either Google or AltaVista, and principally these studies calculate inlinks of scholarly articles.

2.3. Google Scholar: a tool for citation collection

There is now a trend of using Google Scholar for research impact calculations as the site covers a wide variety of scholarly, peer-reviewed literature (Google Inc., 2007). A study by Noruzi (2005) suggests that Google Scholar has the potential as a citation index for bibliometric work. Bauer and Bakkalbasi (2005) also compared the number of citations to the *Journal of the American Society for Information Science and Technology* (*JASIST*) articles found in the Web of Science versus those found in Google Scholar. They found a significant correlation of citations between these two services. Vaughan and Shaw (2006) compared the citations of ISI, Google, and Google Scholar for 30 randomly selected LIS faculty members. They found that Google and Google Scholar hits were significantly more numerous than ISI citations. They also concluded that the most

common type of citation in Google was a bibliographic service (38%), while the most common type of citation in Google Scholar was a journal paper (52%). Google has less overlap with ISI citations than does Google Scholar, and thus the authors concluded that Google Scholar has a greater potential to replace ISI as a source of science and technology indicators.

2.4. Cited and citing references

The relationship between cited and citing references was first explored in the 1960s (Price, 1965). Harter, Nisonger, and Weng (1999) more recently investigated the semantic relationship between citing and cited documents for a sample of document pairs in three LIS journals: *Library Journal*, *College and Research Libraries*, and *JASIST*. They conducted a macroanalysis based on a comparison of the Library of Congress classification numbers assigned to citing and cited documents, and a microanalysis based on a comparison of descriptors assigned to citing and cited documents by the indexing and abstracting services ERIC, LISA, and Library Literature. Both analyses suggest that the subject similarity among pairs of cited and citing documents is typically very small, supporting a subjective, psychological view of relevance and a trial-and-error, heuristic understanding of the information search and research processes. In his study, Vinkler (2002) found that an increase in the mean citation impact of papers is directly correlated with an increase in the number of references that authors listed. Uzun (2006), using the ISI indexed journal *Scientometric*, also found that the number of references contained in research articles and their mean citation impact are dependent on each other.

3. Methods

The purpose of this study was to investigate the pattern of cited and citing references of research articles published in LIS OA journals. The sample consisted of English-language, open-access, peer-reviewed (or editor-reviewed) journals published between 2000 and 2004. In order to identify journals, the study followed the same method as used in a study that examined the bibliometric parameters of these OA journals (Mukherjee, 2009). This present study focuses on hyperlinks as attributes of references in formal scholarly publications. The research was conducted during November–December 2007. The full names and abbreviations of these OA journals are mentioned in Table 1.

Articles classified as editorial materials, PowerPoint slides of conferences, book reviews, columns, reports, e-dissertations, and news items were not considered for the analysis. All articles published during the sample period, their references (cited), and hyperlink references cited were counted manually. To analyze the pattern of cited references in detail, the ranges of cited references were classified into 12 strata with an interval of 10. They were: 0, 1–10, 11–20, 21–30, 31–40, 41–50, 51–60, 61–70, 71–80, 81–90, 91–100, and more than 100. The number of articles under every cited reference stratum was identified. Articles without any cited references (i.e., stratum *0*) were excluded from any further analysis. Every hyperlinked reference was checked manually to find out its functionality during investigation. Numerical details related to every individual article were saved in SPSS for further analysis.

Each article was then searched in Google Scholar to find the number of Web citations (citing references) it had received. Web citations were measured only of those articles whose text was accessed in English and that contained at least one reference in the reference lists. The articles' full titles as listed in their journals' tables of contents were searched in quotation marks (i.e., phrase search in Google) using Google Scholar's simple search option. Sometimes, the full journal name and year of publication were used in the advanced search field of Google Scholar in order to narrow the results. If Google Scholar displayed the results of an article from different hosts with a different number of Web citations, the result with the highest number of Web citations was considered for further analysis, irrespective of the host. All the Web citations that an article received through 2006 were calculated. This allows time for articles to be read, to influence a researcher or scholar in some way, to become part of a study, and eventually to be cited in published articles. Articles published during 2004 would typically take at least 2 years to receive citations by December 2006.

To analyze the pattern of citing references in detail, the Web citations were first classified into the same 12 citation strata. During data gathering, it was observed that most of the articles from LIS OA journals received citations within the range of 1 to 10. In order to give a richer picture, stratum 1–10 was further subdivided into 1–5 and 6–10 resulting in 13 total strata of Web citations. All the articles from these journals were grouped into the corresponding citation ranges according to the number of citations they received (see Appendix A.).

One of the research questions of this paper was to identify the pattern of hyperlinked-cited/citing references of these OA journals.

Table 1
Articles, cited references, hyperlinked cited references, and citing references

Name of the journal	Total articles	Articles without references	Cited references	Hyperlinked cited references	Live hyperlinked references	Citing references
ARD	155	14 (9.0%)	2132	1788	1670	555
CHL	13	02 (15.3%)	113	38	23	0
CYM	10	0	239	31	26	114
DLM	234	12 (5.1%)	3944	2642	2391	2516
EAS	37	07 (18.9%)	497	149	122	18
EID	110	11 (10%)	2278	366	288	402
FIM	391	45 (11.5%)	10,985	4599	4181	2714
HPW	41	09 (21.9%)	537	341	298	23
INR	142	0	4294	798	567	948
IST	96	24 (25%)	841	211	167	216
ITD	47	20 (42%)	875	418	311	72
JDI	130	08 (6.1%)	2980	1198	1037	859
JKM	55	02 (3.6%)	1212	88	53	47
LPP	41	05 (12.2%)	463	144	107	26
LRS	21	0	604	120	74	19
SJI	87	02 (2.3%)	1655	470	412	16
SMR	26	01 (3.8%)	1384	97	63	46
Total	1636	162 (9.9%)	35,033	13,498	11,790	8591

Legend: ARD: Ariadne; CHL: Chinese Librarianship; CYM: Cybermetrics; DLM: D-Lib Magazine; EAS: The Electronic Journal of Academic and Special Librarianship; EID: Electronic Journal of Information Systems in Developing Countries; FIM: First Monday; HPW: High Energy Physics Libraries Webzine; INR: Information Research; ITD: Information Technology and Disabilities; IST: Issues in Science and Technology Librarianship; JDI: Journal of Digital Information; JKM: Journal of Knowledge Management Practice; LPP: Library Philosophy and Practice; LRS: LIBRES; SMR: School Library and Media Research; SJI: South African Journal of Information Management.

Patterns were identified in terms of language, top-level domain, sources of articles, and file format. To make the task manageable, a sample was chosen from the total population. Choice was based on the hypothesis that the pattern of hyperlinks would be different in different ranges of citations. One article, irrespective of year, from each citing reference stratum (except 0) that received a higher number of Web citations as compared to other articles of that stratum was selected from each journal. If more than one article received the same number of Web citations under any stratum, the article with more cited references was considered. Under stratum 0, two articles were chosen: one from each journal with the highest number of cited references, irrespective of year of publication, and one from that year in which the journal received the highest number of Web citations. Here again the article with the highest number of cited references was given preference.

It should be noted that before choosing this process as mentioned above, other possible combinations were also considered. The Web citations sources, top-level domain, file format, etc. of other articles available under the same citation stratum were also verified randomly to confirm whether their patterns differed significantly. The reason for the stipulation of one article from each citation stratum from each journal was because no more than one article was available under most of the strata for some journals. Due to the unevenness of citation, this categorization was chosen to represent the total population.

In order to analyze the live hyperlink cited references of selected sample articles in terms of language, top-level domain, source, and file format, hyperlink references were navigated manually. These parameters for citing references were confirmed by navigating *cited by* tags in Google Scholar's searched results. During the investigation, it was observed that sometimes Google Scholar displayed duplicate results. Because of this, before calculating the actual number of citing references (Web citations) all the cited references listed for each article were examined manually, and duplicate references in each individual list were removed.

File formats and domain types were determined from the URLs of the citations. The domain types were classified into six categories: .org, .edu, .com, .net, .gov, and others, and the file formats were classified into three broad categories: PDF, HTML (including HTM, XML, SHTML) and DOC (including XLS, PPT, TXT). The sources of citations were classified into the following categories:

1. Journal articles. Citation comes from or points towards a scholarly journal article. For example, a *D-Lib Magazine*'s article cited in *Journal of Information Science* or vice-versa.
2. Conferences. Citation comes from or points towards conference (including a workshop, symposium) proceedings. For example, an ACM proceedings' article cited an article from *D-Lib Magazine* or vice-versa.
3. Full text papers. Citation comes from or points towards a full text article that is posted on the Web and having all characteristics of an article. Sometimes this type of article does not mention the source where it is published. This may be a preprint article but not a postprint one. Both the cited and citing articles include references but do not indicate whether they are peer-reviewed.
4. Reports. Citation comes from or points towards a full text report (usually unpublished) available on the Web. It may be a research report, project report, thesis, or dissertation and may include references.
5. Books/Book chapter. Citation comes from or points towards a book or book chapter. For example, the *Journal of Digital Information* cites an article of a book available in books.google.com or vice-versa.
6. Bibliographies. Citation comes from or points towards bibliographies available in author's resume, online bibliographies, Web bibliographies, etc.
7. Web pages. Citation comes from or points towards Web pages which do not have any individual author, or Web pages containing information about the related topic without any cited references.

This classification was based on earlier studies conducted by various scholars (e.g., Vaughan & Shaw, 2003, 2005) but modifications were incorporated as necessary for this study.

4. Findings

4.1. Distribution of cited/citing references: 2000–2004

Table 1 displays the distribution of articles, cited references, hyperlinked and live hyperlinked-cited references, and citing references by journal. As shown in the table, of the total 1636 articles, there were at least 162 (9.9%) articles that do not have any cited references. The remaining 1474 articles have an average of 23.7 references per article. The percentage of articles without any cited references varies from a minimum 2.3% in *SJI* to a maximum of 42% in *ITD*. The average cited references per article were observed to be highest in *SMR* (55.3) and lowest in *CHL* (10.2). It is interesting to see that *FIM,* although contributing the largest number of cited references, does not reach first position in terms of references per article.

Table 2A
Number of articles in various cited reference strata

Journals	Number of articles											
	0	1–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	>100
ARD	14	55	49	26	07	02	01	0	0	0	0	01
CHL	02	07	03	0	01	0	0	0	0	0	0	0
CYM	0	0	06	1	01	0	02	0	0	0	0	0
DLM	12	57	101	38	14	06	02	03	01	0	0	0
EAS	07	15	08	2	03	01	0	01	0	0	0	0
EID	11	21	29	23	15	04	03	02	02	0	0	0
FIM	45	76	90	64	27	27	12	15	15	04	6	10
HPW	09	11	09	09	1	2	0	0	0	0	0	0
INR	0	11	36	43	26	13	03	05	0	02	3	0
IST	24	37	28	5	01	0	0	01	0	0	0	0
ITD	20	06	05	4	04	03	01	02	0	02	0	0
JDI	08	37	29	25	17	04	05	01	02	01	0	01
JKM	02	16	15	9	04	03	03	02	0	01	0	0
LPP	05	22	07	3	01	02	01	0	0	0	0	0
LRS	0	02	08	4	01	03	02	01	0	0	0	0
SJI	02	19	36	17	08	05	0	0	0	0	0	0
SMR	01	01	04	9	03	02	0	0	03	0	0	03
Total	162	393	463	282	134	77	35	33	23	10	09	15
Percent		26.66	31.41	19.13	9.09	5.22	2.37	2.24	1.56	0.68	0.61	1.02

Table 2B
Number of articles in various citing reference strata

Journal/ year	Actual articles	Number of articles sampled[a]	Articles in various citation strata												
			0 (%)	1–10		11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	>100
				1–5	6–10										
ARD	155	141	62 (43.97)	48	19	8	1	1	1	0	0	0	1	0	0
CHL	13	11	11 (100)	0	0	0	0	0	0	0	0	0	0	0	0
CYM	10	10	2 (20.00)	4	0	0	4	0	0	0	0	0	0	0	0
DLM	234	222	45 (20.27)	66	44	34	15	6	4	1	1	2	0	1	3
EAS	37	30	22 (73.33)	7	1	0	0	0	0	0	0	0	0	0	0
EID	110	99	25 (25.25)	53	11	6	4	0	0	0	0	0	0	0	0
FIM	391	346	204 (58.96)	69	22	23	10	4	3	2	2	2	0	2	3
HPW	41	32	25 (78.13)	6	1	0	0	0	0	0	0	0	0	0	0
INR	142	136	38 (27.94)	51	21	14	6	3	2	0	0	0	0	1	0
IST	96	72	28 (38.88)	32	8	2	2	0	0	0	0	0	0	0	0
ITD	47	27	14 (51.85)	10	2	0	0	1	0	0	0	0	0	0	0
JDI	130	122	35 (28.69)	56	13	6	6	3	0	2	0	0	0	0	1
JKM	55	53	40 (75.47)	9	4	0	0	0	0	0	0	0	0	0	0
LPP	41	36	24 (66.67)	11	1	0	0	0	0	0	0	0	0	0	0
LRS	21	21	11 (52.38)	8	2	0	0	0	0	0	0	0	0	0	0
SJI	87	85	79 (92.94)	5	1	0	0	0	0	0	0	0	0	0	0
SMR	26	25	14 (56.00)	7	4	0	0	0	0	0	0	0	0	0	0
Total	1,636	1,468	679	442	154	93	48	18	10	5	3	4	1	4	7
Percent	100	89.73	46.25	30.11	10.49	6.34	3.26	1.23	0.68	0.34	0.20	0.27	0.07	0.27	0.48

Number mentioned in parentheses under citation strata 0 indicates percentage of articles that does not received any citation up to December 2006. Legend: same as Table 1.
[a] Articles without any cited references were excluded for measuring Web citations.

From Table 1 it becomes clear that the frequency distribution of cited references of these journals is uneven. Table 2A shows the quantity of articles under various cited-reference strata. The highest percentage of articles (31.4%) in these OA journals is under the cited references strata 11–20, followed by the range 1–10 (26.6%), 21–30 (19.1%) and 31–40 (9%) respectively. There are comparatively fewer (13.7%) articles with more than 40 references. At the individual journal level the number of cited references is not spread into various ranges of references. Most of articles from *ARD, IST, JDI, JKM* and *LPP* contained references in the range 1–10, whereas most of the articles from *DLM, FIM, INR* and *SJI* contained cited references in the range of 11–20. Articles published in journals like *FIM, DLM, INR, ITD*, and *JDI* have a wide range of references, whereas articles published in *EAS, HPW*, and *IST* have comparatively fewer references under various ranges. There were 10 articles in *FIM*, three articles in *SMR*, and one article each in *ARD* and *JDI* that contained more than 100 cited references. The longest list of references in *INR* as noted under the strata was 91–100; whereas it was 81–90 in the case of *ITD* and *JKM*, 71–80 in the case of *DLM*, and *EID* 61–70 in the case of *EAS*, *IST*, and *LRS*; 51–60 in the case of *CYM* and *LPP*; and 41–50 in the case of *HPW* and *SJI*.

On the other hand, eight out of 17 journals were cited by more than 100 other works, and eight other journals were not cited very often. One journal, *CHL*, was not cited at all for the articles published during 2000–2004. The reason for this may be that *CHL* is yet to be indexed by Google Scholar. The 16 e-journals contained 1455 articles (excepting 168 articles that were available in a non-English language and/or did not contain any cited references) and received 8591 Web citations. The average rate of citations per article was 5.90 (excluding articles from *CHL*). The quantity of citing references of individual OA journal is presented in Table 1.

Table 2B indicates the number of articles and their percentages in 13 citation strata. A majority of OA articles (46.2%) have not received any citations. Most of the articles (30.1%) have citations in the

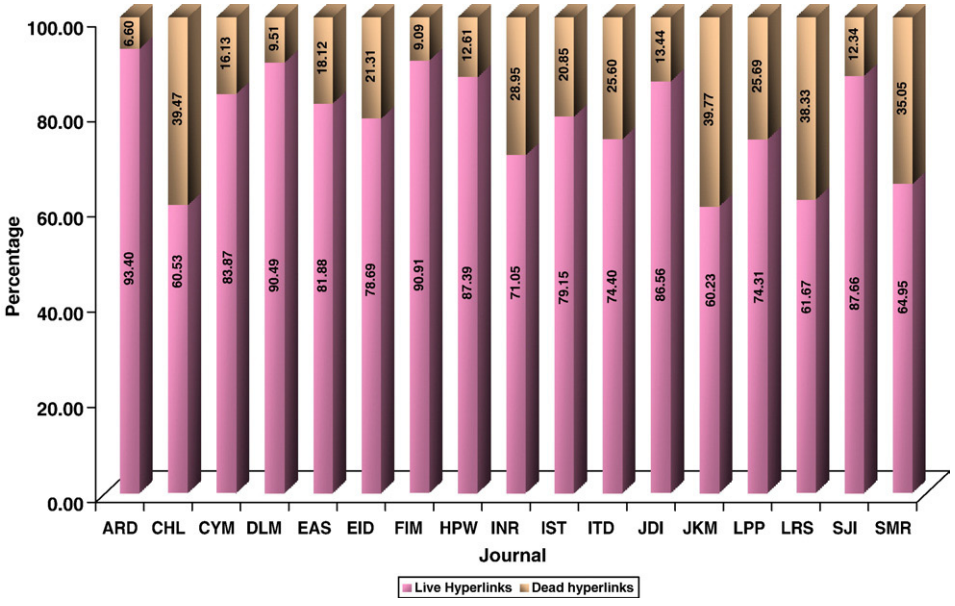

Fig. 1. Status of hyperlinked references in LIS open access journals.

Table 3
Quantity of sample articles and hyperlinked cited and citing references in various citation strata

Citation strata	No. of journals (out of 17)	Sample quantity	Cited refs.	Hyperlinked refs. (% of refs.)	Live hyperlinked refs.	Dead hyperlinks		Total citations received
						Shift	'404'	
0	17	33	1584	362 (19.82)	272 (75.13)	54	36	0
1–5	16	16	581	167 (28.74)	144 (86.22)	5	18	70
6–10	15	15	414	168 (40.57)	134 (79.76)	13	21	129
11–20	7	7	154	91 (59.09)	82 (90.10)	5	4	135
21–30	8	8	350	96 (27.42)	76 (79.16)	6	14	227
31–40	6	6	287	100 (34.84)	70 (70.00)	14	16	220
41–50	4	4	111	75 (67.56)	58 (77.33)	12	5	193
51–60	3	3	115	48 (41.73)	33 (68.75)	4	11	172
61–70	2	2	57	29 (50.87)	25 (86.20)	0	4	125
71–80	2	2	65	38 (58.46)	31 (81.57)	4	3	151
81–90	1	1	17	18 (105.88)	8 (44.44)	9	1	85
91–100	3	3	90	55 (61.11)	43 (78.11)	1	11	283
>100	3	3	39	24 (61.53)	21 (87.5)	0	3	993
Total		103	3864	1271 (32.89)	997 (78.44)	127	147	2783

Legend: Refs. = References. No. = Number.

stratum 1–5, and a few of articles (0.07%) have citations in the stratum 81–90. The overall number of articles in various citation strata is given in the table. At the individual journal level, it is astonishing to see that although *FIM* on the whole has received the highest number of citations, 58.9% of articles in *FIM* have not received any citations. The other e-journals with more than 50% of their articles without any citations were *SJI* (92.9%), *JKM* (75.4%), *EAS* (73.3%), *HPW* (78.1%), *LPP* (66.6%), *SMR* (56%), *LRS* (52.3%), and *ITD* (51.8%).

4.2. Distribution of hyperlink references by journals

Table 1 also indicates that of the total cited references, 38% were hyperlinked, and the percentage of hyperlink references was very uneven in these journals. In the case of *ARD*, hyperlinked-cited references were as high as 84%, but in the case of *SMR* and *JKM* they were as low as 0.07%. Of the total hyperlinked references, 87% of them were live as of December, 2006. The percentage of live hyperlinked references varied from 93% in *ARD* to 60% in *JKM*. The proportion of hyperlinked and live hyperlinked references of individual OA journals is presented in Fig. 1. The loss of hyperlinked references that existed in December 2006 for the articles published from 2000 to 2004 was almost 13%.

4.3. Pattern of hyperlinks

Next, this study analyzed the pattern of hyperlinks irrespective of journals. Table 3 shows the number of journals available in every stratum, the quantity of articles chosen from each stratum, the number of cited references available in these articles, the number of hyperlinked and live hyperlinked-cited references available in these samples, and the number of Web citations that these sample articles received. The sample consisted of 17 OA journals, 103 articles, 997 hyperlinked-cited references, and 2783 citing references. Of the 17 OA journals, there were as many as three journals that each received Web citations in the strata more than 100 and 90–100. There was only one journal that received citations in stratum 81–90, whereas there were two journals each in strata 71–80 and 61–70, three journals in stratum 51–60, and four journals in stratum 41–50. Six, eight, seven, 15, and 16 journals each received Web citations in the strata 31–40, 21–30, 11–20, 6–10, and 1–5, respectively. So the total number of articles comes to 70 from the 17 OA journals that received Web citations under various strata. In addition, another 33 articles were also selected from all the 17 OA journals that did not receive any Web citations. The total sample, then, consisted of 103 articles.

Comparing the pattern of citations in different citation strata in Table 3, it appears that the percentage of hyperlinked-cited references is higher in the case of articles having received higher citations. Out of the total cited references, only 19.82% of references were hyperlinked under stratum 0, and 28.72% under stratum 1–5, whereas it was 61.53% in the case of stratum more than 100. Although the highest percentage of hyperlinked-cited references was noted in the stratum 81–90, the data were based on the single article available in this stratum. Overall, the rate of hyperlinked-cited references increased from the preceding stratum with a small decrease in between, but the percentage of live hyperlinked references remained the same in various citation strata. Up to December 2006, as many as 274 (27.48%) links became inactive, out of which 147 links were nonfunctional and addresses of 127 links were changed to different locations.

4.3.1. Pattern of hyperlinks according to language

Table 4 shows the language of hyperlinked-cited and citing references. The pattern is almost same in each of these citation strata. Therefore, only the overall result has been presented in Table 4. Out of the total 997 hyperlinked-cited references, almost all (99.29%) hyperlinked-cited references were in English, whereas 89.14% of citing references came from other English-language articles.

4.3.2. Pattern of hyperlinks according to top-level domain

Table 5 presents the type of domains to/from which journal articles cited/received citations. Many URLs did not have a clear designation of the type of domain from which the site was hosted. Of the total cited/citing sites, 6.52% of cited and 27.42% of citing sites fell into the *others* category. The data in Table 5 indicate that authors of articles in LIS OA journals mostly preferred to cite Web-based items available on the sites of not-for-profit organizations. Their preference was mostly for .org domains (33.50%), followed by .edu (28.89%). Only 19.26% were in the .com domain. Similarly, articles of these journals also received Web citations from all three domains in fairly equal proportion, showing 24.69% from .org, 22.85% from .edu, and 21.56% from .com. The pattern is more or less similar in different strata of

Table 4
Overall pattern of hyperlinked references in the context of language

Cited references			Citing references		
Total hyperlinked references	English	Non-English	Total citations received	English	Non- English
997	990 99.29%	7 0.71%	2783	2,481 89.14%	302 10.85%

Table 5
Pattern of hyperlinked references in the context of top-level domains

Citation strata	Cited references ($n=997$)							Citing references ($n=2783$)						
	.org	.edu	.com	.gov	.net	Oths	Total	.org	.edu	.com	.gov	.net	Oths	Total
0	68	105	49	38	4	8	272							
1–5	49	39	14	14	3	25	144	11	17	23	3	1	15	70
6–10	47	37	32	4	4	10	134	21	36	47	1	1	23	129
11–20	41	23	16	2	0	0	82	43	29	27	0	1	35	135
21–30	42	20	5	1	2	6	76	48	53	62	6	4	54	227
31–40	12	22	20	7	3	6	70	63	42	55	2	3	55	220
41–50	14	18	9	11	1	5	58	48	41	46	1	6	51	193
51–60	17	7	5	0	3	1	33	34	57	42	3	1	35	172
61–70	7	4	8	2	4	0	25	28	17	38	1	2	39	125
71–80	15	3	7	0	3	3	31	32	42	26	18	5	28	151
81–90	3	4	0	1	0	0	8	18	26	7	1	4	29	85
91–100	12	4	21	5	1	0	43	50	53	71	1	14	94	283
>100	7	2	6	2	3	1	21	291	223	156	3	15	305	993
Total	334	288	192	87	31	65	997	687	636	600	40	57	763	2783
Percent	33.50	28.89	19.26	8.73	3.11	6.52		24.69	22.85	21.56	1.44	2.05	27.42	

Legend: Oths: Other domains.

citations, except in some cases where the number of citing references from commercial domains is higher than those from any other domain. Attempts to classify citing references by country based on domain name failed owing to the large number of items in the *others*, or unspecified, category.

4.3.3. Pattern of hyperlinks according to sources

When the cited and citing references were classified according to their sources, there were interesting results. The two largest groups of cited references were not refereed but were scholarly Web pages (40.12%) or full-text articles (29.49%). Due to nonavailability of any hyperlinked-cited references books/book chapters or any hyperlinked citing references from Web pages, Table 6 excludes these two sources of citations, leaving six types. 40.12% of hyperlinked references were targeted to Web pages (mostly without any author or without any cited references), 29.49% to free full-text articles posted on the Web (either one page for an article or several linked pages), and 19.56% to journal articles (articles to another OA journals too). These full-text articles were non-refereed articles, but they were scholarly in nature and were accessible publicly on the Web. However, on analyzing the citing references on the basis of sources, 40.32% of citing references were found to have come from full-text documents, 33.35% from journal articles, and 22.39% from conference proceedings.

4.3.4. Pattern of hyperlinks according to file format

Table 7 shows the file format of cited and citing references. An overwhelming number of cited references were in HTML format (90.17%), whereas most of the citing references were in PDF format (52.46%). The number of citing references from PDF-formatted articles was higher in case of most of Web citation strata. However, the number of cited references was much less in PDF format as compared to HTML format. DOC format was not so prevalent in OA journals.—only 1.30% of cited references and 3.09% of citing references were in DOC format. The higher number of PDF formats in Web citations also indicates that most of the Web citations of the OA articles came from full-text articles rather than from simple Web pages. This is because Web pages are mostly available in HTML format whereas full-text literature on the Web is usually available in PDF format.

5. Discussion

5.1. Distribution of cited/citing references

The findings show that the percentage of articles contained cited references was far greater than articles without cited references, suggesting that, while writing an article for an OA journal, an author tries to maintain the same level of objectivity as in a scholarly article by providing cited references. Schloegl and Stock (2004) found that

Table 6
Pattern of hyperlinked references in the context of sources

Citation strata	Cited references ($n=997$)							Citing references ($n=2783$)						
	Jr.	Conf.	FT	Rep.	Bib	WP	Total	Jr.	Conf.	FT	Rep.	BKs	WP	Total
0	27	8	54	1	34	148	272							
1–5	33	6	42	10	0	53	144	36	6	25	3	0	0	70
6–10	31	1	26	24	0	52	134	62	6	59	1	1	0	129
11–20	22	1	30	4	0	25	82	55	8	67	1	4	0	135
21–30	24	2	39	1	0	10	76	97	28	96	4	2	0	227
31–40	14	3	24	1	0	28	70	93	39	81	5	2	0	220
41–50	3	0	24	0	0	31	58	59	46	80	5	3	0	193
51–60	8	3	14	0	0	8	33	41	42	80	8	1	0	172
61–70	9	0	6	2	0	8	25	48	24	45	7	1	0	125
71–80	6	0	10	0	0	15	31	43	26	69	10	3	0	151
81–90	1	0	5	0	0	2	8	23	22	35	5	0	0	85
91–100	10	0	14	7	0	12	43	115	39	115	11	2	1	283
>100	7	0	6	0	0	8	21	256	337	370	22	8	0	993
Total	195	24	294	50	34	400	997	928	623	1122	82	27	1	2783
Percent	19.56	2.41	29.49	5.02	3.41	40.12		33.35	22.39	40.32	2.95	0.97	0.04	

Legend: Jr. = Journal; Conf. = Conferences; FT = Full text articles but not journal articles; Rep. = Reports, committee reports, theses, dissertations, etc.; Bib. = Bibliographies; WP = Web pages; BKs = Books/book chapter.

Table 7
Pattern of hyperlinked references in the context of file formats

Citation strata	Cited references ($n=997$)				Citing references ($n=2783$)			
	PDF	HTML	DOC	Total	PDF	HTML	DOC	Total
0	15	254	3	272				
1–5	18	118	8	144	33	35	2	70
6–10	3	130	1	134	67	58	4	129
11–20	4	78	0	82	78	56	1	135
21–30	1	75	0	76	121	100	6	227
31–40	33	37	0	70	85	126	9	220
41–50	0	58	0	58	93	92	8	193
51–60	4	28	1	33	106	60	6	172
61–70	3	22	0	25	63	61	1	125
71–80	0	31	0	31	95	55	1	151
81–90	0	8	0	8	47	35	3	85
91–100	4	39	0	43	138	126	19	283
>100	0	21	0	21	534	433	26	993
Total	85	899	13	997	1460	1237	86	2783
Percent	8.53	90.17	1.30		52.46	44.45	3.09	

the average number of references of some highly reputed international LIS journals was 18.3 during 1997–2000. Among the journals with the highest number of references were *Library Quarterly* (42.9 references) followed by *Library & Information Science Research*, (36.8 references), *Information Processing and Management* (33.1 references), *Journal of Documentation* (32.6 references), and *JASIST* (32 references). Comparing this finding (although the sample date is different) with the present research, one can say that there are at least four OA journals (*SMR, ITD, FIM,* & *INR*) that carry cited references almost at par with those. Taken together as whole the quantity of references per article mostly varies between 11 and 20.

The quantity of citing references of 17 OA journals exhibits divergent behavior. Eight journals received a high number of citing references, another eight only a few, and one journal none at all. This is probably because most of the articles in the eight journals which received fewer citing references were not widely read by scholars, or Google Scholar has failed to trap those sources that cite these articles. The number of citing references in the cases of *FIM* and *DLM* was much higher than those in other journals. A possible explanation for this phenomenon is that these two journals have published a higher number of issues and articles than other journals under study. Additionally, *DLM* is also accessible from multiple hosts. During the investigation, it was observed that most of the articles that received citing references in higher ranges were hosted by more than two hosts. In the case of *FIM*, it was surprisingly found that one article published in 2000 received 715 citations (in December 2006; may be much higher now), which is much higher than the total citations of many e-journals.

Considering the citing references under various strata, there are only seven articles in three OA journals (*FIM, DLM*, and *JDI*) that received citations above 100, and there are only 17 articles in three other OA journals (*INR, ARD*, and *EID*) that received citations above 50. This suggests that some of the articles of the six e-journals are very popular among the research community. One of the most striking results shown in Table 3 is that the number of cited references is very low in the case of articles receiving a higher number of Web citations. The number of cited references was only 13 per article for highly cited articles (stratum *more than 100*) whereas it was 93.17 for articles that did not receive any citations (stratum *0).* This implies that the quantity of cited references does not influence whether an article attracts citations.

5.2. Distribution of hyperlink references by journals

The overall percentage of hyperlinked-cited references of these journals may be an indication that LIS authors are not predominantly using hyperlinked references in their articles, or that online articles are yet to be cited by most of the authors. This may be due to the nonavailability of authoritative open sources on the Web and a nonwillingness of authors of OA journals to cite those sources that require authentication to access full text. The distribution of hyperlink references among journals in the present study roughly corresponds to the distribution of hyperlinked references as pointed out by Harter and Kim (1996) for subjects like science, social science, and the humanities. Zhang (1998) observed that "citing e-sources may depend on the authors rather the journal format in which authors choose to publish their work" (p. 249).

The proportion of hyperlinked and live hyperlinked references in these OA articles may be an indication that authors tend to be careful in using hyperlinked sources in their scholarly articles. The reason behind the loss of 13% of hyperlinked references is partially due to shifting pages or incorrect addresses used by the authors in their articles, but mostly due to withdrawal of temporary pages from the Web. To overcome this undesirable situation, authors should mention only those scholarly sources that are likely to be functional in future, so that "link rot" will not be a hindrance in scholarly communication. Another way to overcome such situations may be the use of WebCite®, an archiving system for Web references (cited Web pages and Web sites), which can be used by authors, editors, and publishers of scholarly papers and books to ensure that cited Web material will remain available to readers in future.

5.3. Pattern of hyperlinks according to language, top-level domain, sources, & file format

The discussion related to the pattern of hyperlinked citations is based on 997 cited and 2783 citing references. The size of the sample may look insignificant in terms of generalizing findings, but the significance of the findings is nonetheless important. During data collection, it was observed that the citations received by these OA journals are quite uneven. Most of the journals in this field do not have an adequate amount of citations. Therefore, it was necessary to judge whether the distribution of citations under higher citation strata differed saliently from that of lower citation strata.

When the hyperlinked-cited and citing references were analyzed in terms of language, English appeared as the prominent language of citations irrespective of any citation strata. An overwhelming number of references in English may not be surprising as our dataset considered articles published in English, but clearly, English remains one of the most widely used languages in scholarly communication.

On the other hand, when cited references were categorized according to top-level domain, authors of LIS OA journal articles mostly prefer to cite those journals that were deemed to be authoritative based on their domains. It is quite evident that OA journals are mostly supported by professional or academic bodies. In another study conducted by the present author (Mukherjee, 2009) using the same data-set, it was found that most contributors of these OA journals belong to academic or professional organizations. Comparing the earlier findings with the findings of the present study, it can be said that authors usually prefer to cite literature from domains with which they are familiar. In most of the citation strata, the most commonly cited top-level domain was either .org or .edu.

However, analyzing the citing references according to top-level domain revealed that citations came from all the three domains – educational, organizational, and commercial – in equal manner.

When cited references were classified according to source, the largest groups were Web pages and full-text articles. One reason for this could be that with developments in electronic publishing, more and more scholarly materials are becoming available on the Web, and in many instances scientists cite Web-published papers/

reports/presentations in their works. They do not find it worthwhile to cite only those materials published in a recognizable LIS journal. The other reason for hyperlinking may be to provide additional or related information. This finding confirms an earlier postulation by Rousseau (1997) that inks are generally provided to help readers locate additional information. One can easily jump to related full-text sources, which also maintains the transparencies in citations.

On the other hand, two of the largest groups of citing references were Web posted pre- or postprint full-text articles and journals. This may be an indication that OA LIS journals generally publish articles perceived to be of good quality, which also get citations from other sources of similar quality. Taking Web citations from e-archives, conference proceedings, Web-posted full-text articles, and reports along with journals as indicators of the intellectual impact of an article, almost 100% of citing references represented this kind of influence. It can be concluded that although authors of these OA articles prefer to cite both scholarly and less scholarly freely accessible Web resources, their articles are mostly cited by scholarly sources. An almost equal number of citations from three important scholarly sources indicates that LIS OA journals are now being treated as one of the important legitimate media of scholarly communication in the research community.

A major difference between articles with higher Web citations (stratum more than 100) and those with lower Web citations (stratum 0) was that the former tended to refer more to scholarly sources (journals, conferences, full-text articles, reports, etc.) than to less-scholarly sources (Web pages, bibliographies, etc.) as compared with the latter. Another interesting result needs to be noted here. In most citation strata, journal articles and full-text articles were two prominent sources of citing references. On the other hand, in the stratum *more than 100*, two prominent sources of citing references were either full-text articles or conference documents. These conference documents were not simply PowerPoint slides presented in conferences, but full-text articles that appeared in the form of proceedings freely accessible on the Web. Such conference proceedings can be considered as citations from scholarly sources.

As discussed earlier, most of the authors of these OA journals preferred to use print sources more frequently than Web sources in their reference lists. On analyzing cited references according to file format, it was further observed that, while using hyperlinked sources, LIS authors were mostly motivated by those sources that were available free on the Web, irrespective of their contents. Of the sampled 997 hyperlinked-cited references, the fact that 90.17% were in HTML and only 8.53% were in PDF testifies to this. Although the PDF format is one of the most widely used in scholarly communication, most of the publicly accessible Web resources are still available in HTML format.

On the other hand, on analyzing citing references, it was found that most of the citations (52.46%) came from PDF-based articles. Even the number of citing references from PDF-based articles was higher in the case of most of the Web citation strata. The higher number of PDF formats in Web citations indicates that most of the Web citations of the OA articles came from full-text articles rather than simple Web pages. Most of these citing sources were either preprint journals articles available in institutional archives or articles submitted in various publicly accessible conference proceedings.

6. Conclusion

In LIS research over the last few years, the interest in bibliometric analysis has expanded to include Internet use, Webometrics, and other related measures. New data sources and tools for scholarly communication research have emerged to such an extent that they are opening up numerous opportunities to launch a wide variety of studies. This exploration may contribute to the discovery of new research methods and lead to new theories in bibliometrics (Borgman & Furner, 2000; Zhao, 2003).

As to the research question posed at the beginning of the paper —in what distribution do OA articles cite/get citation to/from another articles?—it is fair to conclude from the present study that the cited references pattern of some OA journals is on par with that of some internationally well-respected non-OA journals. If one goes by the number of references as an indicator for the objective quality of a paper, at least four LIS OA journals compare favorably with some international journals. Also, the citing references pattern of 8 out of 17 OA journals approaches that of traditional journals. This speaks to the maturity of these journals, and also means that authors can be confident that if they publish in these journals, their work will be recognized and cited in the mainstream literature.

The use of hyperlinks in cited references has yet to receive much attention among authors, who still prefer to use more traditional print sources than Web sources. Additionally, there is no relationship between citation impact and number of hyperlinked references cited in research articles. Hyperlinks usually offer only a partial reflection of the scholarly impact of an article. Such relationships cannot be used as a basis for making predictions, in spite of the fact that the bibliographic references of an article are deemed to be the one of the most essential elements of any scholarly article. However, it is worth noting that whether authors use hyperlinked sources in a reference list may depend on their attitude towards linking or on the availability of scholarly texts on the Web.

Finally, analysis of Web citation made to journals indicates that a majority of citations in OA journals are equivalent to formal citation. However, there was no significant difference in terms of language pattern or top-level domain pattern of citations under various citation strata. So these types of analysis cannot be used to measure relative quality or to assess scholarly impact. However, sources of cited references of articles that received a higher number of citations are different from sources of cited references of articles that received fewer citations. The former mostly cite texts available in scholarly sources such as journal articles, full-text articles, and conference papers; the latter mostly cite texts available in less scholarly sources such as Web pages, bibliographies, etc. There is also no significant difference in terms of format between highly cited articles and less-cited articles. However, highly cited articles mostly received citations from articles available in PDF format, in spite of the fact that these articles mostly cite those sources that were available in HTML format.

Though the size of sample may look insignificant for generalizing findings, the significance of the findings are nonetheless important. During data collection, it was observed that the citations received by these OA journals were very uneven. Most of the journals in this field do not have an adequate number of citations. Therefore, it was necessary to judge, irrespective of journal, whether the pattern of citations differs sufficiently under various citation strata.

The finding of the present study is an indication that Google Scholar is quite capable of extracting Web citations of a scholarly nature for OA journals. Of the total Web citations, only a small percentage (0.04%) of Web citations was from less-scholarly sources, i.e., Web pages supporting such propositions. In the long term, Google Scholar could serve as an excellent tool to extract heterogeneous Web citation. Further research is necessary to confirm the results of the present study, both by collecting data from different disciplines as well as from different periods and by examining the extent to which the results may be generalized to other research fields. It would also be interesting to further explore citation patterns using other bibliometric parameters such as authorship, subjects, institutions, and self-citation.

Appendix A. Distribution of articles in various citation strata by year

Journal: *First Monday*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
FM04	76	68	25	31	9	3									
FM03	74	67	41	13	4	6	1		2						
FM02	86	78	45	11	4	9	4	2				1		2	
FM01	76	64	46	7	3	1	2	2		1	2				
FM00	79	69	47	7	2	4	3		1	1		1			3
Total	391	346	204	69	22	23	10	4	3	2	2	2	0	2	3

Journal: *D-Lib Magazine*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
DL04	40	39	13	15	6	4	1								
DL03	52	49	9	17	10	7	3	2				1			
DL02	49	49	13	11	12	9	2		1						1
DL01	45	44	5	10	10	8	5	2			1	1		1	1
DL00	48	41	5	13	6	6	4	2	3	1					1
Total	234	222	45	66	44	34	15	6	4	1	1	2	0	1	3

Journal: *Information Research*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
INR04	44	41	19	15	5	1	1								
INR03	21	18	4	2	6	3	1	2							
INR02	23	23	2	9	5	3	1	1	1					1	
INR01	31	31	11	11	3	5	1								
INR00	23	23	2	14	2	2	2		1						
Total	142	136	38	51	21	14	6	3	2	0	0	0	0	1	0

Journal: *Journal of Digital Information*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
JDI04	36	35	6	24	3	1	1								
JDI03	49	46	21	17	3	3	1	1							
JDI02	21	19	4	10	2	1	1	1							
JDI01	15	14	1	3	3		3	2	0	2					
JDI00	9	8	3	2	2	1									
Total	130	122	35	56	13	6	6	3	0	2	0	0	0	0	1

Note: 16 articles in 2003 contained only abstract, but references are also provided with abstracts.

Journal: *Ariadne*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
AR04	30	30	16	12	2										
AR03	29	29	15	7	6			1							
AR02	32	28	16	5	3	3	1								
AR01	39	33	12	12	6	3									
AR00	25	21	3	12	2	2			1				1		
Total	155	141	62	48	19	8	1	1	1	0	0	0	1	0	0

Journal: *Electronic Journal of Information System in Developing Countries*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
EID04	20	20	10	10											
EID03	35	27	6	16	2	3									
EID02	22	20	5	11	3	1									
EID01	13	12	1	7	3	1									
EID00	20	20	3	9	3	1	4								
Total	110	99	25	53	11	6	4	0	0	0	0	0	0	0	0

Journal: *Issues in Science and Technology Librarianship*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
IST04	26	13	9	4											
IST03	14	12	5	7											
IST02	17	16	4	9	2	1									
IST01	20	15	2	8	5										
IST00	19	16	8	4	1	1	2								
Total	96	72	28	32	8	2	2	0	0	0	0	0	0	0	0

Journal: *Cybermetrics*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
CYM04	2	2	1	1											
CYM03-02	2	2	1	1											
CYM01	2	2	0	0			2								
CYM00	4	4	0	2			2								
Total	10	10	2	4	0	0	4	0	0	0	0	0	0	0	0

Journal: *Information Technology and Disabilities*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
ITD04	16	10	7	3											
ITD03	14	11	7	3	1										
ITD02	7	5	0	4	1										
ITD01	3	1	0					1							
ITD00	7	0													
Total	47	27	14	10	2			1							

Journal: *Journal of Knowledge Management Practice*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
JKM04	17	17	17												
JKM03	12	12	8	2	2										
JKM02	12	12	7	3	2										
JKM01	12	10	7	3											
JKM00	2	2	1	1											
Total	55	53	40	9	4	0	0	0	0	0	0	0	0	0	0

Journal: *School Library Media Research*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
SMR04	4	4	4												
SMR03	3	3	1	2											
SMR02	6	6	5	1											
SMR01	6	6	2	2	2										
SMR00	7	6	2	2	2										
Total	26	25	14	7	4	0	0	0	0	0	0	0	0	0	0

Journal: *High Energy Physics Libraries Webzine*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
HPW04	10	07	5	2											
HPW03	5	5	4	1											
HPW02	4	2	1	1											
HPW01	14	13	11	1	1										
HPW00	8	5	4	1											
Total	41	32	25	6	1	0	0	0	0	0	0	0	0	0	0

Journal: *Library Philosophy and Practice*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
LPP04	9	6	4	2											
LPP03	9	9	7	2											
LPP02	10	9	7	2											
LPP01	6	6	4	1	1										
LPP00	7	6	2	4											
Total	41	36	24	11	1	0	0	0	0	0	0	0	0	0	0

Journal: *Library and Information Science Research Journal*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
LRS04	5	5	4	1											
LRS03	4	4	3	1											
LRS02	5	5	3	2											
LRS01	4	4	1	2	1										
LRS00	3	3	0	2	1										
Total	21	21	11	8	2	0	0	0	0	0	0	0	0	0	0

Journal: *The Electronic Journal of Academic and Special Librarianship*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
EAS04	11	11	11												
EAS03	7	6	5	1											
EAS02	9	5	5												
EAS01	6	5	0	4	1										
EAS00	4	3	1	2											
Total	37	30	22	7	1	0	0	0	0	0	0	0	0	0	0

Journal: *South African Journal of Information Management*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
SJI04	25	25	25												
SJI03	15	15	14	1											
SJI02	16	16	15	1											
SJI01	13	12	11	1											
SJI00	18	17	14	2	1										
Total	87	85	81	5	1	0	0	0	0	0	0	0	0	0	0

Journal: *Chinese Librarianship*

Journal/ year	Actual articles	Number of articles sampled	Articles under various citation strata												
			0	1–5	6–10	11–20	21–30	31–40	41–50	51–60	61–70	71–80	81–90	91–100	100–above
CHL00-04	13	11	11	0	0	0	0	0	0	0	0	0	0	0	0

References

Bauer, K., & Bakkalbasi, N. (2005). An examination of citation counts in a new scholarly communication environment. *D-Lib Magazine, 11*(9). Retrieved March 14, 2006, from http://www.dlib.org/dlib/september05/bauer/09bauer.html

Bjorneborn, L., & Ingwersen, P. (2001). Perspectives of webometrics. *Scientometrics*, *50* (1), 65—82.

Borgman, C. L., & Furner, J. (2000). Scholarly communication and bibliometrics. *Annual Review of Information Science and Technology*, *36*, 3—72.

Brody, T., Stamerjohanns, H., Harnad, S., Gingras, Y., Vallieres, F. & Oppenheim, C. (2004). *The effect of open access on citation impact.* Paper presented at National Policies on Open Access (OA) Provision for University Research Output: An International Meeting. Southampton University, Southampton UK. 19 February 2004. Retrieved 25 October, 2005, from http://opcit.eprints.org/feb19prog.html

Casserly, M. F., & Bird, J. E. (2003). Web citation availability: Analysis and implication for scholarship. *College and Research Libraries*, *64*, 300—317.

Chu, H. (2005). Taxonomy of inlinked Web entities: What does it imply for webometric research? *Library and Information Science Research*, *27*, 8—27.

Crawford, W. (2002). Free electronic refereed journals: Getting past the arc of enthusiasm. *Learned Publishing, 15*(2), 117–23. Retrieved September 24, 2005, from http://www.ingentaselect.com/rpsv/catchword/alpsp/09531513/v15n2/s7/p117

Google Inc. (2007). *About Google Scholar*. Retrieved December 12, 2007, from http://scholar.google.co.in/intl/en/scholar/about.html

Harter, S. P., & Kim, H. J. (1996). Electronic journals and scholarly communication: A citation and reference study. *Information Research, 2*(1). Retrieved August 22, 2007, from, http://InformationR.net/ir/2-1/paper9a.html

Harter, S. P., Nisonger, T. E., & Weng, A. (1999). Semantic relationships between cited and citing articles in library and information science journals. *Journal of the American Society for Information Science and Technology*, *44*, 543—552.

Hickey, T. B. (1995). Present and future capabilities of the online journal. *Library Trends*, *43*, 528—543.

Hitchcock, S., Quek, F., Carr, L., Hall, W., Witbrock, A., & Tarr, I. (1997). *Linking everything to everything: Journal publishing myth or reality*? Retrieved December 16, 2006, from http://journals.ecs.soton.ac.uk/IFIP-ICCC97.html

Ho, J. (2005). Hyperlink obsolescence in scholarly online journals. Journal of Computer-*Mediated Communication, 10*(3). Retrieved December 16, 2006, http://jcmc.indiana.edu/vol10/issue3/ho.html

Kim, H. J. (2000). Motivation for hyperlinking in scholarly article: A quantitative study. *Journal of the American Society for Information Science and Technology*, *51*, 887—899.

Kousha, K., & Thelwall, M. (2006). Motivations for URL citations to open access library and information science articles. *Scientometrics*, *68*(3), 50—57.

Kousha, K., & Thelwall, M. (2006b). Google Scholar citations and Google Web/URL citations: A multi-discipline exploratory analysis. In *Proceedings of the International Workshop on Webometrics, Informetrics and Scientometrics & Seventh COLLNET*

Meeting, Nancy (France). Retrieved December 29, 2006, from http://eprints.rclis.org/6416/01/google.pdf
Kousha, K., & Thelwall, M. (2007a). The Web impact of open access social science research. *Library & Information Science Research*, *29*, 495−507.
Kousha, K., & Thelwall, M. (2007b). How is science cited on the Web? A classification of Google unique Web citations. *Journal of the American Society for Information Science and Technology*, *58*, 1631−1644.
Lawrence, S. (2001). Online or invisible? *Nature, 411*(6837), 521. Retrieved April 20, 2006, from http://ivyspring.com/steveLawrence/SteveLawrence.htm
Li, X., & Crane, N. B. (1996). *Electronic Styles: A Handbook for Citing Electronic Information*, (2nd ed.). Medford, NJ: Information Today Inc.
Mukherjee, B. (2009). Scholarly research in LIS open access electronic journals: A bibliometric study. *Scientometrics*, *80*(1). doi:10.1007/s11192-008-2055-2.
Noruzi, A. (2005). Google Scholar: The new generation of citation indexes. *LIBRI*, *55*(4), 170−180.
Okerson, A. (1991). The electronic journals: What whence and when? *The Public Access Computer Systems Review, 2*. Retrieved July 15, 2005, from http://www.library.yale.edu/~okersonm/pacs.html
Price, D. J. De Solla (1965). Network of scientific papers. *Science*, *149*, 510−515.
Quarterman, J. S. (1997). Haiti and Internet governance. *First Monday, 2*(6). Retrieved May 6, 2006, from http://firstmonday.dk/issues/issue2_6/quarterman/index.html
Rousseau, R. (1997). Sitations: An exploratory study. *Cybermetrics*, *1*(1), 1−9.
Schloegl, C., & Stock, W. G. (2004). Impact and relevance of LIS journals: A scientometric analysis of international and German-language LIS journals-citation analysis versus reader survey. *Journal of the American Society for Information Science and Technology*, *55*, 1155−1168.
Smith, A. G. (2004). Web links as analogues of citations. *Information Research, 9*(4). Retrieved December 14, 2006, from http://InformationR.net/ir/9-4/paper188.html
Smith, A. G. (2005). Citation and links as a measure of effectiveness online LIS journals. *IFLA Journal*, *31*(1), 76−84.
Thelwall, M., Vaughan, L., & Bjorneborn, L. (2005). Webometrics. *Annual Review of Information Science and Technology*, *39*, 81−135.
Tomney, H., & Burton, P. F. (1998). Electronic journals: A study of usage and attitudes among academics. *Journal of Information Science*, *24*, 419−429.
Uzun, A. (2006). Statistical relationship of some basic bibliometric indicators in scientometrics research. In *Proceedings of the International Workshop on Webometrics, Informetrics and Scientometrics & Seventh COLLNET Meeting, Nancy-France* (pp. 87–91). Retrieved December 26, 2007 from, http://eprints.rclis.org/archive/00006043/01/France1.pdf
Van Brakel, P. A. (1995). Electronic journals: Publishing via Internet's World Wide Web. *The Electronic Library*, *13*, 389−395.
Vaughan, L., & Shaw, D. (2003). Bibliographic and Web citation: What is difference? *Journal of the American Society for Information Science and Technology*, *54*, 1313−1322.
Vaughan, L., & Shaw, D. (2005). Web citation data for impact assessment: A comparison of four science discipline. *Journal of the American Society for Information Science and Technology*, *56*, 1075−1087.
Vaughan, L., & Shaw, D. (2006). *Comparison of citations from ISI, Google and Google Scholar: Seeking web indicator of impact*. Paper presented at the 9th International Conference on Science and Technology Indicators, 7–9 September 2006 Leuven, Belgium.
Vinkler, P. (2002). Dynamic changes in the chance for citedness. *Scientometrics*, *54*, 421−434.
Voorbij, H., & Ongering, H. (2006). The use of electronic journals by Dutch researchers: A descriptive and exploratory study. *Journal of Academic Librarianship*, *32*, 223−237.
Walker, J. R. (1995). *MLA-style citations of electronic sources*. Retrieved August 22, 2005, from http://www.cas.usf.edu/english/walker/mla.html
Whitley, R. (1984). *The intellectual and social organization of the sciences.* Oxford: Claredon Press.
Zhang, Y. (1998). The impact of Internet based electronic resources on formal scholarly communication in the area of library and information science: A citation analysis. *Journal of Information Science*, *24*, 241−254.
Zhao, D. (2003). *A comparative citation analysis study of web-based and print -journal-based scholarly communication in XML research field*. Unpublished doctoral dissertation, Florida State University, Tallahasses. Retrieved from http://etd.lib.fsu.edu/theses/available/etd-09232003-012028/