



## World Library and Information Congress: 70th IFLA General Conference and Council

22-27 August 2004  
Buenos Aires, Argentina

Programme: <http://www.ifla.org/IV/ifla70/prog04.htm>

---

Code Number: 049-E  
Meeting: 149. Library and Information Science Journals  
Simultaneous Interpretation: -

### Citations and links as a measure of effectiveness of online LIS journals

*Citas y links como una medida de efectividad de revistas de LIS online*

**Alastair G. Smith**

**Position or title of presenter(s)** : Senior Lecturer

**Employer or affiliated institution**: School of Information Management, Victoria University of Wellington.

**Mailing address**: PO Box 600, Wellington, New Zealand

**Telephone/fax numbers** 64 4 463 5785 (ph) 64 4 463 5446 (fx)

**E-mail address**: Alastair.Smith@vuw.ac.nz

---

### Short biographical statement and resume:

Alastair Smith teaches library and information management at Victoria University of Wellington. Prior to entering academia, he worked in database development at the National Library of New Zealand, as a special librarian and as a sci/tech reference librarian. His research interests are in the use of online learning and the evaluation of Internet information resources and Web search engines.

**Abstract :**

*How effective are online library and information studies (LIS) journals? Due to the convenience of access, online journals are often the first choice of information professionals who wish to keep up with their field. This study examines the use of citation counts and web links to evaluate online LIS journals. The journal impact factor has been a traditional metric for comparing journals and is based on the citation counts of a journal over a specified period of time, compared with the citable articles published in the journal. In the Internet environment, the Web Impact Factor (WIF) has been proposed by Ingwersen as an equivalent metric for websites. The WIF is broadly defined as the ratio of links made to a site, compared to the number of information units (e.g. pages) at the site. The study compares the WIFs of a sample of online LIS journal websites with their conventional citation counts. Links to online journals are often considered to be equivalent to citations, but in fact there are significant differences. The second part of the study will examine links made to online LIS journals, and compare them with conventional citations made to the journals. The study provides indications of how effective the online medium is for communicating LIS research, and offers guidance for LIS authors and journal editors to help them make effective use of online journals in communicating with LIS professionals.*

**Resumen:**

¿Que tan efectivas son las revistas online de Biblioteconomía y Documentación (LIS - Library and Information Studies)? Debido a la conveniencia de acceso, las revistas online son frecuentemente la primera opción usada por profesionales de la información quienes desean mantenerse actualizados en sus áreas de trabajo. Este estudio examina el uso del conteo de citas y Web links para evaluar revistas LIS online. El factor de impacto de las revistas ha sido una medida tradicional para comparar revistas y esta basado en el conteo de citas de una revista durante un periodo de tiempo específico, comparado con los artículos citables publicados en la revista. En el Internet, el Factor de Impacto del Web (WIF) ha sido propuesto por Ingwersen como un equivalente de medida para las páginas Web. El WIF esta definido como el ratio de los links hechos a un sitio Web, comparado con el numero de unidades de información (Ej. paginas) en el sitio. El estudio compara los WIF de una muestra sitios Web de revistas LIS online con sus convencionales factores de impacto de revista. Los links a revistas online frecuentemente se consideran como el equivalente a citas, pero lo cierto es que hay diferencias significativas. La segunda parte del estudio examinara los links hechos a revistas LIS online y los comparará con citas hechas a revistas convencionales. El estudio ofrece indicaciones de que tan efectivo es el medio online para comunicar investigaciones en el área de LIS, y ofrece una guía para autores de LIS y editores de revistas para ayudarlos a hacer uso efectivo de revistas online cuando se estén comunicando con profesionales del LIS.

## **Introduction**

How important are LIS e-journals, and how can they be evaluated? Traditionally, measures based on citation counts such as ISI's Journal Impact Factor have been important in measuring the success of journals. The growth of publishing on the web has raised the possibility of new measures. A number of writers have seen an analogy between citations in print sources, and links between web sites. Ingwersen (Ingwersen, 1998) proposed the Web Impact Factor (WIF) as the online equivalent of the ISI Journal Impact Factor. The Journal Impact Factor is based on the citation counts of a journal over a specified period of time, compared with the citable articles published in the journal. In contrast, the Web Impact Factor is based on the number of links made to a web site, compared with the size (usually the number of pages) of the website.

The term "e-journal" can have narrower and wider meanings. A wide interpretation includes any journal available electronically, including online versions of conventional print journals available for subscription from publishers or aggregators. However for the purpose of this study, e-journals are open access periodicals only available over the Internet, that include a review process for at least part of their content.

This study examines counts for conventional citations and links to a sample of LIS e-journal websites, and calculates WIFs for the e-journals. The differences between these measures of e-journal impact are discussed.

In the second part of the study, samples of links to the e-journals are studied to determine the extent to which they are similar to conventional citations, and to what extent they serve different functions.

## **Literature Review**

Studies of electronic publishing, and metrics for the web, have been widespread in the last decade. A sub-discipline of bibliometrics, called variously "webometrics" or "cybermetrics", has emerged.

A number of studies examine the increasing importance of electronic sources in research dissemination. Bar-Ilan *et al* found that electronic sources are indispensable in modern university scholarship (Judit Bar-Ilan, Peritza, & Wolman, 2003). Herring (Herring, 2002) noted a greater use of electronic resources in a study of citation patterns in scholarly electronic journals. Lawrence (Lawrence, 2001) found online articles were more highly cited, indicating both that online availability encouraged use, and also implies that online citations are important as research linkages. However web citations can be ephemeral: Casserly and Bird (Casserly & Bird, 2003) found that slightly more than half the web citations in a sample of LIS articles were still available; although searching the web increased the availability to almost 90%. Oppenheim and Smith (Oppenheim & Smith, 2001) noted an increasing tendency by LIS students to cite Internet sources in their dissertations. Shin (Shin, 2003) found that the impact factor of journals increased when they became available in electronic form, indicating that the greater availability of the electronic format lead to more citations.

The growth of e-journals in information science was examined by Hawkins (Hawkins, 2001) who found that the number of articles per year had risen from 26 in 1995 to 250 articles per year in 2001. Koehler *et al* (Koehler, Aguilar, & Finarelli, 2000) compared a small sample of

e-journals in LIS with a paper journal, and found differences in the characteristics of articles. Although more women had articles in the electronic forms, Koehler *et al* felt that whether a journal was electronic did not affect its presence or behaviour as an information science journal.

Are web links equivalent to journal citations? Both Kim (Kim, 2000) and Prime *et al* (Prime, Bassecoulard, & Zitt, 2002) found that citations and “sitations” (web links) are made for very different reasons. A survey of 414 links between websites in the ac.uk domain by Wilkinson *et al* (Wilkinson, Harries, Thelwall, & Price, 2003) found only two links that were equivalent to journal citations. On the other hand Smith (Smith, 2003) in a study of research oriented websites, found that about 20% of links were broadly equivalent to research citations. Chu (Chu, 2003) investigated 1400 links to academic websites, and found that about 25% were made from teaching/learning motivations. Vaughan and Thelwall (Liwen Vaughan & Thelwall, 2003) used sites in the disciplines of LIS and law to investigate factors influencing the creation of links to a site. They found that age and content were important factors. Thelwall (Thelwall, 2003) investigated 100 random intersite links to UK university home pages, and found four types of motivation for linking: ownership, social, general navigational, and gratuitous.

There is some evidence of a link between Journal Impact Factor and WIF. An early study of e-journal links by Harter and Ford (Harter & Ford, 2000) found no correlation between links to e-journal articles and conventional ISI citation measures, although they suggested that links to e-journal home pages might be a new measure of scholarly communication. However Vaughan and Hysen (L Vaughan & Hysen, 2002) found a relationship between external links and the Journal Impact Factor of LIS journals. Vaughan and Shaw (Liwen Vaughan & Shaw, 2003) compared bibliographic and web citations to articles in LIS journals. Many of the web citations represented “intellectual impact”, and journals with tables of contents available on the web had more web citations. An and Qiu (An & Qiu, 2003) found a correlation between impact factors of Chinese engineering journals and the WIFs of the journal web sites.

Rousseau (Rousseau, 2002) argues that care must be exercised when using impact factors, and that a battery of different impact factors should be evaluated. This implies that WIFs or a similar web based impact factor could be valuable in supplementing evaluation of LIS e-journals. Marek and Valauskas (Marek & Valauskas, 2002) have also explored the use of web logs, recording hits, to evaluate the use of electronic journal articles, and identify “classic” articles.

There are valid arguments about the reliability of using commercial search engines to evaluate web links for bibliometric studies. Bar-Ilan (J Bar-Ilan, 2001) found disparities in the coverage of links to the home page of the online journal *Cybermetrics*.

## **Methodology**

LIS e-journals studied in this paper were those that were open access (non charged-subscription) periodical only available over the Internet, with articles that underwent some kind of peer review process. A selected list was taken from Hawkins (Hawkins, 2001) and other sources.

The ISI databases were searched for citations to LIS e-journals. Those that had citations were then searched on Alta Vista, to determine the overall number of links, and their Web Impact

Factor. A sample of links to the e-journals was examined, to determine whether the links were similar to conventional citations, or whether they served different purposes.

### **Institute of Scientific Information Citation counts**

Bibliometric studies of conventional journals are often done using the Journal Impact Factor calculated by ISI and published in their Journal Citation Reports. However few LIS e-journals are included in the Journal Citation Reports. Instead, Web of Knowledge (which provides a web interface to ISI's citation indexes Science Citation Index, Social Sciences Citation Index and Arts and Humanities Citation Index) was used to find total citation counts, using the "cited work" search. These indicate the number of times a journal has been cited by the journals indexed by ISI for their citation databases between 1997 and 2004.

A limitation with using the ISI databases is that citation data is dependent on the accuracy with which original authors entered the citation data. Consequently journals can appear under different forms (e.g. DLIB and D-Lib), and different journals can be cited similarly (E.g. JEP is the abbreviation for both the *Journal of Electronic Publishing* and the *Journal Of Economic Progress*). In the current study, the ISI guide to citation formats was consulted, but other likely abbreviations were searched. Where citations were likely to be to other journals, the full article record was retrieved to determine if the subject matter, volume and issue numbering etc was consistent with a citation to the required e-journal.

The ten LIS e-journals for which citations were found in the ISI databases, and which were included in the study, were:

- *Ariadne*: <http://www.ariadne.ac.uk>
- *Cybermetrics*: <http://www.cindoc.csic.es/cybermetrics/>
- *D-Lib Magazine*: <http://www.dlib.org/>
- *First Monday*: <http://firstmonday.org>
- *Information Research*: <http://InformationR.net/ir/>
- *Journal of Digital Information*: <http://jodi.ecs.soton.ac.uk>
- *Journal of Electronic Publishing*: <http://www.press.umich.edu/jep>
- *Journal of Information, Law and Technology*: <http://elj.warwick.ac.uk/jilt>
- *LIBRES: Library and Information Science Research Electronic Journal*: <http://libres.curtin.edu.au/>
- *PACS-R: Public Access Computer Systems Review*: <http://info.lib.uh.edu/pr/pacsrev.html>

*PACS-R* has in fact ceased publication, but had sufficient links in both the ISI databases and in the web to be worthy of study.

### **Web links and Web Impact Factors**

As a comparison with the citation counts from ISI databases, links from websites to the e-journals were measured. In addition, the Web Impact Factor, a measure analogous with the Journal Impact Factor, was calculated. This measure, proposed by Ingwersen (Ingwersen, 1998), is the ratio of the number of links made to a web site, divided by the number of pages at the web site.

Although as noted in the literature review, there are reservations about the use of commercial search engines for studying web phenomena, they provide a coverage of the web that is not available elsewhere. While several web search engines can provide counts of links to a site,

and the number pages present at the site, in the current study the Alta Vista Advanced search engine (<http://www.altavista.com/web/adv>) was used, since it provides for the use of Boolean operators, and appears to apply these with greater consistency than other search engines. Searches were carried out in March 2004.

For each of the e-journals, a search was carried out to determine the number of external links, and the number of pages at the site. The number of external links to the e-journal website was determined by:

```
link:xxx and not host:xxx
```

Where xxx is the URL of the e-journal website.

In the current study, only external links were counted, since this excludes internal navigation links and overcomes differences in whether links within the site are made relatively (e.g. a href="file.htm") or absolutely (e.g. a href="http://ejournal.org/file.htm"). Arguably, links between articles in the same e-journal should be counted, since these are analogous to citations, but it was assumed that these would be a small proportion of the total links. This assumption was supported by the examination of a sample of e-journal links undertaken in the current study (see below).

Where the e-journal resided in a subdirectory rather than having its own domain (for example *Information Research* is located in a subdirectory at [InformationR.net/ir/](http://InformationR.net/ir/), while D-Lib has its own domain [dlib.org](http://dlib.org)) the url: command was used instead of the host: command, i.e.

```
link:xxx and not url:xxx
```

The number of pages at the site was determined by the commands:

```
host:xxx
```

or

```
url:xxx
```

E-journals have an added dimension to the traditional "title varies"; they also have "URL varies". Several journals had changed URLs (e.g. *Journal of Digital Information* changed from [journals.ecs.soton.ac.uk/jodi](http://journals.ecs.soton.ac.uk/jodi) to [jodi.ecs.soton.ac.uk](http://jodi.ecs.soton.ac.uk)). On the other hand, some journals changed title, but stayed at the same URL (e.g. *E-JASL: The Electronic Journal of Academic and Special Librarianship* formerly *the Journal of Southern Academic and Special Librarianship*). Where alternate sites or mirrors were used, an OR'd search was used to find links, for example

```
(link:journals.ecs.soton.ac.uk/jodi or  
link:jodi.ecs.soton.ac.uk) and not  
(url:journals.ecs.soton.ac.uk/jodi or  
host:jodi.ecs.soton.ac.uk)
```

However the number of pages was estimated by using the main URL, since an estimate of the amount of information at the site was required, which would be inflated if pages at both the current and past URLs were counted.

In the case of *D-Lib* (which has a number of mirror sites, including one in Argentina) this was not possible, since the complexity of the Boolean statement required appeared to be too great for AltaVista to handle:

```
(link:dlib.org or link:ukoln.ac.uk/lis-journals/dlib/ or  
link:dlib.anu.edu.au/ or link:gwdg.de/edoc/aw/d-lib/ or  
link:dlib.org.ar/ or link:dlib.ejournal.ascc.net/) and
```

not (host:dlib.org or url:ukoln.ac.uk/lis-journals/dlib/  
or host:dlib.anu.edu.au/ or url:gwdg.de/edoc/aw/d-lib/ or  
host:dlib.org.ar/ or host:dlib.ejournal.ascc.net/)

Results from this search statement were inconsistent, so the estimate for external links to *D-Lib* was based just on the main dlib.org site; test searches indicated that most links were to this site.

The pages found by a web crawler are not necessarily all those present at the site, and can depend on a number of factors:

- Depth of crawling by spider
- Structure of articles: whether a single page, or multiple pages
- Whether different formats are available of the same article, for example *Library Philosophy and Practice* articles appear in both PDF and HTML
- The extent to which pages are included in the journal's directory that have other information e.g. directions to authors, etc.

Arguably a better measure would be the number of articles included in the journal; however here there are problems with differing definitions of what constitutes an article, so this measure was not pursued.

The count of external links to the e-journal site, and number of pages at the e-journal site, was used to calculate the Web Impact Factor of the e-journal.

### **Nature of linking to LIS E-Journals**

In order to investigate the nature of links made to LIS e-journals, and the extent to which they were analogous to conventional citations, a sample of pages that linked to each of the e-journals was examined.

A search was carried out on AltaVista advanced search for links:

link:xxx

where xxx is the URL of the e-journal, as above. Alta Vista was set to search the whole world, and for pages in all languages. Site collapse (which means that only one page from each site is displayed) was turned off. The searches and examination of sites was carried out in March 2004. Both external and internal pages were searched for, since one of the aims was to look at all pages that linked to the e-journal, including those made from the same e-journal.

A feature of AltaVista advanced search from a sampling point of view is that the display order appears to be random, unless a ranking term is provided. However in order to ensure that a random sample of links was used, every 50<sup>th</sup> item retrieved was examined, up to a total of 20 items. In some cases fewer than 1000 pages linked to the e-journal in which case every 20<sup>th</sup> item was examined. If a page didn't work, or no longer included a link to the e-journal (for example if it was a news page that changed frequently), the next page in the results list was examined.

Pages linking to the e-journal were classified according to the scheme in Table 1.

**Table 1: classification of links to e-journals**

1. Link to a formal article in the e-journal:
  - a. From another e-journal article, conference paper or similar document that could be considered the online equivalent of a conventional research publication.
  - b. From an article in same e-journal
  - c. From an online article by same author
  - d. From non-article website, e.g. an online bibliography, researcher home page, teaching resource, etc.
2. Link to a whole issue of an e-journal
3. Link to the e-journal as a whole
  - a. From a list of e-journals
  - b. From another source
4. Link to non-article material provided at the e-journal website: news, directories etc
5. Internal navigation link in e-journal, e.g. a link from an article back to the journal home page.

Classification was carried out by the researcher.

## ***Results and Discussion***

This section discusses the results of the different forms of citation and linking to LIS e-journals.

The counts from ISI citation databases and from the AltaVista searches are shown in Table 2. In addition, the Google Page Rank (<http://www.google.com/technology/>) is included – this is a measure used by the Google search engine to rank results, and is a score out of 10 derived from the number of links to a site. In this case it was measured using the Google tool bar (<http://toolbar.google.com/>) .



**Table 2: Citation and link counts**

E-Journal Title	ISI citns	External links	Pages	Web Impact Factor	Google Page Rank
Ariadne	126	7202	1502	4.79	8
Cybermetrics	29	580	113	5.13	6
D-Lib Magazine	585	14857	1497	9.92	8
First Monday	53	9494	851	11.16	8
Information Research	2	2209	392	5.64	7
Journal of Digital Information (JoDI)	1	4313	599	7.20	7
Journal of Electronic Publishing (JEP)	1	3852	420	9.17	8
Journal of Information, Law and Technology (JILT)	2	2897	3089	0.94	7
LIBRES: Library and Information Science Research Electronic Journal	4	438	124	3.53	7
PACS-R: Public Access Computer Systems Review	68	1506	99	15.21	7

There appears to be only a slight relationship between the number of ISI citations and the number of external links. *D-Lib*, *Ariadne* and *First Monday* have relatively high citation counts and links. *LIBRES* has a low number of citations and links. On the other hand several journals with low numbers of ISI citations (*Information Research*, *JoDI*, *JEP*, and *JILT*) have significant numbers of web links. *Cybermetrics* and *PACS-R* have significant numbers of ISI citations, but relatively few external links (in the case of *PACS-R* this may be because the journal has ceased).

The Web Impact Factor of the journals also varies, with *JILT* at a low of 0.94 and *PACS-R* at a high of 15.21. While this may be a useful indication of the influence of a journal on the web, it may also indicate that, for the reasons noted previously, AltaVista is an imperfect tool for determining the total number of pages at a site; and also that the number of pages may be a poor measure of the information content of a site. The exceptionally high WIF for *PACS-R* may be due to AltaVista not having indexed all pages at the site, and also due to the fact that many issues of *PACS-R*, often comprising several articles, were posted as a single page.

*D-Lib*'s high ISI citation count is interesting, and may indicate that it crosses the divide between LIS and Computer Science: ISI Science Citation Index has a good coverage of computer science literature, where many of the citations to *D-Lib* appear to come from.

The Google Page Rank has been extremely successful as a ranking mechanism for the search engine, and web managers place great value on optimising the Page Rank of their sites. For these e-journals, the Google Page Rank is relatively high, at 7 or 8, except for *Cybermetrics* at 6. As a comparison, the web site of the *Guardian* newspaper has a Page Rank of 8, and that of the *New Scientist* has a Page Rank of 9.

Perhaps the significant point about these various measures is that they illustrate that e-journals have a variety of qualitative measures that can be used to evaluate them, and perhaps as e-journals become more widely accepted, a richer range of evaluative measures will be available.

The study of a sample of links to the e-journals are listed in the Appendix. A summary of the most significant types of links is listed in Table 3. This shows number of links of each type as a percentage of the total links to each e-journal.

**Table 3: Percentages of types of pages linking to LIS e-journals**

E-journal title	Link from other		All links to journal articles (1a,b,c,d)	Links to Journal as a whole (3a,b)		Internal Navigation links (5)
	Link from formal publi (1a,b,c)	web pages (1d)		Journal as a whole (3a,b)	Internal Navigation links (5)	
Ariadne	15	50	65	25	5	
Cybermetrics	5	0	5	90	0	
D-Lib Magazine	50	40	90	0	10	
First Monday	10	75	85	10	5	
Information Research	10	55	65	20	10	
Journal of Digital Information (JoDI)	10	35	45	35	15	
Journal of Electronic Publishing (JEP)	10	50	60	20	20	
Journal of Information, Law and Technology (JILT)	0	50	50	35	15	
LIBRES: Library and Information Science Research Electronic Journal	0	20	20	65	0	
PACS-R: Public Access Computer Systems Review	15	50	65	25	5	
<b>overall %</b>	<b>12.5</b>	<b>44.5</b>	<b>57</b>	<b>31</b>	<b>8</b>	

Almost 60% of links to these e-journals were to journal articles, indicating that the majority of links were to content, rather than to home pages, navigation links etc. On the other hand, just over 30% of links were to the journal as a whole. While these links do indicate recognition of the journal, many of these links are from directory listings of e-journals, so all e-journals, regardless of quality or importance, will have links of this type.

It appears that the different publications have different “profiles” with regard to the sources of citations. *Cybermetrics* and *LIBRES* had relatively high numbers of links to the journal as a whole. This could mean that they haven’t established a large body of articles to be cited, and consequently their links come mainly from sources that list e-journals in general, rather than specific articles.

*D-Lib* was most cited from formal publications. This isn’t surprising given its origins in both the library and computer science field. It also happens to be the most highly cited by ISI database journals.

On the other hand most other LIS e-journals were more highly linked from sources other than formal publications (e.g. from online bibliographies, personal home pages, online teaching resources, etc). This could be because these publications are more specifically concerned with the general Internet, particularly in the case of *First Monday*.

Some types of links reflected the construction of the e-journal site. For example *JoDI*, *JILT*, and *JEP* had a relatively high proportion of internal links.

In examining the sample of linking pages some features specific to particular journals were noted, which reflected their particular character. Links to *Ariadne* were often from project

websites to articles written about the project, a form of self citation. *Cybermetrics* (hosted in Spain but in English) had noticeably more links from non-English language sites, and from sites in non-English language countries. *First Monday* articles were particularly popular as citations from cached discussion lists.

The assumption made in using an external WIF, rather than the overall WIF, that relatively few links are made between articles in the same e-journal, was borne out. Only 4% of total links were between articles in the same e-journal.

## **Conclusions**

What lessons does this study have for users and publishers of LIS open access e-journals?

First, E-journals in LIS are becoming a significant body of literature, as evidenced by the fact that they appear in significant numbers in ISI's citation count, if not yet in the formal Journal Citation Reports. This means that authors can be confident that by publishing in e-journals, their work will be recognised and cited in mainstream literature.

Second, analysis of links made to e-journals indicates that a majority are to article content, indicating that links are performing some of the functions of conventional citations. This indicates a maturing of e-journals as a medium.

Third, e-journal publishers need to be aware of different measures of effectiveness. The Web provides a greater range of measures than are available in the print environment. As well as measures such as the Journal Impact Factor, based on conventional citations, measures based on numbers of links, such as Web Impact Factor, are available. It must be appreciated, however, that these are measuring different features than the conventional citation count. Further research needs to be conducted to evolve new measures.

Some other, perhaps more minor, points relate to how e-journals are constructed and managed. Journal publishers have been keen to have high citation counts. Recognition on the Web, particularly by the Google page rank, can be promoted by links. Links from sites that are themselves highly linked promote visibility on the web, for example when searching Google. By providing links between e-journals (as is done for example by the list of digital resources provided by *Information Research* at <http://informationr.net/fr/freejnls.html>) LIS e-journals can raise their overall visibility on the web. A methodological issue that arose in this study was the structure of e-journal URLs: bibliometric studies of e-journals could be aided by publishers having a standard "root" URL for the journal and articles, and changes of URL increase the complexity of tracking links.

Open access e-journals in LIS are coming of age, and in a relatively short time have become a mature medium for the reporting of scholarship and research. As well as providing a publishing avenue, this exploratory study indicates that they are also becoming an instructive area for bibliometric research. As noted by Lawrence and others in the literature review, the convenience of open access e-journals makes them an attractive resource for users and increasingly they are becoming accepted as credible sources of scholarship.

## **References:**

URLs checked 30 March 2004.

- An, L., & Qiu, J. (2003). Research on the relationships between Chinese journal impact factors and web impact factors and external web link counts. *Journal of the China Society for Scientific and Technical Information*, 22(4), 398-402.
- Bar-Ilan, J. (2001). How much information the search engines disclose on the links to a web page? - A case study of the *Cybermetrics* home page. In *Proceedings of the 8th International Conference on Scientometrics & Informetrics, Sydney 16-20 July 2001* (pp. 63-73). Sydney: Bibliometric and Informetric Research Group, UNSW.
- Bar-Ilan, J., Peritza, B. C., & Wolman, Y. (2003). A survey on the use of electronic databases and electronic journals accessed through the web by the academic staff of Israeli universities. *Journal of Academic Librarianship*, 29(6), 346-361.
- Casserly, M., & Bird, J. (2003). Web citation availability: Analysis and implications for scholarship. *COLLEGE & RESEARCH LIBRARIES*, 64(4), 300-317.
- Chu, H. (2003). *Reasons for citation (hyperlinking): what do they imply for webometric research?* Paper presented at the International Conference on Scientometrics and Informetrics, 9th. 25-29 August 2003, Beijing.
- Harter, S. P., & Ford, C. E. (2000). Web-Based Analyses of E-journal Impact: Approaches, Problems, and Issues. *JASIS*, 51(3), 1159-1176.
- Hawkins, D. T. (2001). Bibliometrics of electronic journals in information science. *Information Research*, 7(1). <http://InformationR.net/ir/7-1/paper120.html>
- Herring, S. D. (2002). Use of electronic resources in scholarly electronic journals: a citation analysis. *College & Research Libraries*, 63(4), 334-340.
- Ingwersen, P. (1998). Web Impact Factors. *Journal of Documentation*, 54(2), 236-243.
- Kim, H. J. (2000). Motivations for hyperlinking in scholarly electronic articles: A qualitative study. *Journal of the American Society for Information Science*, 51(10), 887-899.
- Koehler, W., Aguilar, P., & Finarelli, S. (2000). A bibliometric analysis of select information science print and electronic journals in the 1990s. *Information Research*, 6(1). <http://www.shef.ac.uk/~is/publications/infres/paper88.html>
- Lawrence, S. (2001). Online or Invisible? *Nature*, 411(6837), 521.
- Marek, K., & Valauskas, E. J. (2002). Web logs as indices of electronic journal use: tools for identifying a 'classic' article. *Libri*, 52(4), 220-230.
- Oppenheim, C., & Smith, R. (2001). Student citation practices in an information science department. *Education for Information*, 19(4), 299-323.
- Prime, C., Bassecouard, E., & Zitt, M. (2002). Co-citations and co-sitations: A cautionary view on an analogy. *Scientometrics*, 54(2), 291-308.
- Rousseau, R. (2002). Journal evaluation: technical and practical issues. *Library Trends*, 50(3), 418-.
- Shin, E.-J. (2003). Do Impact Factors change with a change of medium? A comparison of Impact Factors when publication is by paper and through parallel publishing. *Journal of Information Science*, 29(6), 527 - 533.
- Smith, A. G. (2003, 25-29 August 2003). *Classifying links for substantive Web Impact Factors*. Paper presented at the ISSI 2003, Beijing. pp. 305-311
- Thelwall, M. (2003). What is this link doing here? Beginning a fine-grained process of identifying reasons for academic hyperlink creation. *Information Research*, 8(3 paper no. 151). <http://information.net/ir/8-3/paper151.html>
- Vaughan, L., & Hysen, K. (2002). Relationship between links to journal Web sites and impact factors. *Aslib Proceedings*, 54(6), 356-361.
- Vaughan, L., & Shaw, D. (2003). Bibliographic and Web citations: What is the difference? *Journal of the American Society for Information Science and Technology*, 54(14), 1313 - 1322.

- Vaughan, L., & Thelwall, M. (2003). Scholarly use of the Web: What are the key inducers of links to journal Web sites? *JASIS*, 54(1), 29-38.
- Wilkinson, D., Harries, G., Thelwall, M., & Price, L. (2003). Motivations for Academic Web Site Interlinking: Evidence for the Web as a Novel Source of Information on Informal Scholarly Communication. *Journal of Information Science*, 29(1), 49-56.

**Appendix: classification of a sample of links to LIS e-journals**

<b>E-Journal Title</b>	<b>Classification (table 1)1a</b>	<b>1b</b>	<b>1c</b>	<b>1d</b>	<b>23a</b>	<b>3b</b>	<b>4</b>	<b>5total</b>			
Ariadne		1	1	1	10	1	5	0	0	1	20
Cybermetrics		1	0	0	0	0	14	4	1	0	20
D-Lib Magazine		6	3	1	8	0	0	0	0	2	20
First Monday		2	0	0	15	0	2	0	0	1	20
Information Research		0	2	0	11	0	2	2	1	2	20
Journal of Digital Information (JoDI)		1	1	0	7	1	4	3	0	3	20
Journal of Electronic Publishing (JEP)		2	0	0	10	0	3	1	0	4	20
Journal of Information, Law and Technology (JILT)		0	0	0	10	0	4	3	0	3	20
LIBRES: Library and Information Science Research Electronic Journal		0	0	0	4	2	13	0	1	0	20
PACS-R: Public Access Computer Systems Review		2	1	0	14	0	0	2	1	0	20
<b>Total links in class</b>		15	8	2	89	4	47	15	4	16	200
<b>Percentage of links in class</b>		7.5	4	1	44.5	2	23.5	7.5	2	8	100