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## Web citation behaviour in scholarly electronic journals in the field of library and information science

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## Abstract

*The modern era is facing a radical change in the way people find and use information resources. Although the information gathering and use pattern in the traditional print environment have been studied for many years, the electronic media presents a new and relatively unexplored area for such study. In this context, this article describes a citation analysis of research articles from scholarly electronic journals published in 2000-2006. The analysis focused on the extent to which scholars are using web-based sources in scholarly electronic journals. Results of the study shows that 81.49% of articles published in selected 9 electronic journals during 2000-2006 have web references. Out of 25,730 references 56.54 % of references are print journal references and 43.52% of them are web references. The majority of articles having web references are found in ARIADANE (93.24%) which ranks first, followed by Cybermetrics: International Journal of Scientometrics, Informetrics, and Bibliometrics (89.47%) and D-LIB Magazine (89.19%). It can be observed from the study that comparatively more number of articles (81.05%) published during the years 2000-2006 have web references.*

## Keywords

*Internet; Electronic Journals; Web based sources; Web references; Citation analysis; Library and Information Science*

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## Introduction

The growing web-based sources and emerging network technologies have been revolutionizing society by making information available to the people in new ways. In the mean time, it is convenient for the people to get access to web-based sources. These two forces are leading to radical changes in scholarly communications. As a consequence of such an electronic reform, web-based sources are growing steadily. This is evident as a growing number of electronic journals, magazines and newsletters are available on the Web. There is also a continuous growth rate in the publications created on and for the

Internet and the explosive growth is still accelerating. In addition, there are many self-publications, preprints and conference proceedings being made available on the Web.

[Zhang](#) (1998) identified that compared with the impact of print sources, the impact of e-sources on formal scholarly communication in LIS is small, as measured by e-sources cited, and does not increase significantly by year even though there is observable growth of the impact across the years. The study of [Germain](#) (2000) checks the accessibility of sixty-four URLs cited in thirty-one academic journal articles and results of this longitudinal study found an increasing decline in the availability of URL citations. But in 2001 [Zhang](#) provides empirical evidence that e-sources are increasingly used among scholars. The longitudinal analysis of e-source citations shows that there has been a notable increase in the number and proportion of authors who cite e-sources in their research articles over the 8-year period.

[Lawrence et al.](#) (2001) evaluated citation to web located resources in computer science articles concluding that citation to web located resources had increased dramatically over a 7 year period. [Herring](#) (2002) Results also indicate a growing reliance on electronic resources by scholars, a high occurrence of non-traditional types of resources, and a relatively high use of interdisciplinary references. The use of web located references in scholarly law articles was examined by [Rumsey](#) (2002) who found that such citations increased significantly between 1995 through to 2000. He reported that the average number of web located citations per article increased from 1.9 to 10.45 over a 6 year period.

[Davis](#) (2002) shows that the total number of bibliographic citations continued to grow from a median of ten in 1996 to thirteen in 2000. [Casserly and Bird](#) (2003) found that more than half (56.4%) web references were permanent, 81.4 percent were available on the Web, and searching the Internet Archive increased the availability rate to 89.2 percent. [Sellitto](#) (2004) found that 48.1% (1041) of all citations used in the papers referred to a Web-located resource. A significant number of references to URLs were found to be missing (45.8%) and an evaluation of these Web located citations allowed the average half-life (4.8 years) for these missing resources to be determined.

The above studies clearly show that there is continuous growth in the use of web-based sources in the scholarly journals. However to what extent web-based sources as a whole have been accepted and used as alternatives and/or additions to traditional means in the formal scholarly communications system is still unclear. In this context, the present case study in the field of Library and Information Science for the years 2000 to 2006, is trying to investigate the extent to which web-based sources have been used in citations in formal scholarly communications.

## Objectives of the Study

The main objectives of the study are:

- To identify the extent of use of web-based sources by scholarly researchers for their research;
- To know the overall impact of web-based sources on formal communication in the field of Library and Information Science during 2000 to 2006;
- To assess either e-journal articles more likely to cite web based sources than print journal articles or not; and
- To identify which e-journal has more number of web references.

## Methodology

The data for this study were drawn from a selective sample of free e-journals available through the Web without subscription or registration. A total nine e-journals were selected in the area of Library and Information Science. All articles published in these nine journals during 2000 to 2006 were examined among which all research articles that included reference citations were selected. A total of 1277 articles were found out of which 1035 article had web references.

The references listed for each article were examined and duplicate references in each individual list were removed. Data concerning total number of articles, total number of articles with web references, total number of references, total number of web references and total number of print journal references were recorded. The data collected for the study has been analysed and is presented in the form of tables and graphs in the following:

## 1. Selected E-Journals for the Study

The selected e-journals and their web addresses are listed in Table 1.

**Table 1. E-Journals and their web addresses**

<b>Symbol</b>	<b>Name of the e-journal</b>	<b>Web address (URL)</b>
EJ1	D-LIB Magazine	<a href="http://www.dlib.org/">http://www.dlib.org/</a>
EJ2	E-JASL (Electronic Journal of Academic and Special Librarianship)	<a href="http://southernlibrarianship.icaap.org/">http://southernlibrarianship.icaap.org/</a>
EJ3	Information Research- An International Electronic Journal	<a href="http://informationr.net/ir/">http://informationr.net/ir/</a>
EJ4	Journal of Digital Information	<a href="http://journals.tdl.org/jodi">http://journals.tdl.org/jodi</a>
EJ5	ARIADANE	<a href="http://www.ariadne.ac.uk/">http://www.ariadne.ac.uk/</a>
EJ6	Library Philosophy and Practice	<a href="http://www.webpages.uidaho.edu/~mbolin/lpp.htm">http://www.webpages.uidaho.edu/~mbolin/lpp.htm</a>
EJ7	Issues in Science and Technology Librarianship	<a href="http://www.istl.org/">http://www.istl.org/</a>
EJ8	Cybermetrics: International Journal of Scientometrics, Informetrics, and Bibliometrics	<a href="http://www.cindoc.csic.es/cybermetrics/cybermetrics.html">http://www.cindoc.csic.es/cybermetrics/cybermetrics.html</a>
EJ9	School Library Media Research	<a href="http://www.ala.org/aaslsImrTemplate.cfm?Section=slmrb&amp;CFID=84071722&amp;CFTOKEN=83426299">http://www.ala.org/aaslsImrTemplate.cfm ? Section=slmrb&amp;CFID=84071722&amp;CFTOKEN=83426299</a>

## Analysis

## 1. D-LIB Magazine

Table 2 clearly shows the percentage of articles having web references from the year 2000 to 2006. Total 333 articles were published in *D-LIB Magazine* during these years out of which 89.19% of articles had web references. In 2006, the number of web references was 97.78%. Table also illustrates the percentage of web references and print journal references in the *D-LIB Magazine*. It is clear from the table that a total of 5,634 references are found out of which 71.16% are web references and only 28.84% of references are print journal references.

**Table 2. Percentage of articles having web references in *D-Lib Magazine* by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	48	36 (75.00)	595	425 (71.42)	170 (28.57)
2001	45	43 (95.56)	693	459 (66.23)	234 (33.76)
2002	49	47 (95.91)	973	679 (69.78)	294 (30.22)
2003	52	44 (84.61)	926	606 (65.44)	320 (34.55)
2004	40	38 (95.00)	689	509 (73.88)	180 (26.12)
2005	54	45 (83.33)	1034	780 (75.43)	254 (24.56)
2006	45	44 (97.78)	724	551 (76.10)	173 (23.89)
Total	333	297 (89.19)	5634	4009 (71.16)	1625 (28.84)

Note: Number within the parenthesis represents the percentage

## 2. E-JASL (Electronic Journal of Academic and Special Librarianship)

In the case of *E-JASL*, only 70 articles are published during the year 2000-2006 and out of which 75% of articles have web references. It is also observed that all the articles published in the year 2005 have web references (Table 3).

**Table 3. Percentage of articles having web references in *E-JASL* by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	7	1 (14.29)	60	4 (6.67)	56 (93.33)
2001	2	1 (50.00)	43	5 (11.63)	38 (88.37)
2002	9	3 (33.33)	110	53 (48.18)	57 (51.82)
2003	8	5 (62.5)	104	25 (24.04)	79 (75.96)
2004	11	9 (81.81)	197	68 (34.52)	129 (65.48)
2005	14	14 (100)	170	51 (30)	119 (70)
2006	19	12 (63.16)	212	46 (21.69)	166 (78.30)
Total	70	45(75)	896	252(28.13)	644(71.88)

Note: Number within the parenthesis represents the percentage

Table also shows the percentage of web references as well as print journal references in the articles published during 2000-2006. Total 896 references are found of which 71.88% are print journal references and 28.13% are web references.

### 3. Information Research: An International Electronic Journal

Table 4 summarises the percentage of articles having web references from the year 2000 to 2006. Total 221 articles are published in '*Information Research: An International Electronic Journal*' and out of which 78.73% of articles have web references. In the year 2006 more number of web references (93.02%) are found.

**Table 4. Percentage of articles in *Information Research* having web references by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	23	14 (60.87)	679	108 (15.91)	571 (84.09)
2001	34	19 (55.88)	960	99 (10.31)	861 (89.69)
2002	24	20 (83.33)	599	150 (25.04)	449 (74.96)
2003	21	19 (90.48)	995	212 (21.31)	783 (78.69)
2004	45	38 (84.44)	1170	228 (19.49)	942 (80.51)
2005	31	24 (77.42)	1189	135 (11.35)	1054 (88.65)
2006	43	40 (93.02)	1565	310 (19.81)	1255 (80.19)
Total	221	174 (78.73)	7157	1242 (17.35)	5915 (82.65)

Note: Number within the parenthesis represents the percentage

Data regarding the percentage of web references and print journal references shows that 82.65% of references are print journal references and only 17.35% of references are web references.

### 4. Journal of Digital Information

In the case of the '*Journal of Digital Information*' a total of 146 articles are found of which 84.25% have web references. In the year 2001 more number of web references (93.33%) are identifiable and comparatively less number of web references (77.27%) are found in the year 2002 (see Table 5). Table 5 also shows that from a total of 3,619 references, 60.62% are print journal references and only 39.38% are web references.

**Table 5. Percentage of articles having web references in the *Journal of Digital Information* by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	9	7 (77.78)	252	66 (26.19)	186 (73.81)
2001	15	14 (93.33)	401	171 (42.64)	230 (57.36)
2002	22	17 (77.27)	555	185 (33.33)	370 (66.67)
2003	46	36 (78.26)	558	179 (32.08)	379 (67.92)
2004	38	35 (92.11)	1243	686 (55.18)	557 (44.81)
2005	9	8 (88.89)	307	82 (26.71)	225 (73.29)
2006	7	6 (85.71)	303	56 (18.48)	247 (81.52)
Total	146	123(84.25)	3619	1425(39.38)	2194(60.62)

Note: Number within the parenthesis represents the percentage

### 5. ARIADANE

Table 6 reveals the percentage of articles in *ARIADANE* having web references during the years 2000 to 2006. A total of 222 articles are published in *ARIADANE* during these years of which 93.24% have web references. All the articles published in the year 2003, 2004 and 2006 include web references. Table 6 also illustrates the percentage of web references as well as print journal references. It is clear from the table that total 3269 references are found of which 86.99% are web references and only 13% of references are print journal references.

**Table 6. Percentage of articles in *ARIADANE* having web references by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	25	20 (80.00)	261	197 (75.48)	64 (24.52)
2001	39	34 (87.18)	498	424 (85.14)	74 (14.86)
2002	32	28 (87.5)	386	319 (82.64)	67 (17.36)
2003	29	29 (100)	435	392 (90.11)	43 (9.86)
2004	30	30 (100)	467	454 (97.22)	13 (2.78)
2005	33	32 (96.97)	551	504 (91.47)	47 (8.53)
2006	34	34 (100)	671	554 (82.56)	117 (17.43)
Total	222	207 (93.24)	3269	2844 (86.99)	425(13)

Note: Number within the parenthesis represents the percentage

## 6. Library Philosophy and Practice

Table 7 illustrates the percentage of articles in *Library Philosophy and Practice* having web references during the years 2000 to 2006. Only 96 articles are published in *Library Philosophy and Practice* during these years of which 54.17% of articles have web references. In the year 2004 more number of web references (63.64%) are found. Percentage of web references and print journal references are also presented in Table 7. It is clear from the table that from a total 1471 of references 76.82% are print journal references and only 23.18% are web references.

**Table 7. Percentage of articles having web references in *Library Philosophy and Practice* by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	7	2(28.57)	52	3 (5.77)	49 (94.23)
2001	6	3 (50)	76	22 (28.95)	54 (71.05)
2002	10	5 (50)	82	25 (30.49)	57 (69.51)
2003	9	3 (33.33)	147	51 (34.69)	96 (65.31)
2004	11	7 (63.64)	163	52 (31.90)	111 (68.09)
2005	18	11 (61.11)	296	43 (14.53)	253 (85.47)
2006	35	21 (60)	655	145 (22.13)	510 (77.86)
Total	96	52 (54.17)	1471	341(23.18)	1130(76.82)

Note: Number within the parenthesis represents the percentage

## 7. Issues in Science and Technology Librarianship

Percentages of articles having web references are shown in Table 8. A total of 137 articles were published during the years 2000 to 2006 of which 67.88% include web references. In the year 2000, more number of web references (78.95%) are found. Data regarding the percentage of web and print references shows that totally 1464 references are found of which 70.70% are print journal references and only 29.30% of references are web references.

**Table 8. Percentage of articles having web references in *Issues in Science and Technology Librarianship* by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	19	15 (78.95)	197	52 (26.4)	145 (73.60)
2001	21	14 (66.67)	163	51 (31.29)	112 (68.71)
2002	17	13 (76.47)	157	52 (33.12)	105 (66.88)
2003	14	7 (50)	210	29 (13.81)	181 (86.19)
2004	26	14 (53.85)	294	88 (29.93)	206 (70.07)
2005	16	12 (75)	152	59 (38.82)	93 (61.18)
2006	24	18 (75)	291	98 (33.68)	193 (66.32)
Total	137	93 (67.88)	1464	429(29.30)	1035(70.70)

Note: Number within the parenthesis represents the percentage

## 8. Cybermetrics: International Journal of Scientometrics, Informetrics and Bibliometrics

Comparatively very few articles are published in *Cybermetrics: International Journal of Scientometrics, Informetrics and Bibliometrics* out of which 89.47% of articles have web references. All the articles published during the years 2000, 2001, 2004 and 2005 have web references. Table 9 also indicates the percentage of web references and print journal references. A total of 653 references are found of which 82.85% are print journal references and only 17.15% of references are web references.

**Table 9. Percentage of articles having web references in *Cybermetrics* by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	4	4 (100)	106	15 (14.15)	91 (85.85)
2001	2	2 (100)	63	11 (17.46)	52 (82.54)
2002-03	2	1 (50)	33	3 (9.09)	30 (90.91)
2004	2	2 (100)	67	4 (5.97)	63 (94.03)
2005	3	3 (100)	158	40 (25.32)	118 (74.68)
2006	6	5 (83.33)	226	39 (17.26)	187 (82.74)
Total	19	17(89.47)	653	112(17.15)	541(82.85)

Note: Number within the parenthesis represents the percentage

## 9. School Library Media Research



Table 10 clearly shows the percentage of articles having web references during the years 2000 to 2006. A total of 33 articles are published in *School Library Media Research* during these years of which 81.82% have web references.

**Table 10. Percentage of articles in *School Library Media Research* having web references by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	7	5 (71.43)	424	388 (91.51)	36 (8.49)
2001	6	3 (50)	381	22 (5.77)	359 (94.23)
2002	6	5 (83.33)	267	37 (13.86)	230 (86.14)
2003	3	3 (100)	96	5 (5.21)	91 (94.79)
2004	4	4 (100)	114	23 (20.18)	91 (79.82)
2005	3	3 (100)	166	42 (25.3)	124 (74.69)
2006	4	4 (100)	119	28 (23.53)	91 (76.47)
Total	33	27(81.82)	1567	545(34.78)	1022(65.22)

Note: Number within the parenthesis represents the percentage

All the articles published in the years 2003, 2004 and 2006 include web references. Percentage of web references and print journal references in the *School Library Media Research* is also presented in the table. A total of 1567 references are found out of which 65.22% of references are print journal references and only 34.78% are web references.

### Percentage of articles having web references in Different e-journals

Percentage of articles having web references in different e-journals and Percentage of web references and print references in different e-journals is presented in Table 11. Figure 1 and 2 also shows the percentage of articles having web references in different e-journals and also the percentage of web references and print references in different e-journals respectively.

**Table 11. Percentage of articles having web references in different e-journals**

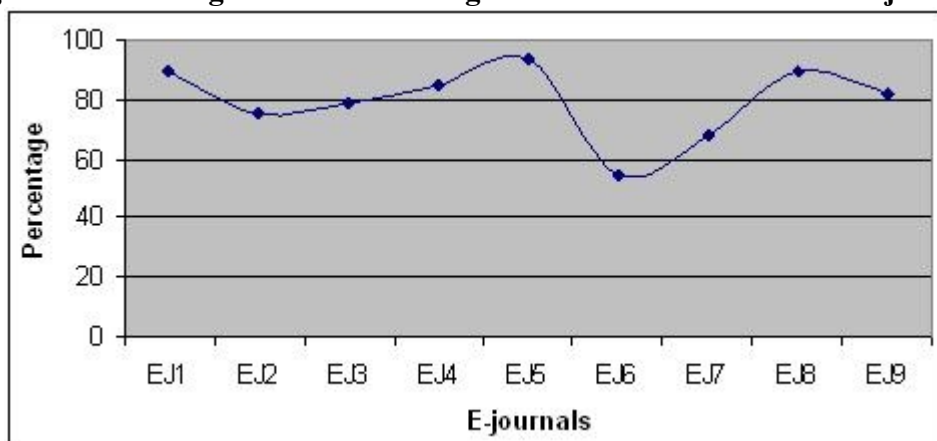
* E-journal	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
EJ1	333	297 (89.19)	5634	4009(71.16)	1625(28.84)
EJ2	70	45(64.28)	896	252(28.13)	644(71.88)
EJ3	221	174(78.73)	7157	1242(17.35)	5915(82.65)
EJ4	146	123(84.25)	3619	1425(39.38)	2194(60.62)
EJ5	222	207(93.24)	3269	2844(86.99)	425(13.00)
EJ6	96	52(54.17)	1471	341(23.18)	1130(76.82)
EJ7	137	93(67.88)	1464	429(29.30)	1035(70.70)
EJ8	19	17(89.47)	653	112(17.15)	541(82.85)
EJ9	33	27(81.82)	1567	545(34.78)	1022(65.22)
Total	1277	1035(81.68)	25730	11199(43.52)	14531(56.54)

Note: Number within the parenthesis represents the percentage

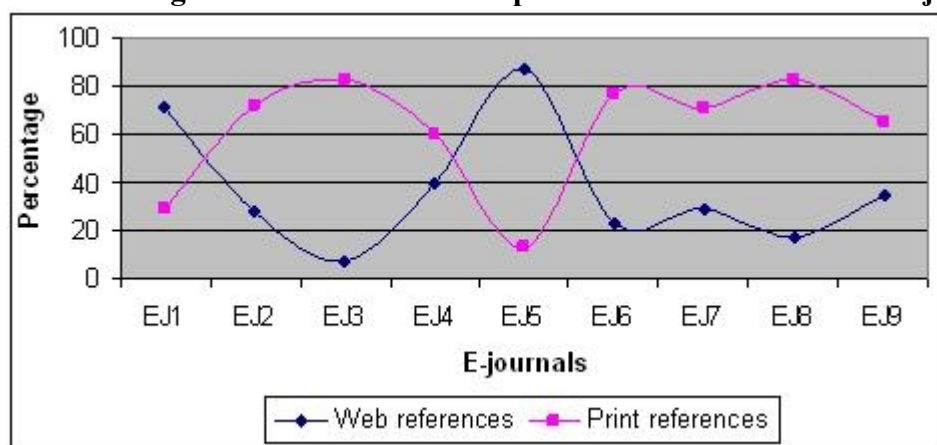
\* Titles of e-journals are given in Table 1.



**Figure 1. Percentage of articles having web references in different e-journals**



**Figure 2. Percentage of web references and print references in different e-journals**



The majority of articles having web references are found in ARIADANE (93.24%) which ranks first, followed by *Cybermetrics*D-LIB Magazine (89.19%). Overall, 81.68% of articles include web references. *ARIADANE* journal has the majority (86.99%) of web references while *Cybermetrics* (82.65%) have the majority of print journal references. The data also clearly indicate that during the years 2000-2006, from all references found in all nine e-journals' articles, 56.47% are print journal references and 43.52% are web references.

### Percentage of articles having web references by year

Percentage of articles having web references, percentage of web references and percentage of print journal references are illustrated in Table 12. It can be observed that 81.05% of articles published during the years 2000-2006 have web references. In case of 2001 (76.47%) comparatively less number of articles have web references.

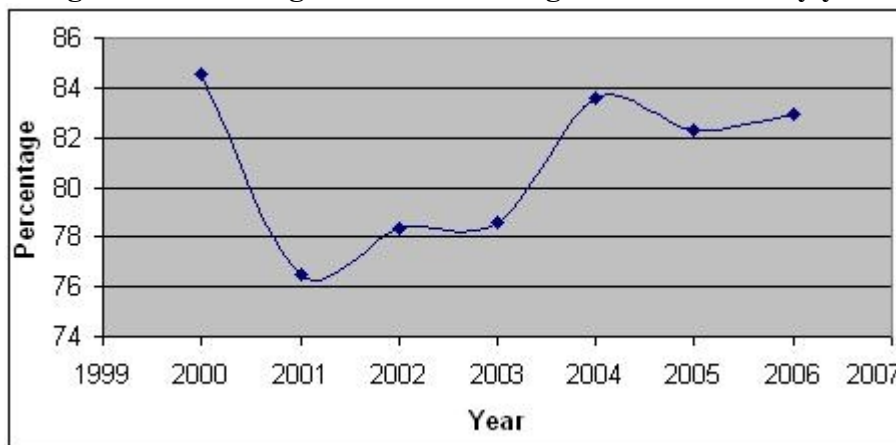
**Table 12. Percentage of articles having web references by year**

Year	Total number of articles	Total number of articles with web references	Total number of references	Total number of web references	Total number of print journal references
2000	149	126 (84.56)	2626	1258 (47.90)	1368 (52.09)
2001	170	130 (76.47)	3278	1264 (38.56)	2014 (61.43)

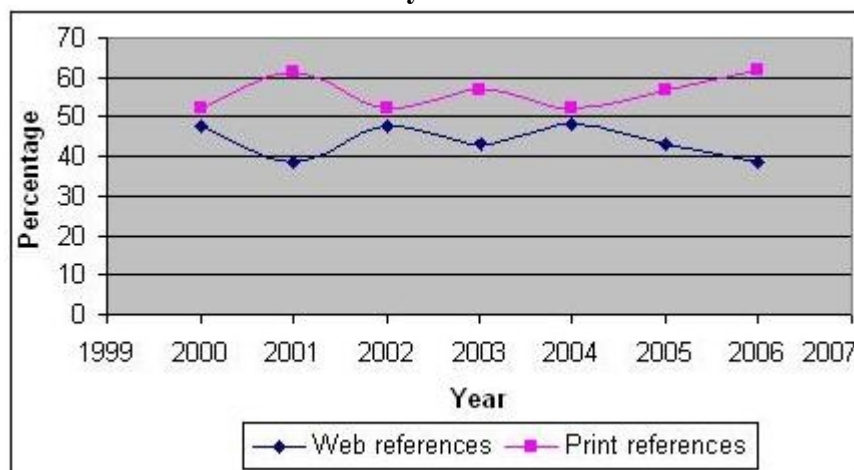
2002	171	134 (78.36)	3168	1503 (47.44)	1659 (52.36)
2003	182	143 (78.57)	3471	1499 (43.18)	1972 (56.81)
2004	207	173 (83.57)	4404	2112 (47.95)	2292 (52.04)
2005	181	149 (82.32)	4023	1736 (43.15)	2287 (56.84)
2006	217	180 (82.94)	4766	1827 (38.33)	2939 (61.66)
Total	1277	1035 (81.05)	25730	11199 (43.52)	14531 (56.47)

Note: Number within the parenthesis represents the percentage

**Figure 3. Percentage of articles having web references by year**



**Figure 4. Percentage of web references and print references in different e-journals by year**



## Conclusion

This study shows the use of web-based sources in the scholarly e-journals in the area of Library and Information Science is almost equal to that of print sources, as measured by web references cited in e-journal articles published in 2000-2006. It is also observed that there is an observable impact of web-based sources on scholarly electronic journals. The study shows that the use of web references is more in 2000 but it has decreased significantly in the year 2001. From the year 2002, there is a continuous growth in the use of web references in the target e-journals (Figure 3). Another important observation of the study is that scholars used more print journal references in the scholarly e-journals as compared to web references (Figure 4). Problem for web sources to be accepted and cited

is associated with the limitations of web-based sources themselves. The dynamic nature of web-based sources leads to the instability of some of its sources, including content fluidity and changes in technologies used to provide access to web-based sources. Continuing problems and limitations in accessibility of web-based sources is still a serious problem that may affect their acceptability among scholars as legitimate media of formal scholarly communication. Efforts need to be made to identify what factors promote or inhibit using web-based sources in scholarly communication so that we can have a strategic plan for such a transition.

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