

The Impact of Open Access Journals on Library and Information Scientists' Research in Taiwan

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ABSTRACT

As some library and information science (LIS) journals in Taiwan are open access, the aim of the study is to investigate what, if any, impact open access journals have on library and information science scholars' research in Taiwan. Therefore, the objectives of the study is to explore the scholarly productivity of LIS scholars in Taiwan, to find out what articles they publish and OA articles as a percentage of all titles, and to calculate the mean citation rate of open access articles and articles not freely available online. A bibliometric method was used in the study. To determine whether a difference in research impact existed, two research impact indicators were used, that is, open access articles as a percentage of all published titles and mean citation rate of open access articles and those not freely available online. Data on published articles with citation counts by the LIS scholars in Taiwan from 2000 to 2009 was collected from the ACI Database and Social Science Citation Index Database. The study shows that for 72 LIS scholars who were subjects of the investigation, 64 of them had published 745 articles within the previous ten years: 679 articles in Chinese and 66 articles in English; 499 of these were OA articles, and 264 were non-OA articles; OA articles constituted 66.98% of the total number of academic articles. The mean citation rate of OA versus non-OA article citation was 1.29. Analysis of impact indicators shows that open access journals have an impact on the research of LIS scholars in Taiwan, in particular, LIS OA journals have more research impact in Chinese than those in English.

Keywords: Open access journals, Taiwan; Library and information science; Research impact; Scholarly journals; Electronic journals.

INTRODUCTION

Since the beginning of the movement for open access (OA), publication of open access journals (OAJ) has gradually gained acceptance. However, many studies of open access journal advantages have been concentrated in the fields of science, technology and medicine, and there has been a relative lack in social science research. Scholarly journals in the field of library and information science (LIS) in Taiwan have adopted the open access model, but as yet there has been little discussion of this. Among more than 800 scholarly journals in Taiwan, there are 12 library and information science (LIS) journals published by LIS schools and large scale libraries using a non-profit publishing model which is in contrast to commercial publishing model adopted by the LIS journals in west. The nine LIS schools and more than seventy full-time faculty who form the academic community make a contribution to as well as use these LIS scholarly journals. After the rise of the open access movement, up to the present, ten LIS journals have been published using the OA model in Taiwan, and two OA journals have been included in the Directory of Open Access Journals, that is, *Journal of Librarianship and Information Studies* (圖書與資訊學刊), and *Journal of Educational Media and Library Sciences* (教育資料與圖書館學).

The fact that open access academic resources are available on the Internet free of charge, and can therefore increase readership and citation rates, has aroused discussion. As more and more computer science journals offer online services, Lawrence (2001) analyzed 119,924 conference papers from computer science and related fields between the years 1990 and 2000. He discovered that papers that were accessed online were cited more than those not online, demonstrating that articles available online for free had a greater impact, and would lead to more article citations. Since then, studies investigating the impact on research of open access articles have continued to appear.

Antelman (2004) investigated whether open access articles had such a large impact. She examined four academic fields – philosophy, political science, electrical engineering, and mathematics. From the ISI Web of Science database, academic papers from these four scholarly disciplines were sampled, and via Google they were checked to see whether the

article was accessible free of charge on the Internet. The study found that the proportion of access to the total number of scholarly articles varied according to the scholarly discipline. Open access articles in philosophy constituted 17% of the total; for political science, 29%; for electrical engineering, 37%; and for mathematics, 69%. Open access articles do indeed have research impact, and there is a difference in citation rate for open access and non-open access articles from different disciplines.

Mukherjee(2009)studied the impact of open access journals in terms of quantity of articles published, subject distribution of articles, impact factor , and journals' and authors' self-citation, using 17 fully open access journals on Google Scholar during 2000 to 2004 in the field of library and information science. The results indicate that during this 5-year publication period, there were 1,636 articles published by these journals. The articles e received a total of 8,591 web citations during a 7-year citation period, eight of the 17 journals received more than 100 citations so the author concludes the LIS OA journals have scholarly impact. However, this article only used LIS OA journals without comparing those LIS journals commercially published, therefore, it can't prove the research impact and advantages of LIS OA journals.

Wang (2010) has explored the consciousness and behaviors of LIS scholars toward open access journals, and examined how they use and cite open access journals as well as publish their articles in open access journals. Results indicated that 95 per cent LIS scholars knew about open access journals, 85 per cent LIS scholars used OA journals, 69 per cent cited OA journals and 38 per cent LIS scholars published their articles in OA journals.

It can be seen that open access academic resources increase readership and article citation rates, due to the fact that they are provided free of charge on the Internet. The research impact of open access articles is becoming increasingly important to scholars, especially in the fields of science and technology. Antelman (2004) in her research proposes a mean citation rate between OA and non-OA articles to estimate the impact of OA articles. The ratio between the two varies between 1.45 to 1.9 for the four academic disciplines. Harnad and Brody (2004) suggest a ratio of 2.5 in 1992 to 5.8 in 2001. But these studies are biased in favor of the science and technology fields, and have little to do with the social sciences and related disciplines.

RESEARCH QUESTIONS

This study will examine the impact of open access journals on the scholarly productivity of LIS scholars in Taiwan. Referring to the Budapest Open Access Initiative(BOAI), open access journals are defined as the scholarly journals published with free availability on the public Internet, permitting any users to read, download ,copy, distribute, print, search , or link to the full texts of those articles, crawl them for indexing, without financial, legal or technical barriers. Research questions of the study are as follows: (1) What is the scholarly productivity of LIS scholars in Taiwan? (2) How many articles are published by LIS scholars in Taiwan and, among those articles, what is the proportion of OA articles? (3) What is the citation count of published articles by LIS in Taiwan and the proportion of OA articles? and (4) Do OA articles influence the research of LIS scholars in Taiwan?

RESEARCH METHODS

Using a bibliometric method, the study uses two indicators to evaluate research impact: the percentage of academic articles that are OA articles, and the mean citation rate of OA articles to non-OA articles. This study investigates the question of whether open access journals have an impact on the research of LIS scholars in Taiwan. Since the BOAI began in 2001, the present study will be limited to the academic publications in library and information science in Taiwan over the last ten years.

Bibliometric analysis

This study utilizes bibliometric analysis, looking at the ratio of open access articles to the total number of academic articles, and citation rates for OA and non-OA articles, to create an index to assess the research impact of open access journals on scholars. To collect data on academic publication of articles in library and information science in Taiwan, a Taiwanese periodicals

citation database and an international periodicals citation database were used to collect articles published within the last ten years (2000-2009) by LIS scholars, and a bibliographical register was created on which to perform a statistical analysis. Journal articles published by scholars are used to analyze scholars' scholarly productivity; second, analysis was done of which articles originated from open access journals and which ones originated from non-open access journals; which ones were journals published domestically and which ones are internationally published. The proportion of articles in open access journals represented the impact of open access journals on scholars.

This study utilized the Academic Citation Index database (ACI), the ISI Social Science Citation Index database (SSCI), and the Directory of Open Access Journals to verify OA journals, collecting academic articles published by 72 scholars between 2000 and 2009 in nine schools of library and information science in Taiwan.

Data collection

Because articles in library and information science by Taiwan's academics are mainly published in Chinese in domestic journals and are also published in international journals, this study must analyze the data collected from two kinds of citation databases, those drawn from Taiwan's journals and from international journals. This study utilized the ACI database of Airiti, Inc., and the SSCI database, in its collection of articles published by academics in the field of library and information science, and in the collection of document citation data. ACI was established by Airiti, Inc., as a periodical citation database registering publications in the social sciences and the humanities in Taiwan. As of May 2010, it contained 430 journals over 19 academic disciplines. That of library and information science contained 12 major journals, and is a relatively complete register for the years 2003-2009 (Airiti Digital Library, 2010). From July 15th through the 21st, 2010, the author collected Chinese articles published in the field of library and information science between 2000 and 2009, created an Excel database archive and undertook a statistical analysis.

The U.S. Institute of Scientific Information established the SSCI database which, in 2010 registered 66 journals in the field of information science and library science. Between July 15 and 21, 2010, using the subject search terms "Information Science and Library Science" and "Taiwan" for the country search term, the author retrieved English-language articles published between 2000 and 2009 by Taiwan's scholars in library and information science. The results were archived in an Excel database, and statistical analysis was then done.

BIBLIOMETRIC ANALYSIS OF JOURNAL ARTICLES PUBLISHED BY LIS SCHOLARS

Basic data

Scholars in library and information science in Taiwan

Most scholars in library and information science come from nine LIS schools. Those 72 full-time faculty and researchers, forming a small academic community, are the object of this study in Taiwan. Since 1961, when the Department of Library Science, National Taiwan University, was established, a complete LIS educational system has been formed, consisting of five bachelor's programs, 8 master's programs, and 2 PhD programs provided by the nine schools listed below: the Department of Library and Information Science at National University (NTU); the Department of Library and Information Science at Fu Jen Catholic University (FJU); the Department of Information and Library Science at Tamkang University (TKU); the Graduate Institute of Library, Information, and Archival Studies at National Chengchi University (NCCU); the Graduate Institute of Library and Information Science at National Chung Hsing University (NCHU); the Department of Information and Communications at Shih Hsin University (SHU); the Graduate Institute of Library and Information Studies, at National Taiwan Normal University (NTNU); the Department of Library and Information Science at Hsuan Chuang University (HCU); and National Chiao Tung University's Digital Library and Information Science Master Program (NCTU).

This study examines the group of 72 academics, 67 of whom are full-time faculty in library and information science, and 5 researchers who teach at other schools; 38 are female, 34 male. There are 21 full professors; 25 associate professors; 19 assistant professors, and 7 lecturers. There are 53 full-time teachers holding doctoral degrees, accounting for 73.61% of all of the full-time teachers. Their academic backgrounds vary: there are 49 people in the discipline of library and information science; 15 have a background in computer science; 5 have a background in educational technology; 3 people came from other fields. In summary, background in library and information science constituted 68%; other disciplines 32%.

Journals that publish academic articles

Referring to ACI Database, during the past decade, those LIS scholars mainly published their research papers in 12 LIS scholarly journals and other related journals in Chinese for scholarly communication and promotion in Taiwan. A few scholars also published their papers in LIS journals in West.

The study found that of the 72 scholars, 64 published articles during 2000 to 2009, and 62 scholars published articles in 26 Chinese journals listed in the ACI's database's, including 13 journals that were published in open access journals, and 13 journals in non-open access journals. In the SSCI's database's, 17 scholars published articles in 23 English journals, including 20 non-open access journals, and 3 open access journals. A total of 49 journals were published by these LIS scholars over 10 years; 33 journals were in non-open access journals, and 16 were open-access journals. See Table 1 and Table 4.

Analysis of academic articles published in Chinese

Publication of Chinese articles

With regard to articles published in Chinese, out of the 72 LIS scholars, 62 of them published 679 articles in Chinese in the ACI database. They are distributed over 26 Chinese journals including 13 non-OA journals, and 13 OA journals. The ACI database lists 12 journals in the field of library and information science; there are 10 OA journals, so it can be clearly seen that the majority of Chinese LIS journals have adopted the OA model of publishing. There were 494 OA Chinese articles and 185 non-OA Chinese articles: the OA Chinese articles comprised 72.8% of the total, publication of OA articles accounted for the majority. When ranked in order of number of articles published, the top three OA journals were the *Journal of Educational Media and Library Sciences* (教育資料與圖書館學), with 81 articles; *University Library Quarterly* (大學圖書館), with 73 articles; and the *Journal of Library and Information Science* (圖書館學與資訊科學), with 68 articles. The top two non-OA journals were the *Journal of Librarianship and Information Studies* (圖書與資訊學刊), with 115 articles; *Archives Quarterly* (檔案季刊), with 41 articles.

Table 1: Statistics 2000-2009 for Chinese-language articles published and their citation counts by LIS Scholars in Taiwan

N=62

Title (Chinese)	Title (English)	Articles published	Citation count
	I. Open access journals		
1. 教育資料與圖書館學	1. <i>Journal of Educational Media & Library Sciences</i>	81	52
2. 大學圖書館	2. <i>University Library Quarterly</i>	73	42
3. 圖書館學與資訊科學	3. <i>Journal of Library & Information Science</i>	68	42
4. 圖書資訊學刊	4. <i>Journal of Library and Information Studies</i>	68	42
5. 國家圖書館館刊	5. <i>National Central Library Bulletin</i>	66	28

6. 台北市立圖書館訊	6. <i>Journal of the Taipei Public Library</i>	50	27
7. 臺灣圖書館管理季刊	7. <i>Interdisciplinary Journal of the Taiwan Library Administration</i>	36	9
8. 圖書資訊學研究	8. <i>Journal of Library and Information Science Research</i>	28	7
9. 國立成功大學圖書館館刊	9. <i>National Cheng Kung University Library Journal</i>	14	6
10. 佛教圖書館館刊	10. <i>Information Management for Buddhist Libraries</i>	5	5
11. 高教評鑑	11. <i>Evaluation in Higher Education</i>	2	0
12. 交大管理學報	12. <i>Chiao-Tung University Management Review</i>	2	0
13. 中文計算語言學期刊	13. <i>International Journal of Computational Linguistics & Chinese Language Processing</i>	1	0
	Subtotal of OA journals	494	260
	II. Non-open access journals		
1. 圖書與資訊學刊	1. <i>Journal of Librarianship and Information Studies</i>	115	73
2. 檔案季刊	2. <i>Archives Quarterly</i>	41	35
3. 教育資料與研究	3. <i>Educational Resources and Research</i>	7	6
4. 興大人文學報	4. <i>Chung-Hsing University Journal of Humanities</i>	5	6
5. 教學科技與媒體	5. <i>Instructional Technology & Media</i>	4	3
6. 科技管理學刊	6. <i>Journal of Technology Management</i>	3	2
7. 博物館學季刊	7. <i>Museology Quarterly</i>	3	1
8. 輔仁學誌：文學院之部	8. <i>Fu Jen Studies: College of Liberal Arts</i>	2	0
9. 教育研究月刊	9. <i>Journal of Education Research</i>	1	0
10. 教育科學研究期刊	10. <i>Journal of Research in Education Sciences</i>	1	0
11. 中華傳播學刊	11. <i>Chinese Journal of Communication Research</i>	1	0
12. 教育研究集刊	12. <i>Bulletin of Educational Research</i>	1	0
13. 管理與系統	13. <i>Journal of Management & Systems</i>	1	0
	Subtotal of non-OA journals	185	126
	Total	679	386

59.6% of the Chinese-language articles published by the 72 scholars were in the following five journals: 1.) *Journal of Librarianship and Information Studies* (圖書與資訊學刊), with 115 articles, at 16.9% of the total; 2.) *Journal of Educational Media and Library Sciences* (教育資料與圖書館學) with 81 articles, of 11.9%; 3.) *University Library Quarterly* (大學圖書館), at 73 articles, of 10.8%; 4.) *Journal of Library and Information Studies*, (圖書資訊學刊), and 4) *Journal of Library and Information Science*, (圖書館學與資訊科學) respectively with approximately 68 articles, at 10%. Out of the 10 top journals preferred by the academics, eight of them were open access journals.

Citation rate of Chinese journals

Of the 679 Chinese-language articles published by the 62 scholars, 386 were cited in the period 2000-2009; the mean citation rate for each Chinese article was 0.57 times. OA articles were cited 260 times, and non-OA articles were cited 126 times. The citation ratio between Chinese-language OA articles and non-OA articles was 2.06. If the mean citation ratio is calculated from the 13 open access journals, 13 non-open access journals, the mean citation ratio for OA and non-OA Chinese articles is also 2.06. This demonstrates that open access journals have a research impact on academics publishing articles in Chinese in the field of library and information sciences.

Of the 679 Chinese articles published by the 62 academics over the previous 10 years, 10 of them did not publish, so that each scholar published an average 9.43 articles in Chinese over ten years, or 0.94 articles per year per person. Chinese-language OA articles constituted 72.75% of the total articles published in Chinese. Of the nine schools of library and information science, the top three publishing Chinese articles were NTU, at 137 articles; NCCU, at 115 articles, and TKU, at 100 articles, as seen in the table below.

Table 2: Statistics 2000-2009 for Chinese-language articles published from LIS schools

N=62

School	Number of authors	Number of faculty in department	Articles in Non-OA journals	Articles in OA journals	Total articles	%
NTU	10	12	35	102	137	20.2
NCCU	6	6	42	73	115	16.9
TKU	9	10	27	73	100	14.7
NTNU	6	7	19	64	83	12.2
SHU	9	10	21	58	79	11.6
FJU	9	10	15	52	67	9.7
Other	5	5	14	30	44	6.5
NCHU	4	5	7	28	35	5.2
HCU	3	6	2	8	10	1.5
NCTU	1	1	3	6	9	1.3
Total	62	72	185	494	679	100

Analysis of articles published in English

Publication of English articles

With regard to articles published in English, 17 of the 72 scholars published 66 articles in English, and over ten years for 72 people, an average of 0.92 English articles were published per person. For 17 people, an average of 3.88 articles were published per person. Of the 66 articles, 61 were published in non-OA journals, and 5 were OA articles: the OA English articles comprised 7.6% of the total. This shows that in Taiwan most of the English-language articles in library and information science were published in non-OA journals. Of the 9 schools of library and information science, the top three that originate English-language articles are NCCU, with 23 articles; NTNU, with 14 articles; and NTU, with 12 articles, as seen in the table below.

Table 3: Statistics 2000-2009 for English-language articles published from LIS schools

N=10

School	Number of authors	Number of faculty in department	Articles in Non-OA journals	Articles in OA journals	Total articles	%
NCCU	2	6	22	1	23	34.8
NTNU	4	7	11	1	14	21.2
NTU	4	12	12	0	12	18.2
SHU	2	10	7	2	9	13.6
Other	1	5	5	0	5	7.6
NCHU	2	5	2	0	2	3
HCU	1	6	2	0	2	3
FJU	1	10	0	1	1	1.5

TKU	0	10	0	0	0	0
NCTU	0	1	0	0	0	0
Total	17	72	61	5	66	100

Over the ten years, 17 scholars published 66 English articles in 23 journals, 3 of which were OA, and 20 of which were non-OA journals. When ranked in order of number of articles published, the top three non-OA journals were *Electronic Library*, with 16 articles; *Scientometrics*, with 12 articles; and the *Journal of the American Society for Information Science and Technology*, with 6 articles. Three of the OA journals were: *Information Research: An International Electronic Journal*, with 3 articles; *The Journal of Artificial Societies and Social Simulation* and the *Journal of the Medical Library Association*, each with 1 article, as seen in the table following.

Table 4: Statistics 2000-2009 for English-language articles published and their citation counts by LIS Scholars in Taiwan

N=10

Title	Articles published	Citation count
I. Open access journals		
1. <i>Information Research: An International Electronic Journal</i>	3	0
2. <i>The Journal of Artificial Societies and Social Simulation</i>	1	0
3. <i>The Journal of the Medical Library Association</i>	1	19
Subtotal of open access journals	5	19
II. Non-open access journals		
1. <i>Electronic Library</i>	16	33
2. <i>Scientometrics</i>	12	62
3. <i>Journal of the American Society for Information Science and Technology</i>	6	58
4. <i>Computers and Education</i>	4	66
5. <i>Online Information Review</i>	3	2
6. <i>Malaysian Journal of Library and Information Science</i>	2	1
7. <i>Education Technology and Society</i>	2	8
8. <i>Journal of Information Science</i>	2	7
9. <i>Information and Management</i>	2	19
10. <i>Information Processing and Management</i>	9	19
11. <i>Simulation: Transactions of the Society for Modeling and Simulation International</i>	1	3
12. <i>Library Hi Tech</i>	1	2
13. <i>Library Collections, Acquisitions, and Technical Services</i>	1	2
14. <i>Canadian Journal of Information and Library Science – Revue</i>	1	0
15. <i>Cyberpsychology and Behavior</i>	1	2
16. <i>Knowledge Organization</i>	1	1
17. <i>Expert Systems with Applications</i>	1	3
18. <i>Library and Information Science Research</i>	1	26
19. <i>British Journal of Educational Technology</i>	1	0
20. <i>Journal of Documentation</i>	1	0
Non-OA journals	61	321
Total	66	340

Citation rate of English articles

The 66 English-language articles published by the 17 scholars were cited 340 times, with an average citation rate for each article of 5.15, 0.57 times more than that of the Chinese articles. Of the article citations, 321 came from non-OA articles, and 19 came from OA articles. The citation ratio between English-language OA articles and non-OA English-language articles was 0.06. The mean citation ratio for English OA articles and English non-OA articles was 0.39. This shows clearly that for English-language articles, academics in the field of library and information science are cited more from non-OA articles, and that the impact of English-language OA journals in library and information science is relatively slight. The three most often cited journals are: 1) *Computers and Education*; 2) *Scientometrics*; and 3.) the *Journal of the American Society for Information Science and Technology*, as seen in Table 4.

Analysis of articles published in Chinese and English journals

Publication of Chinese and English articles

Overall, during 2000 to 2009, of the 72 LIS scholars, 64 published 745 articles in 49 journals, which include 679 Chinese articles and 66 English articles, each contributing an average of 10.34 articles. Of the 745 articles, 499 of them were articles in OA journals, and 246 were in non-OA journals; the proportion of OA articles stands at 66.98%. Compared with the Antelman study, Taiwan's academics in the field of library and information science had a higher percentage of articles published in OA journals. This shows that open access journals have a tangible research impact. Over the previous 10 years, of the nine schools in library and information science that have published Chinese and English articles, the top three are NTU, at 149 articles; NCCU, at 138 articles, and TKU, at 100 articles, as seen in the table below.

Table 5: Statistics 2000-2009 for articles published from LIS schools

N=72

School	Number of authors published	Number of faculty in department	Chinese articles		Subtotal	English articles		Subtotal	Aggregate Total		Total	%
			Non-OAJ	OAJ		Non-OAJ	OAJ		Non-OAJ	OAJ		
NTU	11	12	37	100	137	12	0	12	49	100	149	20.0
NCCU	6	6	42	73	115	22	1	23	64	74	138	18.5
TKU	9	10	28	72	100	0	1	1	28	72	100	13.4
NTNU	7	7	21	62	83	11	1	12	32	63	95	12.8
SHU	9	10	21	58	79	7	2	9	28	60	88	11.8
FJU	9	10	17	50	67	0	0	0	17	51	68	9.1
Other	5	5	15	29	44	5	0	5	20	29	49	6.6
NCHU	4	5	13	22	35	2	0	2	15	22	37	5.0
HCU	3	6	2	8	10	2	0	2	4	8	12	2.3
NCTU	1	1	3	6	9	0	0	0	3	6	9	1.2
Total	64	72	185	494	679	61	5	66	246	499	745	100

Overall, over the 10-year period, scholars in library and information science published 745 articles in Chinese and in English in 49 journals, 33 of which were non-OA, and 16 of which OA, journals. This includes 246 articles in non-OA journals, and 499 articles in OA journals. The top three OA journals are the *Journal of Educational Media and Library Sciences* (Chinese), with 81 articles; *University Library Quarterly* (Chinese), with 73 articles; and both the *Journal of Library and Information Science* (Chinese) and the *Journal of Library and Information Studies* (Chinese), each with 68 articles. The top three ranking non-OA journals in terms of number of

articles published are the *Journal of Librarianship and Information Studies* (Chinese), with 115 articles; *Archives Quarterly* (Chinese), with 41 articles; and *Electronic Library* (English), with 16 articles, as can be seen in the table below.

Table 6: Statistics 2000-2009 for articles published and their citation counts by LIS Scholars in Taiwan

N=72

Title	Articles published	Citation count
I. Open access journals		
1. <i>Journal of Educational Media and Library Sciences</i> (Chinese)	81	42
2. <i>University Library Quarterly</i> (Chinese)	73	52
3. <i>Journal of Library and Information Science</i> (Chinese)	68	42
4. <i>Journal of Library and Information Studies</i> (Chinese)	68	42
5. <i>National Central Library Bulletin</i> (Chinese)	66	28
6. <i>Journal of the Taipei Public Library</i> (Chinese)	50	27
7. <i>Interdisciplinary Journal of Taiwan Library Administration</i> (Chinese)	36	9
8. <i>Journal of Library and Information Science Research</i> (Chinese)	28	6
9. <i>National Cheng Kung University Library Journal</i> (Chinese)	14	7
10. <i>Information Management for Buddhist Libraries</i> (Chinese)	5	5
11. <i>Information Research: An International Electronic Journal</i> (English)	3	0
12. <i>Evaluation in Higher Education</i> (Chinese)	2	0
13. <i>Chiao Tung Management Review</i> (Chinese)	2	0
14. <i>International Journal of Computational Linguistics and Chinese Language Processing</i> (Chinese)	1	0
15. <i>Library Association</i> (English)	1	19
16. <i>The Journal of Artificial Societies and Social Simulation</i> (English)	1	0
Subtotal	499	279
II. Non-open access journals		
1. <i>Journal of Librarianship and Information Studies</i> (Chinese)	115	73
2. <i>Archives Quarterly</i> (Chinese)	41	35
3. <i>Electronic Library</i> (English)	16	33
4. <i>Scientometrics</i> (English)	12	62
5. <i>Educational Resources and Research</i> (Chinese)	7	3
6. <i>Journal of the American Society for Information Science and Technology</i> (English)	6	58
7. <i>Chung Hsing Journal of Humanities</i> (Chinese)	5	6
8. <i>Instructional Technology and Media</i> (Chinese)	4	3
9. <i>Computers and Education</i> (English)	4	66
10. <i>Journal of Technology Management</i> (Chinese)	3	0
11. <i>Museology Quarterly</i> (Chinese)	3	1
12. <i>Online Information Review</i> (English)	3	2
13. <i>Fu Jen Studies: College of Liberal Arts</i> (Chinese)	2	2
14. <i>Malaysian Journal of Library and Information Science</i> (English)	2	1

15. <i>Educational Technology and Society</i> (English)	2	8
16. <i>Journal of Information Science</i> (English)	2	7
17. <i>Information and Management</i> (English)	2	19
18. <i>Information Processing and Management</i> (English)	2	26
19. <i>Journal of Education Research</i> (Chinese)	1	0
20. <i>Journal of Research in Education Sciences</i> (Chinese)	1	0
21. <i>Chinese Journal of Communication Research</i> (Chinese)	1	0
22. <i>Bulletin of Educational Research</i> (Chinese)	1	0
23. <i>Journal of Management and Systems</i> (Chinese)	1	0
24. <i>Simulation-Transactions of the Society for Modeling and Simulation International</i> (English)	1	3
25. <i>Library Hi Tech</i> (English)	1	2
26. <i>Library Collections Acquisitions and Technical Services</i> (English)	1	2
27. <i>Canadian Journal of Information and Library Science-Revue</i> (English)	1	0
28. <i>Cyberpsychology and Behavior</i> (English)	1	2
29. <i>Knowledge Organization</i> (English)	1	1
30. <i>Expert Systems with Applications</i> (English)	1	3
31. <i>Library and Information Science Research</i> (English)	1	26
32. <i>British Journal of Educational Technology</i> (English)	1	0
33. <i>Journal of Documentation</i> (English)	1	0
Subtotal	246	447
Total	745	726

Citation rate of Chinese- and English-language articles

64 out of 72 scholars published 745 articles, which were cited 726 times. The Chinese-language articles were cited 386 times; English articles were cited 340 times. The mean citation for each article was 0.97 times; for Chinese articles the mean citation was 0.57; for English it was comparatively more, at 5.15. These 16 OA journals were cited 279 times; and 33 non-OA articles were cited 447 times. The citation ratio between OA and non-OA articles was 0.62, but the mean citation rate for OA and non-OA articles was 1.29. It can be seen from both the share of OA articles of the total number of articles, as well as the mean citation rates for OA and non-OA articles, open access journals have a research impact on the practice of academics in the field of library and information science, as seen in Table 6.

DISCUSSION AND CONCLUSION

This study has examined the research impact on open access journals on scholars in the field of library and information science. Through the research techniques of bibliometrics, it can be seen that open access journals have had an impact on the academic research of scholars in this field, as the following summary will explain, as well as the limitations of this research and suggestions for future research.

LIS journals publishing and scholarly productivity of scholars in Taiwan

This study investigates the published articles of Taiwan's academics in the field of library and information science during 2000 to 2009. It found that 745 articles were published in 49 journals by 64 people; 62 people published 679 Chinese-language articles in 26 Chinese journals; and

17 people published 66 articles in 23 English-language journals. Each scholar published an average of 10.35 articles: 9.43 Chinese articles and 0.92 English articles. Chinese articles published were in the majority, constituting 91%. LIS scholars in Taiwan submit their papers in Chinese and in English, but they favor the LIS Journals in Chinese more than those in English.

The study shows that there are 12 journals in the field of library and information science published in Chinese and the 72 LIS scholars in Taiwan prefer to submit their papers to these journals. Besides, there are another 14 related journals published by LIS scholars. In Taiwan the discipline of library and information science boasts 12 major journals, of which 10 are OA journals, showing that publication of Chinese OA journals is on the increase. The OA Journals in the field of library and information science seem have a significant influence on LIS academics in Taiwan.

Bibliometric analysis of published articles by LIS scholars

Out of 72 scholars in library and information science, 62 published 679 articles in Chinese journals between 2000 and 2009, a figure that includes 494 OA articles, and 185 non-OA articles. The Chinese articles were published in 26 Chinese-language journals, 13 of which were non-OA journals and 13 OA journals. Scholars publishing Of the 72 scholars, 17 published 66 English articles in 23 English-language journals, 61 of which were OA articles and 5 non-OA articles.

Overall, 64 of the 72 academics in library and information science published articles, with a total of 745 articles in 49 journals over the previous 10 years. 679 were in Chinese, and 66 were in English; 499 were published in OA journals, and 264 in non-OA journals, so that OA articles constituted 66.98% of the total. Open access journals have a research impact on LIS scholars in Taiwan.

Analysis of citation rates of published articles

The 679 Chinese-language articles published by the 62 scholars were cited 386 times over the previous 10 years. Articles in OA journals were cited 260 times, and those in non-OA journals, 126 times. The citation ratio of OA to non-OA articles is 2.06. It can be seen that there is a research impact of open-access journals on academics publishing articles in Chinese in this field. The 66 English-language articles published by 17 scholars were cited 340 times. The citation ratio of English-language OA articles to non-OA articles is 0.06; the average citation ratio of English-language OA articles to English non-OA articles is 0.39. This shows that the research impact of open access English language articles on academics in the library and information science field is low.

Overall, 64 of the 72 academics published 745 articles in English and in Chinese, and were cited 726 times. The citation ratio of OA articles to non-OA articles is 0.62, but the mean citation rates of OA articles to non-OA articles is 1.29. The proportion of OA articles to total articles, and the mean citation rates of OA articles to non-OA articles, show open-access journals have a research impact on LIS scholars in Taiwan, in particular, LIS OA journals have more research impact in Chinese than those LIS OA Journals in English.

Comparison with international research

The research undertaken in this study and that of international studies shows some dissimilarity. Antelman's research discovered that among academic articles, the proportion of open access articles in various fields varies: in philosophy, 17% of the articles were open access; in political science the rate proportion was 29%; in electrical engineering 37%, and in mathematics 69%. In this study, 72 academics in library and information science published 745 articles between 2000 and 2009, of which 66.98% were open access academic articles. When compared with Antelman's study, this study discovered that Taiwanese scholars published more OA articles, and open access articles had an influence on their research.

Antelman's research discovered that the citation ratio of OA to non-OA articles in the four fields ranged from 1.45 to 1.9. The study shows that the citation ratio of OA articles to non-OA articles was 0.62. However, the average citation ratio of OA articles to non-OA articles was 1.29, a figure lower than that arrived at by Antelman. Overall, academics in library and information science published a higher proportion of OA articles than non-OA article, and, as an

analysis of the average citation ratios for both shows, OA articles have a research impact on LIS scholars in Taiwan.

Limitations of this study

As this is a quantitative research study, it presents limitations on the conclusions that may be drawn from this research. This study utilizes the quantitative method of bibliometric analysis, which can handle large quantities of data, and can present the circumstances of relevant open access articles published by academics, and their citation data, making it relatively objective. But there is no way to interpret a cause and effect relationship between the publication of OA journal articles and their citation. For this, qualitative research is still needed to investigate the behavior of academics in their utilization of open access journals, as well as factors of research impact.

In addition, the ACI database was released in 2010, and it still had multiple lacunae which influenced the present study: 1) The 2003-2009 ACI database is relatively complete, but records between 2000 and 2002 are incomplete, which has an influence on the part of this study dealing with statistical data for citation of open access articles. 2) The ACI database does not yet provide academic discipline classification, and it is difficult to capture all of the academic journal articles published in the field of library and information science, citation counts, or data on articles cited. For this reason the researcher for this study had to collect data from each scholar one item at a time, and this may have caused omissions in the analysis of the academics or the scholarly journals. 3) The journals and articles recorded by ACI are as yet incomplete, and older journals have not been covered into the database, which has an impact on the completeness of the database. 4) This study was not able to acquire data on when each journal began open access publication, so everything starts with 2000, which is a limitation of this study. 5) This study uses the SSCI database, therefore there was no way to collect several articles published in the field of library and information science that were not contained in the SSCI database.

Suggestions for future research

This study has several recommendations for future research. First, Taiwan's LIS journals already publish OA journals to a large extent. A follow-up investigation into Taiwan's open access scholarly journals publishing and its influence on scholarly communication is worthwhile. Second, this study uses a citation database to analyze research impact on scholars. Other research methods are worth developing as well, such as ones that use the Internet to collect open access publications, their citation counts, and analyze the articles that they cite in turn. We propose using Google Scholar, Scopus, and ISI databases to do studies of scholarly communication in the field of library and computer science and other social science academics and scholarly journals. Third, we recommend further research into adoption open access publishing of scholarly journals in library and information science. Fourth, we recommend setting up evaluation indicators for assessing research impact, and this study proposes two indicators: the percentage of academic articles that are OA articles, and the mean citation rate of OA articles to non-OA articles, both of which can be considered as assessment criterion.

The study of open access journals contains two contradictory impulses: it is hoped that this open access movement can enhance the efficacy of scholarly communication through the Internet, but everyone is still concerned about whether the open access movement has any concrete research impact. This study demonstrates that in Taiwan, the open access model is being actively pursued in the publication of journals, and has been recognized by several scholars who publish their OA articles in them. However, non-OA articles still predominate among those publishing library and information science articles in English. The performance of open access journals in this field in Taiwan shows that the open access model is gradually starting to flourish, and proves that OA journals are starting to have an impact on the research of scholars in Asia.

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