Journal of Library and Information Studies 9:1 (June 2011) p.27-49

Longitudinal Trends in Internationalisation, Collaboration Types, and Citation Impact: A Bibliometric Analysis of Seven LIS Journals (1980-2008)

Sei-Ching Joanna Sin

Abstract

Journal publication is a core avenue for sharing research in the LIS field. Effective scholarly communication is beneficial to the growth of a discipline. Bibliometrics research shows that articles in prestigious international journals are predominantly those of authors based in a few nations, however. Papers from authors outside the established nations are likely to be cited less often. This study analysed the longitudinal changes in geographical patterns of authorship, collaboration types, and factors affecting the citation impact of seven top LIS journals over a period of 29 years. In addition to data from all nations, this paper includes specific findings relating to Asian countries. Analysis of 8,140 papers shows that the internationalisation level in the sample set has increased in terms of number of nations represented and in a decreasing Gini coefficient. The presence of Asian nations such as Taiwan and Singapore as top contributing countries is particularly notable in the past 10 years. Domestic collaboration is found to be the dominant type of authorship pattern. In terms of citation impact as measured by citation counts, logistic regression was used to test the effects of author continent, country income level, collaboration type, publication year, and number of authors. Papers from lower-income countries or from Asian or European authors are found less likely to be 'more cited.' International and domestic collaboration had a positive relation with citation counts. A practical implication is that authors may consider international collaboration as a way to increase the visibility and impact of their research. Nevertheless, the reasons behind such differential citation impact require more exploration. Invisible colleges, the strengths of weak ties, and the geographic scope of a paper are some factors to be further examined. It is hoped that more research can help identify and overcome barriers in scholarly communication so as to achieve a genuine internationalisation of science.

Keywords: Bibliometrics; LIS Journals; Internationalisation of Science; Citation Impact; Collaboration

1. Introduction

In many disciplines, including the field of Library and Information Science (LIS), journal publication is a core avenue for sharing scholarly research. Effective scholarly communication facilitates the exchange of

Assistant Professor, Division of Information Studies, Wee Kim Wee School of Communication and Information, Nanyang Technological University, Singapore.
E-mail: joanna.sin@ntu.edu.sg

臺灣大學學術期刊資料庫

diverse ideas. It is beneficial to the growth of a discipline. Bibliometrics research shows that journal authorship patterns are highly uneven, however. In terms of authors' geographical affiliations, most papers published in high-ranking international journals are written by authors based in a few nations. These countries are usually developed nations that also have a long tradition of scholarly journal publishing. Examples include the United States (US) and the United Kingdom (UK) (Dore et al., 1996; Frame, Narin, & Carpenter, 1977; Sin, 2005). More interestingly, Cronin and Shaw (1999) found that authors outside of the US, the UK and Canada (the *North Atlantic countries*) are more likely to be uncited than authors working in the three nations mentioned above. In summary, bibliometrics research consistently found the international visibility and impact of research from developing or non-Western countries more limited. This leads to questions about the effectiveness of the international scholarly communication system.

The recent advancement of information and communication technologies (ICTs) has allowed more efficient international communication. This could help facilitate the internationalisation of scholarship (He & Spink, 2002; Koehler, 2001). The open-access publishing movement has also provided more opportunities for scholars to access and publish research internationally. In the LIS field, some open-access journals such as *Information Research* have gained a strong foothold and are indexed in the ISI's Social Science Citation Index (SSCI). For most other open-access journals, however, it might take some time to attain the visibility and impact of extant prominent journals. Some scholars are concerned that researchers from developing nations may still have difficulties publishing their research in prestigious journal (Dahdouh-Guebas, Ahimbisibwe, Van Moll, & Koedam, 2003).

Examining the longitudinal changes in journal authorship can provide insight into whether recent social and technological developments have largely resolved the uneven flow of scholarly communication. It helps identify whether more efforts are needed to bolster the visibility of research from more nations. This study will focus on the longitudinal changes in authors' geographical affiliations in top LIS journals. Bibliometrics scholars suggest that authors in less-established countries could adopt several authoring strategies, one of which is international collaboration (Frame & Carpenter, 1979). This study examines whether there is, indeed, an increase in international coauthorship as suggested and if such collaboration has a positive relation with citation impact as

臺灣博碩士論文知識加值系統 期刊資料庫

measured by citation counts. Specifically, it explores the following research questions: 1) Has the rate of internationalisation in LIS journals, as measured by the distribution of authoring countries, increased or slowed down over the years? 2) Is there more international collaboration in LIS research (as is the trend in other disciplines)? and 3) Are articles from non-Western or developing countries still more likely to be cited less often?

To address the above questions, this study focuses on the longitudinal trends of authorship distribution, collaboration patterns, and citation impact in relation to the authors' geographical affiliations. Descriptive measures of seven journal publications over a range of 29 years addressed questions one and two. For question three, logistic regression analysis was used to test whether citation counts differ based on authors characteristics (e.g., author's continent, author's country income category) and article characteristics (such as collaboration type, number of authors, and publication year).

The study frame, data analysis, and discussion of this paper include authors from all geographical regions. Selected findings related to Asian countries will be highlighted in the results and discussion section. The paper will provide an understanding of the publication landscape and changes in LIS top journals. It will offer insight into the effectiveness of different publication strategies. It is hoped that such understanding will pave the way for further bibliometrics and social informatics research. Future study could focus on identifying the facilitators and barriers in international scholarly communication and the implications of such a communication pattern on global knowledge sharing.

2. Literature Review

The production, communication and consumption of scientific knowledge have long fascinated scholars in different fields, including bibliometrics and scholarly communication. *Bibliometrics*, as defined by Pritchard (1969, p.348) is "to shed light on the processes of written communication and of the nature and course of development of a discipline ..... by means of counting and analysing the various facets of written communication." *Scholarly communication* is defined by Borgman (1990, p.13) as the "study of how scholars in any field..... use and disseminate information through formal and informal channels."

Bibliometrics studies consistently point to the uneven production of scientific publications across the globe. For example, scientific publications are heavily concentrated in a few science centres (Liang, Feng, & Wu, 2000). Frame, Narin and Carpenter (1977) analysed the 1973 Science Citation Index

臺灣大學圖書館 期刊資料庫

(SCI). They confirmed the dominance of the United States in the research front. The US produced 103,780 articles, an amount almost four times that of the UK, the second largest producer country. Their study also presented the Gini coefficient of research publications in mainstream journals. The Gini coefficient is a measure of concentration, ranging from 0 (complete equality) to 1 (total inequality). The resultant Gini coefficient was 0.9082, indicating a very high level of inequality in authorship distribution. The authors concluded that the production of mainstream science was more heavily concentrated in the hands of a few countries than was national wealth as measured by GNP.

In recent decades we have seen the advancement of various communication technologies and the rise of globalisation. These may change the uneven distribution of science. In scholarly publications, scholars are increasingly in favour of publishing in international journals, especially those indexed by the SCI and SSCI, over publishing in national or local journals. Zitt, Perrot and Barre (1998) described this trend using a model of transition. They suggested that researchers are moving form 'national' to 'transnational' publication. This transition could partly be explained by the researchers' interest in sharing their research with a wider audience by publishing in the more visible international journals. Other scholars have also noted this preference to publish in international journals to gain greater readership (Bottle & Efthimiadis, 1984; He & Spink, 2002). At the same time, the recent improvement in ICT has made international publication potentially more efficient and feasible. He and Spink (2002) suggested that the growth of collaborative research and flow of information over the Web have contributed to the increasing level of globalisation in publications across disciplines.

While recent technological developments favour improving international communication, scholars in the digital divide underscored that such development alone would not automatically bring about a more even information flow (Dijk, 2005). Research in social informatics points out that ICT often leads to differential effects on different social groups (Sawyer & Eschenfelder, 2002). In bibliometrics and various disciplines, researchers have started to examine their journals to assess empirically their level of internationalisation (Gutierrez & Lopez-Nieva, 2001; Rey-Rocha & Martin-Sempere, 2004; Zitt & Bassecoulard, 1998).

In LIS, studies have been conducted to evaluate various authorship characteristics of LIS journals (Buttlar, 1991; Lipetz, 1999). However, very few studies have explored the degree of internationalisation in LIS. Wormell

臺灣大學學術期刊資料庫

(1998, p. 598) is one of the exceptions that offered a more in-depth analysis of LIS journals' internationality. Wormell examined seven LIS journals and explored the relation between the distribution pattern of authors, citations and journal subscriptions. The author found that the 'core international LIS journals were not as international as their reputation claimed to be'. Cronin and Shaw (1999) offers further perspectives on journal internationalisation. Their study analysed four journals in terms of authors geographic location, citations, and acknowledgement of funding sources. They found that most first authors were based in the *North Atlantic countries* (513 out of 716 articles). Worth highlighting is that authors from the 'Rest of World' were found more likely to be uncited (28%) than North Atlantic authors (14%).

Other papers have focused on studying selected categories of authors. Uzun (2002) focused on authors from developing countries (DCs) and the former socialist Eastern European Countries (EECs). He examined 21 LIS journals and found that only 7.9% of the articles were by authors from DCs or EECs. Their articles were more often published in less prestigious journals. He and Spink (2002) recognised that scholarship is an increasingly international pursuit; the importance of studying foreign authors was emphasised. They analysed the geographic distribution of authorship in the *Journal of the American Society for Information Science* (JASIS) and *Journal of Documentation* (J Doc). The study found an increased representation of foreign authors in both journals. Uzun (2004) also identified an increase in the share of papers contributed by foreign authors in JASIST, JDoc, *Journal of Information Science* (JIS), and *Information Processing & Management* (IP&M).

In terms of articles from Asian nations, Mukherjee (2010) analysed publications indexed in SSCI that were published by scholars in Asian countries between 2001 to 2007. The study frame included the top 100 subjects from each Asian country that were also included in the Library and Information Science (L&IS) category. Among the 1,885 items retrieved, there was an increase in Asian research articles over the years. The analysis showed that the number of publications from the top 15 Asian countries almost doubled, from a total of 185 articles in 2001 to 369 in 2007. It should be noted, however, that the data represent actual counts and not the relative share of publications among all nations. Over the years, some journals have increased the number of issues published each year (e.g., JASIST) or have published more articles each year (Sin, 2005). It is thus of interest to analyse Asian nations' relative share of papers in the LIS journals, in

臺灣大學圖書館 期刊資料庫

addition to actual counts.

The changing patterns in international collaboration have also interested the bibliometrics community. It is observed in broader disciplines such as in the Sciences, there is a trend toward increasing collaboration in general (Glanzel, 2002), and in international collaboration specifically (Wagner & Leydesdorff, 2005). Earlier studies suggested that international collaboration was related to higher citation impact (Katz & Hicks, 1997). Recent studies found more variations in the impact of such collaboration. The impact varies across subject fields or author countries. It is hypothesised that the effect of international collaboration on an article being highly cited is not as prominent for larger countries such as the US, as it is for smaller countries (Persson, 2010). The relation between collaboration types and citation impact requires more research. Such analysis is particularly interesting for the LIS field. This is because, as He and Spink (2002) pinpoint, international collaboration in LIS authorship is a topic rarely examined.

Related studies on LIS collaboration in general (i.e., without distinguishing domestic from international collaboration) suggest that more research in this area is promising. First, studies indicate a rising collaboration trend within LIS. Chua and Yang (2008) analysed articles in JASIS for the period 1988–1997 and 1998-2007. They found that collaboration, especially that among authors from different institutions has grown. Second, Levitt and Thelwall (2009) suggested that collaboration was associated with higher citation rate. This is based on longitudinal analysis of data from the SSCI L&IS category for every even year during 1976-2004. Given these findings on increasing collaboration and its positive relation with higher citation impact, the next step is to distinguish the different types of collaboration and their effects. The current study aimed to address the dearth of research on LIS international collaboration patterns. It identified the trends in domestic and international collaboration for the complete sample dataset, and the trends for Asian nations. Logistic regression was used to test whether collaboration patterns are related to higher citation impact.

3. Research Method

This research represents a bibliometrics study. It analysed research articles published in top LIS journals from 1980 to 2008. There are many prominent journals for different LIS subfields; evaluating all of them was beyond the scope of this explorative study. This research focused on a subset of highly visible LIS journals. The goal was to explore

臺灣大學學術期刊資料庫

the longitudinal change in authorship within this journal subset, rather than to generalise the findings to all LIS journals. Both journal citation impact and prestige were taken into account in the journal selection process. The study incorporated two selection criteria: (1) a publication that is listed under the *Information and Library Science* category in the ISI 2007 Journal Citation Report (JCR), Social Science Edition, and ranked in the top 15 in terms of Impact Factor; and (2) the top 15 journals in terms of prestige as ranked by directors and deans of LIS schools (Nisonger, 2005). Seven journals met both criteria and were selected for this study. These seven journals are, in alphabetical order: *Annual Review of Information Science and Technology* (ARIST); *Information Processing & Management* (IP&M); *Journal of Documentation* (J Doc); *Journal of the American Medical Informatics Association* (JAMIA); *Journal of the American Society for Information Science and Technology* (JASIST); *MIS Quarterly* and *Scientometrics*.

The study frame consisted of research papers that published in the selected journals from 1980 to 2008. Data about the papers were obtained from the ISI Web of Knowledge database. A *research paper* was operationally defined as a paper under the category of 'Article', 'Review', and 'Bibliography' in the ISI database. These categories were selected as they are longer papers with strong focus on specific research topics. Articles classified as 'Book review', 'Editorial materials', 'Meeting abstract,' and such were excluded. Articles without author information or authors' geographical affiliations were also excluded. The resulting dataset contained 8,140 articles. The bibliographic data were processed and analysed using SPSS and the open source *R* statistics program. Gini coefficients were calculated using the *ineq* package for the *R* statistics program.

The full author count method was used in counting authors' contributions. That is, coauthors were fully credited. Various counting methods have been used in bibliometrics studies. In the *straight* or *first-author count* option, for example, only the first author is credited for the publication, all other coauthors are excluded. This study used the *full* or *normal author count* method, so that all authors are credited. Huang and Lin (2010) examined a large set of physics journal articles to analyse the effects of five author counting methods on country ranks. It is found that while there were slight variations in rankings for certain clusters of countries, the counting methods did not affect the country ranks greatly. Analysis of different author count methods can also be found in Harsanyi (1993) and Egghe, Rousseau and Van Hooydonk (2000).

臺灣大學圖書館 期刊資料庫

Research question one examined the internationalisation level of the selected LIS journals. Various measures have been used to gauge journal internationality. This study focused on the national distribution of authors, a widely-used measures (Zitt & Bassecoulard, 1998), which will facilitate comparison of results. Internationalisation is defined here as the inclusion of papers by authors from various countries around the world and a relatively-even geographic distribution of authors. Specifically, this is measured by: first, the number of countries contributing to a journal, and second, through the Gini coefficient, a global measure of national distribution of authors as classified by Zitt and Bassecoulard (1998).

The Gini coefficient is one of the most commonly used measures of concentration, which offer a way to evaluate unevenness in distribution. It is a summary statistic of the Lorenz curve, a cumulative frequency curve that compares the distribution of a variable with the distribution that represents a state of perfect equality. It is frequently used, for example, in the measure of income or wealth inequalities. It is also used in measuring authorship, such as in Frame, Narin & Carpenter (1977). To examine the longitudinal change in authorship geographic distributions, the current paper computed the Gini coefficient for each year in the study period.

Research question three tested whether the following factors have statistically significant differences in citation counts. Citation impact is represented here as the number of citation counts that an article receives. There are five exploratory variables: (1) author's continent, (2) author's country income based on World Bank classification (2010), (3) collaboration type, (4) publication year, and (5) number of authors. The first three factors are the paper's main focus as this paper is interested in authors' geographical location. These variables have been found to be significant in previous research, for example, author's location in Cronin and Shaw (1999), country income level in Akre et al. (2011) and Sin (2005), collaboration type and number of authors in Katz & Hicks (1997), and publication year in Moed (2005).

Citation count of each paper is the study's outcome variable. It is commonly agreed that citation counts are not normally distributed (Seglen, 1992). Often, a few studies are cited very frequently, while some articles are not cited. This non-normal distribution existed for the study's data as well. Thus, for the outcome variable, the citation counts were categorised as 'less cited' and 'more cited' using the median (5 citation counts) as the cut-off point. SPSS's *Binary Logistic* function was used for this analysis.

This analysis does not aim to build a

臺灣大學學術期刊資料庫

model for citation count prediction. Literature on theory of citing indicates that citation behaviour is influenced by complex scientific, disciplinary, and institutional norms as well as individual peculiarities (Moed, 2005). Measuring and modelling such factors are beyond the scope of this study. In addition, the factors examined here are not conceptualised as the ultimate causes of differential citation count. Bibliometrics scholars caution against the inference of causal relationships from such analysis (Moed, 2005). Also, frequently-used variables such as country income level (Price, 1986) often stand as proxy to a host of related factors including R&D funding, national ICT infrastructure, education level, etc. The goal of this logistic regression analysis is to test whether geographical factors, indeed, influence statistically significant citation counts in this more globalised age. If significant differences are found for this sample set, future research is encouraged to test for more explanatory factors and the reasons behind such differences.

4. Results

The study set included 8,140 papers. The full author count method yielded a total of 18,708 author counts. These contributing authors came from 78 countries. Figure 1 shows the countries' shares of LIS publications for the whole dataset. In terms of papers from Asian nations, overall, 11.5% of the papers included authors based in Asian countries. Seven Asian countries were in the top-twenty contributing countries list. They are, in alphabetical order: China, India, Israel, Japan, South Korea, Singapore and Taiwan.

Table 1 presents the longitudinal changes in the top-ten countries in five-year intervals. Asian countries are highlighted in bold. It can be observed that for the last time period of this dataset, there was an increase in the presence of Asian countries in the top-ten list. In 1980, only 4.5% of the papers published that year came from Asia. The share of papers from Asian nations rose to 18.2% in 2008. Figure 2 shows the longitudinal trend in publications from Taiwan. The rise in publication share is notable.

4.1. Research question 1: Rate of internationalisation

4.1.1 Number of countries represented

In 1980, scholars from only 13 countries published in the selected journals. In 2008, 48 countries were represented. Figure 3 shows the number of countries for the complete journal set and for each journal. In general, IP&M, JASIST, and *Scientometrics* had a larger number of countries represented. Overall, the best fit line showed an increasing number of countries represented in the seven journals.

臺灣大學學術期刊資料庫

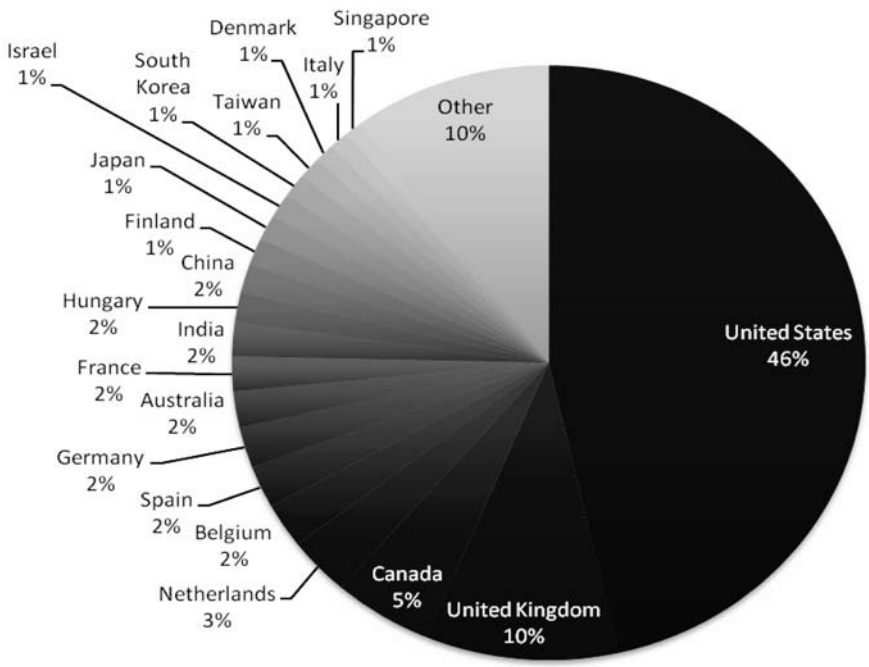


Figure 1. Countries' share of LIS publications

4.1.2. Distribution of authors' geographic affiliations: Gini coefficient

This study found that journal papers came from an increasing number of countries. Nevertheless, the distribution of journal authorship may still be quite uneven. The Gini coefficients indicated that in 1980, the coefficient was 0.96. In 2008, the coefficient reduced to 0.81. The longitudinal data showed a small downward slope, indicating a general trend of decreasing inequality over the years (Figure 4). Worth highlighting is the fact that the drop in unevenness has been more notable since 1997, compared to the rate in the 1980s and the early 1990s. That is, the rate of diversification in authors' countries grew faster after 1997 than during the pre-Internet age. This finding lends support to the idea that LIS authorship is more internationalised in the digital age than before in terms of geographic distribution of authorship. However, it should be emphasised that the degree of concentration was still high (Gini coef. = 0.81, where 1 represents complete inequality).

4.2. Research question 2: Collaboration pattern

For the period of 1980 to 2008, 9.6% of the papers in the dataset involved international

臺灣大學學術期刊資料庫

Table 1. Top-ten contributing countries in five-year intervals

1980-1984			1985-1989			1990-1994		
Country	Paper count	Share of papers	Country	Paper count	Share of papers	Country	Paper count	Share of papers
United States	521	59.6%	United States	420	55.2%	United States	701	54.4%
United Kingdom	133	15.2%	United Kingdom	82	10.8%	United Kingdom	125	9.7%
Canada	47	5.4%	Canada	60	7.9%	Canada	89	6.9%
Hungary	21	2.4%	Hungary	28	3.7%	Germany	61	4.7%
Israel	17	1.9%	Netherlands	26	3.4%	Netherlands	47	3.6%
Poland	16	1.8%	Russia	19	2.5%	France	41	3.2%
Netherlands	15	1.7%	**India**	18	2.4%	Belgium	37	2.9%
Germany	14	1.6%	France	16	2.1%	**India**	29	2.2%
India	14	1.6%	Belgium	14	1.8%	Hungary	26	2.0%
Japan	14	1.6%	**Israel**	11	1.4%	Australia	24	1.9%

1995-1999			2000-2004			2005-2008 (4 years)		
Country	Paper count	Share of papers	Country	Paper count	Share of papers	Country	Paper count	Share of papers
United States	905	60.3%	United States	960	46.8%	United States	713	42.9%
United Kingdom	123	8.2%	United Kingdom	238	11.6%	United Kingdom	194	11.7%
Canada	71	4.7%	Canada	103	5.0%	Canada	89	5.4%
India	42	2.8%	Belgium	80	3.9%	Spain	89	5.4%
Netherlands	41	2.7%	Netherlands	80	3.9%	Netherlands	79	4.8%
France	39	2.6%	Spain	69	3.4%	**China**	69	4.1%
Germany	34	2.3%	Australia	55	2.7%	Belgium	64	3.8%
Australia	31	2.1%	**South Korea**	51	2.5%	Australia	55	3.3%
Spain	27	1.8%	Denmark	46	2.2%	**Taiwan**	49	2.9%
Belgium	25	1.7%	Finland	46	2.2%	**Singapore**	44	2.6%

臺灣大學學術期刊資料庫

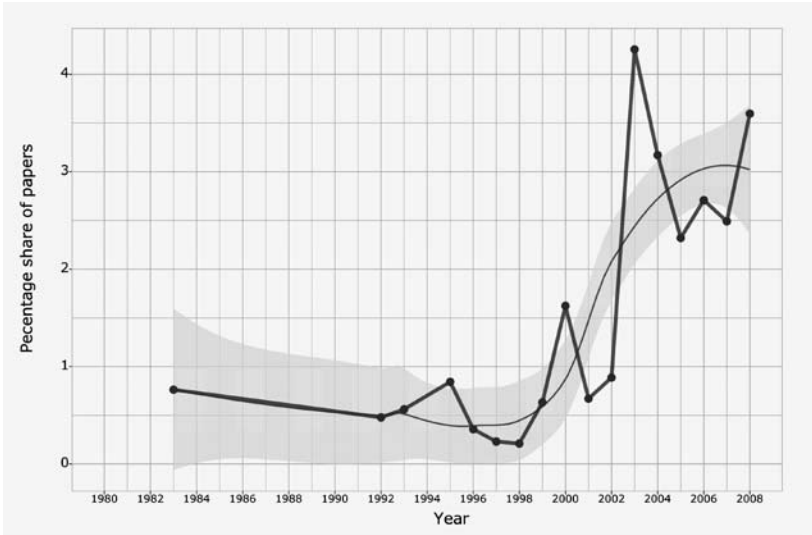


Figure 2. Percentage shares of papers from Taiwan

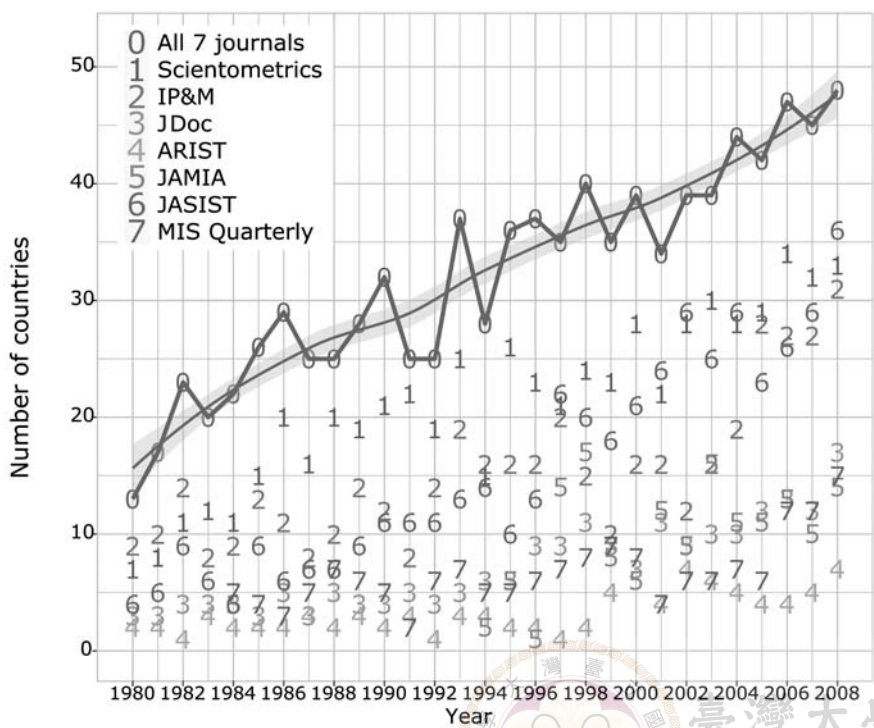


Figure 3. Number of countries represented

臺灣大學學術期刊資料庫

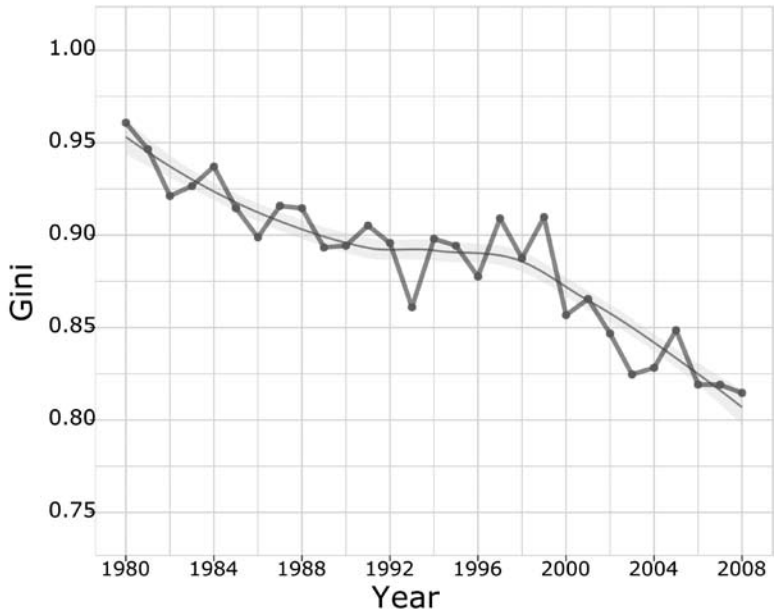


Figure 4. Longitudinal changes in Gini coefficient of geographic distribution of authors

collaboration. Another 53% involved domestic collaboration (i.e., collaborations among authors from the same country). The remaining 37.4% were single-authored papers. Figure 5 shows the longitudinal change in collaboration patterns. Single-authored papers used to dominate the authorship patterns. In 1980, the share of papers for each category were 60.9%, single-authored; 37.8%, domestic collaboration; and 1.5%, international collaboration. In 1995, domestic collaboration accounted for 52% of all papers published that year. Since then, domestic collaboration has become the most common category. International collaboration remained the least common category over the years. A rising trend in international collaboration can be observed, however. In 2008, the share for single-authored papers, domestic collaboration and international collaboration were 24.1%, 58.9% and 17%, respectively.

This study also examined collaboration patterns for papers from Asia (Figure 6). The patterns were more varied than those examined in Figure 5. It can still be observed that in 1997, domestic collaboration took over as the major type of authorship pattern. Since 2005, international collaboration has become the second-most common category for Asian nations. In 2008, the share of Asian nations' single-authored papers, domestic collaboration and international collaboration were 14.6%, 48.8% and 36.6%, respectively. This differed

臺灣大學學術期刊資料庫

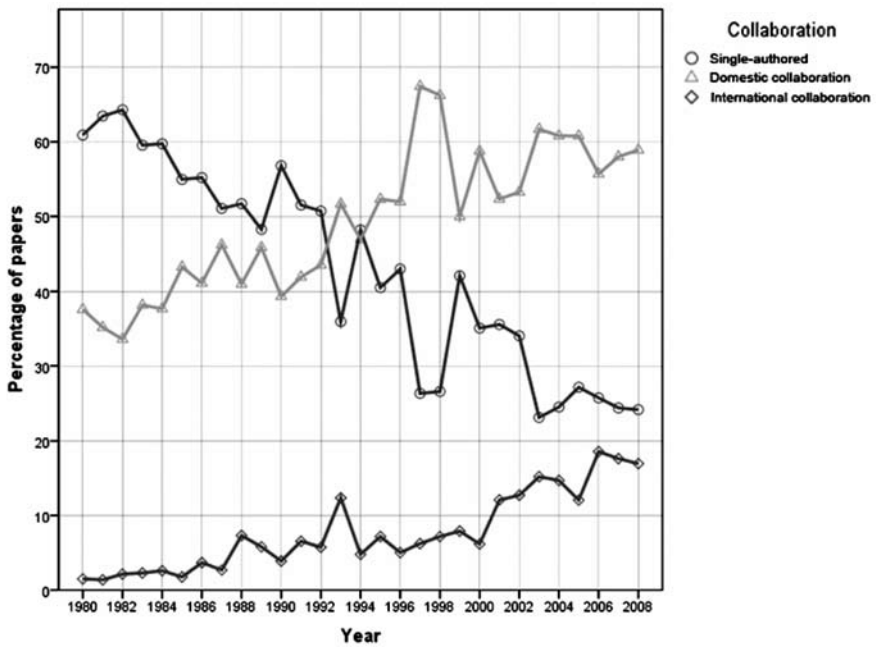


Figure 5. Collaboration types

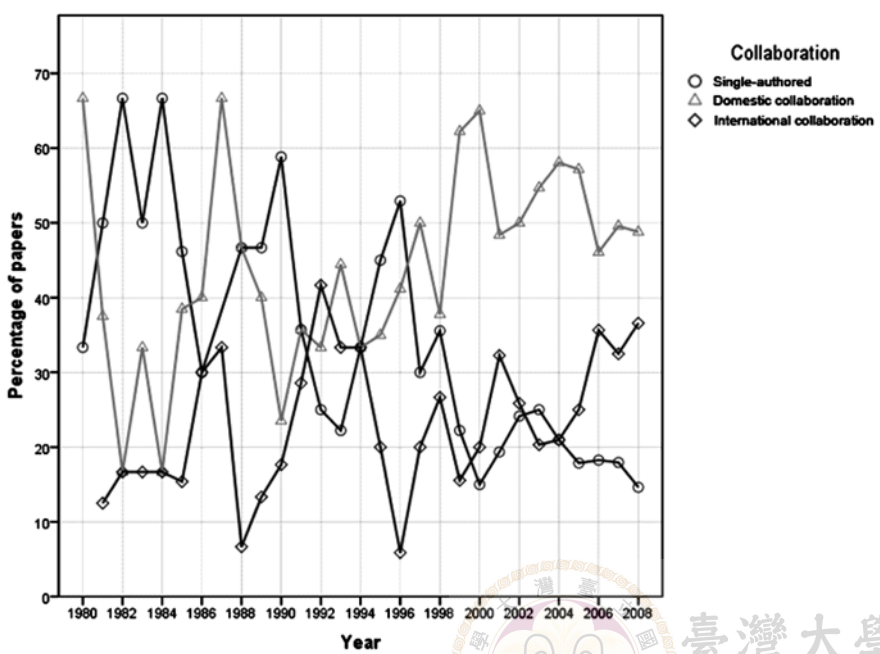


Figure 6. Collaboration types among Asian nations

臺灣大學學術期刊資料庫

from the pattern for all nations discussed above.

4.3. Research question 3: Factors related to citation impact

Logistic regression was used to test the data. Before the analysis, a multicollinearity test was performed using the SPSS *Collinearity Diagnostics* function. Multicollinearity occurs when two or more independent variables are highly correlated. A rule of thumb is that a *tolerance* value of less than .20 might indicate multicollinearity (Menard, 2002). The diagnostics result showed that all five variables in this study have tolerance values above the recommended level. Thus, all five variables were included in the logistic regression. The result was significant (χ= 2028.75, *df*=39, p<.000). For this analysis, the *Nagelkerke* R^2 was .268. That is, the five variables explained 26.8% of the variations in the outcome variable (i.e., an article being 'less cited' or 'more cited'). The lower R^2 reflects the complexity in citation behaviours as discussed above. It may, in part, be related to the use of aggregated geographical level. It is hypothesised that more detailed breakdowns of variables (e.g., using authors' countries instead of continents) will contribute to a higher R^2. Studies interested in modelling citation counts would need variables beyond those examined here in order to account for the unexplained variance.

In addition to the overall model, each of the five variables was found to be significant (Table 2). This study was especially interested in how continent, country income, and collaboration categories related to citation impact. The *odds ratio* can be used to evaluate how each variable (and each level within the variable) affects the direction and magnitude of the changes in the outcome variable. An odds ratio higher than one suggests that a paper with that characteristic is more likely to be 'more cited' than that of the reference group.

The logistic analysis showed that other factors being constant, papers authored by scholars in Asia or Europe were less likely to be in the 'more cited' category, when compared to the reference group (i.e., papers authored by scholars in North America). The odds were lower for papers by Asian-based authors (0.57 times the possibility of papers by North American authors to be 'more cited'). The odds of papers by European-based authors to be 'more cited' were 0.75 times of that of papers from North America. In terms of country income level category, articles from both *lower middle income* countries (odds ratio = 0.53) and *upper middle income* countries (odds ratio = 0.47) were less likely than those from the *high income* group to be 'more cited'.

Collaboration type was also found to be significant. Compared to single-authored papers,

臺灣大學學術期刊資料庫

Table 2. Logistic Regression Analysis Results: Factors Related to Citation Impact

	B	S.E.	Wald	df	Sig.		Odds ratio
Continent			**50.25**	**5**	**0.000**	*	
○ Africa	-0.51	0.38	1.82	1	0.177		0.60
○ Asia	-0.56	0.10	33.92	1	0.000	*	0.57
○ Central and South America	-0.13	0.26	0.26	1	0.609		0.88
○ Europe	-0.28	0.05	27.33	1	0.000	*	0.75
○ Oceania	-0.05	0.16	0.10	1	0.755		0.95
○ North America (reference group)							
Country income group category			**36.66**	**3**	**0.000**	*	
○ Low income	-0.30	0.52	0.34	1	0.560		0.74
○ Lower middle income	-0.63	0.15	17.03	1	0.000	*	0.53
○ Upper middle income	-0.76	0.15	23.87	1	0.000	*	0.47
○ High income (reference group)							
Collaboration type			**41.87**	**2**	**0.000**	*	
○ International collaboration	0.52	0.08	40.07	1	0.000	*	1.68
○ Domestic collaboration	0.16	0.06	6.26	1	0.012	*	1.17
○ Single-authored (reference group)							
Publication Year			**883.03**	**28**	**0.000**	*	
Number of authors	**0.04**	**0.02**	**6.78**	**1**	**0.009**	*	**1.05**
Constant	-4.76	0.38	153.30	1	0.000		0.01

*$p < 0.01$

papers involving international collaboration had higher odds of being 'more cited' (1.68 times of that of single-authored papers). Papers involving domestic collaboration also had higher odds than that of single-authored papers to be 'more cited' (1.17 times of the latter). As noted before, the number of authors and publication year were taken into account and tested. Both factors were significant. A higher number of authors contributed to higher odds of a paper being 'more cited' (odds ratio = 1.05). As hypothesised, papers published recently were less likely than earlier papers to be in the 'more cited' category (Note 1).

5. Discussion

The above analysis indicates that, over the years, there has been an increase

臺灣大學學術期刊資料庫

in the internationalisation level of the seven journals. While the authorship distribution remained quite uneven in 2008, the degree of concentration has been on the decline. The findings agree with Sin's (2005) analysis of 20 LIS journals published from 1980 to 2003. For the current analysis, the rates of diversification in terms of authors' geographic affiliations were higher in recent years than those in the 1980s and early 1990s. This can be seen as a positive development. Nevertheless, it is uncertain whether this higher rate of diversification will carry on or not. Continuous longitudinal analysis is needed to chart the changing internationalisation level. In terms of Asia, there has been an increasing presence of research in the top seven journals from Asian nations, such as Taiwan. The rise in their share of publication is notable, especially during the last 10 years.

Together with the increase in number of contributing nations in the seven LIS journals are the increases in both domestic and international collaboration. The rise in collaboration in other disciplines has been noted (Glanzel, 2002). The current findings indicate a similar trend for the LIS journals sampled in this study. This analysis provides extra insight that domestic collaboration, rather than single-authored paper, is now the dominant authorship type. While international collaboration is still the least common category, it exhibits a rising trend. This trend may be encouraged by two factors: 1) improvements in ICTs that facilitate international communication and 2) government and institutional policies that favour international collaboration. It is hypothesised that such international collaboration will continue to rise. Although based on the data, it is not likely that international collaboration will overtake domestic collaboration as the dominant category for quite some time to come. This is in part due to large nations such as the United States having ample opportunities for collaboration within the same country. The longitudinal trends for Asian countries show that the difference between domestic collaboration and international collaboration has narrowed since 2006 (48.8% for the former, 36.6% for the latter in 2008). It will be interesting to see whether international collaboration will become the dominant category for this journal set in the near future. Research on the influences of institutional policies on scholarly collaboration types should also be encouraged.

The above discussion is based on a longitudinal analysis of seven top journals. Findings from this exploratory study are not intended for generalisation to all LIS journals. To test if similar patterns exist, further research may conduct a similar analysis using a larger set of journals. The current study found notable longitudinal trends. It has also

臺灣大學圖書館 期刊資料庫

demonstrated statistically significant relations between authors' geographical affiliations, collaboration types and citation impact for this sample dataset. This study provides evidence that the current research topic is worth further exploring. Further statistical analysis may consider categorising authors' nations into sub-regions (e.g., East Asia, Western Europe), or conduct analysis at the country level, to allow a finer distinction of different country effects.

The findings on citation impact are particularly worth examining. The findings suggest that international collaboration can be a good publication strategy for all authors. There have been more opportunities for authors outside of North America to publish in top journals and to collaborate domestically and internationally. Even so, ceteris paribus, the citation impact of their publications still seems less favourable. This analysis found that articles from lower income countries were more likely to be 'less cited' than those from higher income nations. It is especially worth highlighting that an author's continent also made a difference, even after other factors including the country's income level was taken into account. Articles including Asian or European authors were more likely to be 'less cited' than those from North American authors.

Given that articles from lower-income or non-North American countries tend to be less-frequently cited, from a practical angle it might be especially valuable for authors from these countries to collaborate internationally. This is because it is difficult for an author to change his or her continent and country income level variable unless the scholar were to relocate. To counter these locational effects, scholars may seek to increase the number of authors through domestic or international collaboration, which is related to higher chances of being more frequently cited. Among the three collaboration types, international collaboration creates the highest likelihood of more frequent citation. This may help partially counter the lower likelihood of citation related to author continents and income level. Further study is needed to investigate the tangible and intangible costs of collaboration facing scholars in different regions. Monetary and logistics support from governments and funders may be encouraged to facilitate both domestic and international collaboration. In addition to practical implications, however, the reasons behind such differential citation impacts require more exploration.

6. Conclusion

The study found an increase in internationalisation in the seven selected top LIS journals during the 1980–2008 period.

臺灣大學圖書館 期刊資料庫

The increasing representation of authors from different nations is worth applauding. The different relations between an author's continent and country income level on citation counts, on the other hand, are intriguing. From a practical perspective, for authors in most nations, more collaboration (especially international ones) may be encouraged as a mean to increase the visibility and impact of one's research. At the same time, there is much needed to uncover the causes behind this varying citation impact. Because of the rigorous peer-review systems of top journals, one can assume that the quality of papers published in these journals is at a similar level, no matter which nation an author is based in.

Cole and Cole (1973, p. 243) found that when comparing works of roughly equivalent quality, researchers could be influenced by factors other than the substantive content of the work itself. Authors employed in prestigious departments or institutes are more likely to have their publication respected. Other than possible perceptual differences as suggested by Cole & Cole, there are other factors that the author of this paper proposes investigating, including invisible colleges and the geographical focus of a study.

A scholar's formal and informal social network may make a difference in an article's citation impact. It is hypothesised that scholars in established countries or academic institutions have a more extensive social network that has been built over a long time, when compared to that of authors residing in emerging nations. A larger social network or the accessibility to more research communication channels (e.g., conferences, workshops) may contribute to higher visibility and subsequently more citations of one's articles. Social networks may also shed light on the different impact levels of domestic vs. international collaboration. For domestic collaboration, authors in the same country may share similar and overlapping social networks. In the case of international collaborations, authors from different nations may be able to tap into varying social networks that have less overlap. That is, a paper may be introduced to a wider range and number of individuals, when compared to the case of domestic collaboration. Further analysis is needed to test this hypothesis. Future research may use a social network framework such as 'strengths of weak ties' to analyse the differential impacts of domestic vs. international collaboration.

The geographical scope of a study may partly contribute to the odds of non-North American articles being 'less cited.' It is hypothesised that some of these papers focus on a population sample or environment of a more specific geographical region. In social sciences and in some LIS subfields (such as information behaviour), it is recognised that

臺灣博碩士學位論文 期刊資料庫

contextual factors are important. To scholars in different geographic, economic, and social environments, a specific geographic focus may limit the perceived relevance of a study. Wormell (1998) found, for example, an article was often cited by scholars from the same region. North American authors make up a large percentage of scholars publishing in LIS journals indexed in SSCI (Sin, 2005). It is possible that papers with a non-North American scope may not be immediately perceived as directly relevant. This may contribute to a lower citation impact of non-North American papers. Geographical scope may also partly explain the higher impact of internationally collaborated papers. International research may involve participants from different countries or include cross-cultural perspectives. This may help increase a study's perceived relevance to a large number of scholars. More analysis is needed to test these tentative hypotheses. Content analysis can be used to identify a paper's geographical scope and perspective. Further hypothesis testing can then be conducted. Other factors such as institutional policies, and historical and linguistic differences may also be considered. The goal of such authorship and bibliometrics research is to identify and subsequently overcome barriers in research publication, so as to pave the way for a genuine internationalisation of science.

Notes

Note 1 Because publication year served mainly as a statistical control and not as the focus of this study, to prevent cluttering the table, the odds ratio for each of the 29 years is not listed in Table 2.

References

Akre, O., Barone-Adesi, F., Pettersson, A., Pearce, N., Merletti, F., & Richiardi, L. (2011). Differences in citation rates by country of origin for papers published in top-ranked medical journals: Do they reflect inequalities in access to publication? *Journal of Epidemiology and Community Health, 65*(2), 119-123.

Bottle, R. T., & Efthimiadis, E. N. (1984). Library and information science literature: Authorship and growth patterns. *Journal of Information Science, 9*(3), 107-116.

Borgman, C. L. (1990). Editor's introduction. In C. L. Borgman (Ed.), *Scholarly communication and bibliometrics*. Newbury Park: Sage.

Buttlar, L. (1991). Analyzing the library periodical literature - content and authorship. *College & Research Libraries, 52*(1), 38-53.

Cole, J. R., & Cole, S. (1973). *Social stratifica-*

臺灣大學學術期刊資料庫

tion in science. Chicago: University of Chicago Press.

Cronin, B., & Shaw, D. (1999). Citation, funding acknowledgement and author nationality relationships in four information science journals. *Journal of Documentation, 55*(4), 402-408.

Chua, A. Y. K., & Yang, C. C. (2008). The shift towards multi-disciplinarity in information science. *Journal of the American Society for Information Science and Technology, 59*(13), 2156-2170.

Dore, J. C., Ojasoo, T., Okubo, Y., Durand, T., Dudognon, G., & Miquel, J. F. (1996). Correspondence factor analysis of the publication patterns of 48 countries over the period 1981-1992. *Journal of the American Society for Information Science, 47*(8), 588-602.

Dahdouh-Guebas, F., Ahimbisibwe, J., Van Moll, R., & Koedam, N. (2003). Neo-colonial science by the most industrialised upon the least developed countries in peer-reviewed publishing. *Scientometrics, 56*(3), 329-343.

Dijk, V. (2005). *The deepening divide: Inequality in the information society*. Thousand Oaks: Sage.

Egghe, L., Rousseau, R., & Van Hooydonk, G. (2000). Methods for accrediting publications to authors or countries: Consequences for evaluation studies. *Journal of the American Society for Information Science, 51*(2), 145-157.

Frame, J. D., Narin, F., & Carpenter, M. P. (1977). Distribution of world science. *Social Studies of Science, 7*(4), 501-516.

Frame, J. D., & Carpenter, M. P. (1979). International research collaboration. *Social Studies of Science, 9*(4), 481-497.

Gutierrez, J., & Lopez-Nieva, P. (2001). Are international journals of human geography really international? *Progress in Human Geography, 25*(1), 53-69.

Glanzel, W. (2002). Coauthorship patterns and trends in the sciences (1980-1998): A bibliometric study with implications for database indexing and search strategies. *Library Trends, 50*(3), 461-473.

Harsanyi, M. A. (1993). Multiple authors, multiple problems bibliometrics and the study of scholarly collaboration - a literature-review. *Library & Information Science Research, 15*(4), 325-354.

He, S. Y., & Spink, A. (2002). A comparison of foreign authorship distribution in JASIST and the Journal of Documentation. *Journal of the American Society for Information Science and Technology, 53*(11), 953-959.

Huang, M.-H., & Lin, C.-S. (2010). International collaboration and counting inflation in the assessment of national research pro-

臺灣大學圖書館 期刊資料庫

ductivity. *Proceedings of the 73rd ASIS&T Annual Meeting, 47*.

Katz, J., & Hicks, D. (1997). How much is a collaboration worth? A calibrated bibliometric model. *Scientometrics, 40*(3), 541-554.

Koehler, W. (2001). Information science as "Little science": The implications of a bibliometric analysis of the Journal of the American Society for Information Science. *Scientometrics, 51*(1), 117-132.

Lipetz, B. A. (1999). Aspects of JASIS authorship through five decades. *Journal of the American Society for Information Science, 50*(11), 994-1003.

Liang, L. M., Feng, Y., & Wu, Y. S. (2000). Shifts in the world science centre: Space-time characteristics and disciplinary analysis. *Interdisciplinary Science Reviews, 25*(3), 227-232.

Levitt, J. M., & Thelwall, M. (2009). Citation levels and collaboration within library and information science. *Journal of the American Society for Information Science and Technology, 60*(3), 434-442.

Menard, S. W. (2002). *Applied logistic regression analysis* (2nd ed.). Thousand Oaks: Sage.

Moed, H. F. (2005). *Citation analysis in research evaluation*. Dordrecht: Springer.

Mukherjee, B. (2010). Assessing Asian scholarly research in library and information science: A quantitative view as reflected in Web of Knowledge. *The Journal of Academic Librarianship, 36*(1), 90–101.

Nisonger, T. E. (2005). The perception of library and information science journals by LIS education deans and ARL library directors: A replication of the Kohl-Davis study. *College and Research Libraries, 66*(4), 341-377.

Pritchard, A. (1969). Statistical bibliography or bibliometrics? *Journal of Documentation, 25*(4), 348-349.

Price, D. J. de Solla. (1986). *Little Science, Big Science – and Beyond*. New York: Columbia University Press.

Persson, O. (2010). Are highly cited papers more international? *Scientometrics, 83*(2), 397-401.

Rey-Rocha, J., & Martin-Sempere, M. J. (2004). Patterns of the foreign contributions in some domestic vs. international journals on Earth Sciences. *Scientometrics, 59*(1), 95-115.

Seglen, P. O. (1992). The skewness of science. *Journal of the American Society for Information Science, 43*(9), 628-638.

Sawyer, S., & Eschenfelder, K. R. (2002). Social informatics: Perspectives, examples, and trends. *Annual Review of Information Science and Technology, 36*,

臺灣大學圖書館 期刊資料庫

427-465.

Sin, S.-C. J. (2005). Are library and information science journals becoming more internationalized? A longitudinal study of authors' geographical affiliations in 20 lis journals from 1981 to 2003. *Proceedings of the American Society for Information Science and Technology, 42*.

Uzun, A. (2002). Library and information science research in developing countries and Eastern European countries: A brief bibliometric perspective. *International Information & Library Review, 34*(1), 21-33.

Uzun, A. (2004). Assessing internationality of scholarly journals through foreign authorship patterns: The case of major journals in information science, and scientometrics. *Scientometrics, 61*(3), 457-465.

Wormell, I. (1998). Informetric analysis of the international impact of scientific journals: How 'international' are the international journals? *Journal of Documentation, 54*(5), 584-605.

Wagner, C. S., & Leydesdorff, L. (2005). Network structure, self-organization, and the growth of international collaboration in science. *Research Policy, 34*(10), 1608-1618.

World Bank. (2010). How we classify countries. Retrieved Sept 27, 2010, from http://data.worldbank.org/about/country-classifications

Zitt, M., & Bassecoulard, E. (1998). Internationalization of scientific journals: A measurement based on publication and citation scope. *Scientometrics, 41*(1-2), 255-271.

Zitt, M., Perrot, F., & Barre, R. (1998). The transition from "National" to "Transnational"Model and related measures of countries' performance. *Journal of the American Society for Information Science, 49*(1), 30-42.

(Received: 2010/10/19; Accepted: 2011/2/14)

臺灣大學學術期刊資料庫

臺灣大學學術
期刊資料庫