Publication and citation patterns of Korean LIS research by subject areas

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ABSTRACT

Many researchers have suggested careful application of bibliometric indicators to research evaluation because of many factors including disciplinary norms that influence the publication and citation behaviors of researchers. Although some researchers have examined different bibliometric patterns across disciplines, relatively few scholars have focused on whether research performance should be evaluated in a uniform manner across research domains within a single discipline, especially in a multi-disciplinary fields such as library and information science (LIS). In order to ascertain whether such subject-specific differences exist in the LIS field, we conducted a bibliometric study that examined the publication and citation patterns across subject areas of LIS research in Korea. The analysis of our study data, which consisted of 6,838 citations to 1,986 domestic papers published between 2001 and 2010 by 163 LIS faculty members in Korea, revealed some evidence of bibliometric pattern differences across subject areas. In particular, we found that the authors in Bibliographic Studies, who were almost twice as productive as authors in other subject areas, received the lowest citation counts, which might be attributed to their different publishing and citing behaviors. Publication and citation patterns across subject areas of LIS papers and observation of the possible effect of sub-disciplinary culture on citing behaviors suggest the need for subject-specific assessment of multidisciplinary research discipline such as LIS. In future studies, we will investigate different publication and citation behaviors of authors by subject areas.

Keywords: Bibliometrics, publication count, citation count, Library and Information Science, subject area, South Korea

INTRODUCTION

Evaluation of faculty research in universities is one of the key elements in faculty recruitment, promotion and tenure, funding allocations, and award determinations (Abbasi, Altman, and Hwang 2010; De Bellis 2009). Two most widely used methods for evaluating faculty research are peer review and bibliometrics. Peer review, which is the qualitative evaluation of research by peers with expert knowledge of the field, has been the dominant method for faculty research evaluation (Brinn, Jones, and Pendlebury 2000). However, shortcomings of peer review, such as reviewer bias, inconsistency, and high resource intensity, gave rise to bibliometrics, which is a quantitative approach to research evaluation based on the analysis of publication statistics (De Bellis 2009).

Bibliometrics, defined by Pritchard (1969, p. 349) as "the application of mathematics and statistical methods to books and other media of communication," rely on publication and citation data to analyze scholarly communication (Borgman 1990). Counting the number of publications is still the simplest and most common way to quantify research productivity, whereas citation indicators, such as citation count, impact factor, *h*-index, *g*-index, have often been used to assess the quality and impact of research (Cronin and Meho 2006; Osareh 1996; Smith 1981). In particular, many studies have demonstrated the validity of citation counts as an effective research performance measure, as they found statistically significant positive correlation between the citations and peer review ratings in disciplines such as physics, chemistry, mathematics, and library and information science (LIS) (Cronin 2005; Korevaar and Moed 1996; Li, et al. 2010; Norris and Oppenheim 2010; Rinia, van Leeuwen, van Vuren, and van Raan 1998; van Raan 2006).

At the same time, however, some researchers have pointed out the limitations of bibliometrics as a domain-specific measure, which is not optimal for comparing research performances across disciplines having different academic practices (Cronin 2005; Bornmann and Daniel 2008). In a similar context, an inter and multi-disciplinary field such as LIS (Saracevic 1999; Cronin and Meho 2008), which consists of researchers having diverse backgrounds (e.g., computer science, business and management, engineering, education, and arts and humanities) and research interests (Wu et al. 2012), may possess differences in publication and citation patterns across subject areas. Nevertheless, many researchers have examined publication and citation counts in LIS as a whole (Li et al. 2010; Norris and Oppenheim 2010), rather than looking into their potential differences by subject areas. In the current study, therefore, we conducted a bibliometric study that compared the publication and citation patterns across subject areas of LIS research in Korea. Specifically, we investigated the following research questions:

a) Which subject areas of LIS were productive (i.e., publication count) and influential (i.e., citation count) in South Korea?
b) Are there any differences in the publication and citation patterns across LIS subject areas in South Korea?

LITERATURE REVIEW

Evaluative Bibliometric Studies in LIS

Despite the conflicting findings regarding the validity of bibliometric measures for assessing research outcome, bibliometrics has remained popular among LIS researchers in evaluating scholarly work. For example, Budd and Seavey (1996) evaluated LIS research in the United States by counting publications and citations and found no significant difference in publication counts across academic faculty ranks, which directly contradicted the finding of an earlier study (Hayes 1983). In addition, Adkins and Budd (2006) attempted to measure the research effectiveness of faculty by examining their publications based on the assumption that faculty who published more are cited more, therefore more effective than faculty with fewer publications and citations. Their study, which used publication and citation data from Social Science Citation Index (SSCI) years 1999 to 2004 to rank the 20 most productive faculty members and programs, found a statistically significant difference in publication and citation counts by faculty rank.

Cronin and Meho (2006), found a positive relationship between citation count and *h*-index rankings of 31 influential information science faculty members. They interpreted the discrepancies between citation counts and *h*-indices in some cases as a discriminatory

power of *h*-index and concluded that *h*-index could complement the citation count in measuring research impact.

Davarpanah and Aslekia (2008) conducted a descriptive study that examined publication counts by language, subject, institution, authorship, citation counts by self-citation and publication year of 894 articles published in 56 SSCI-indexed LIS journals between 2000 and 2004.The study revealed the top nations of LIS journal publishing to be the United States and United Kingdom, the most popular LIS topic to be communication and information technology, and that about a half of the authors in LIS cited their previous works while publishing their work as sole authors.

More recently, Walters and Wider (2015) analyzed the contributions of institutions, disciplines, and countries to LIS research based on the papers published in 31 LIS journals from 2007 to 2012. After categorizing authors into the nine groups (*Librarian*, *LIS*, *Computer Science*, *Management*, *Communication*, *Other Social Sciences*, *Natural Sciences*, *Other Fields*, *Non-Academic*) and journals into the six types (*LIS Core*, *Practice-oriented*, *Information Processing & Management*, *Management-oriented*, *Informetrics*, *other*), Walters and Wider cross-tabulated papers by author and journal categories and then ranked the disciplines, countries, and departments using the publication count.

For LIS research in Korea, Yang and Lee (2012) conducted a bibliometric study that analyzed 2,401 publications from LIS faculties in Korea. The authors examined the research productivity of LIS schools in Korea based on various facets of publication data and found an increasing trend of collaboration, publications, and internationalization in the LIS field in Korea. In a follow-up study, Yang and Lee (2013) compared the LIS faculty rankings by publications, citations, *h*-index, and g-index and found that while publication counts correlate with citation counts for productive authors, no correlation was found between publication and citation counts of authors with the small number of publications.

To sum up, many researchers have tended to measure the quantity and quality of LIS research without consideration of the different research norms or patterns across LIS sub-disciplines. Even though Davarpanah and Aslekia (2008) categorized subjects of the LIS papers analyzed in their study, they focused solely on the distributions of the publications by subjects, rather than looking into the potential impact of subject matter on citation patterns in LIS research, which is known as an inter- and multi-disciplinary field of study as mentioned above (Saracevic 1999; Cronin and Meho 2008). Our research is motivated by the question of whether research performance should be evaluated in a uniform manner across research domains, especially for multi-disciplinary fields such as LIS.

Bibliometric Patterns across Disciplines/Sub-disciplines

Scholars have examined the citations by research areas and found marked differences in citation counts across research areas. Brooks (1985), who reported different citation practices across disciplines, suggested that researchers in humanities tended to cite papers to persuade their arguments to others, while in science, the main reason for citing papers was to demonstrate currency. Vieira and Gomes (2010), who examined 226,166 journal articles published in 2004, reported different citation rates across disciplines of biology & biochemistry, chemistry, mathematics, and physics. In their study, the average citation count of biology &biochemistry was the highest (13.59), while mathematics had the lowest average citation count (3.22). Slyder et al. (2011) also observed a difference in the average citation counts between forestry and geography. In reaction to these study findings that highlighted the variations in citation patterns across disciplines, some scholars proposed

the concept of relative citation indicators that can normalize the different citation practices in various disciplines (Radicchi, Fortunato and Castellano 2008; Castellano and Raddicchi 2009).

Some authors reported different bibliometric patterns across subject areas in LIS, for example, Blessinger and Hrycaj (2010) analyzed characteristics of 32 highly cited articles published in 10 influential LIS journals between 1968 and 2000. As part of their analyses, they checked the subject distribution of 32 articles by assigning them into five categories (*Library Operations*, *Library/Information Science Profession*, *Publishing/Publishing Studies*, *Research in Librarianship/Users*, *Technology*) and found that the majority (68%) of the articles under examination belonged to research in *Librarianship/Users*, while a relatively smaller number of them were regarding practical topics such as *Library Operation* (8%) and *Library/Information Profession*(2%). The authors inferred the causes of difference in subject distribution as: (i) different citation activity across subject areas; (ii) existence of groundbreaking papers in certain areas; and (iii) different citability of papers across subject areas. Furthermore, Lee and Choi (2013) examined whether or not there were significant differences in citation rates by subject areas within Korean LIS. They found that papers addressing bibliographic topics tended to be less cited than those focusing on foundations of LIS, management and administration, library and information services, and information science. In this proposed study, we expanded Lee and Choi's research to investigate subject-specific publication and citation patterns in Korean LIS research as a first step for checking the validity of analyzing LIS research as a whole.

METHODOLOGY

Data Collection

For the study, we updated the dataset from an earlier study that analyzed 2,401 peer-reviewed publications by 159 tenure-track professors from 34 LIS departments in South Korea (Yang and Lee 2012). While Yang and Lee's study used both international and domestic journal papers published by LIS faculty in Korea, this study analyzed only the domestic papers[1] published by the LIS faculty, which consisted of 165 tenure-track professors as of May 2013[2]. International papers were excluded in order to filter out a typical citation patterns as well as to facilitate the subject classification of papers[3]. The bibliographic data for new faculty members were gathered from the Korea Citation Index (KCI: http://www.kci.go.kr) managed by National Research Foundation (NRF) of Korea. The citation data for all faculty members were updated using the KCI database, which has the largest coverage of citation data for academic papers in South Korea. If bibliographic data were unavailable from the KCI, we used other data sources: (i) NAVER Academic Service (academic.naver.com), a scholarly publication search engine that provides academic services including citation information[4], and (ii) Google Scholar (scholar.google.com), which provides citation information for the limited number of Korean journal articles. After

[1]It refers to the papers published in Korean journals by the authors affiliated with Korean universities.

[2]In the updated dataset, the number of faculty members increased from 159 to 165 due to 17 new faculty hires and 11 faculty retirements.

[3]A prior study by Lee and Yang (2011) found different publication and citation patterns between domestic and international papers authored by Korean LIS faculty members.

[4]NAVER Academic Service (NAS) is a component of NAVER, which is the most popular search engine in Korea. Although the NAS coverage of citation data is smaller than that of KCI, NAS contains data not indexed by KCI.

comparing citation counts from NAVER and Google Scholar, we chose greater counts among the two services. As a result, the number of unique papers, excluding the duplications created by collaborations among faculty members, was 1,986, and the total number of citations to the papers was6, 838 as of Dec. 2015.

Data Coding

After collecting the domestic publication data from Korean LIS faculty for the past decade (2001–2010), two of the authors with backgrounds in Korean LIS literature analyzed the article titles to manually assign subject categories to 1,986 publications. From the subject classification schemes for LIS research, which have been proposed by researchers (e.g., Jarvelin and Vakkari 1990; Oh 2005; Park and Song 2013)and institutions (e.g., ALISE's LIS Research Areas Classification Scheme), we chose Park and Song's (2013) classification scheme, which is an extended version of Oh's (2005) scheme, because it is customized for Korean LIS research. Park and Song's scheme consists of 10 key subject areas: (1) *Foundations of LIS* (e.g., history, research methods, librarianship), (2) *Library Building &Facilities*, (3) *Library Structure* (e.g., library/information policy, library collaboration, resource sharing), (4) *Management and Administration* (e.g., planning, personnel, collection development), (5) *Library &Information Services* (e.g., types of libraries, reading and information literacy, service evaluation), (6) *Information Organization* (e.g., classification, cataloging, representation), (7) *Information Science* (e.g., bibliometrics, information system and retrieval, user studies)(8) *Bibliographic Studies* (e.g., old and rare books), (9) *Publishing* (e.g., print and digital publishing), and (10) *Record Management* (e.g., management of government material).

To increase reliability of subject assignment, the subject coders first engaged in a training session with a sample of 100 items, where they discussed the coding guidelines to adjudicate the discrepancies in coding results. After the training session, the coders individually assigned the subjects to the 1,986 articles by analyzing the titles. The inter-coder reliability was Kappa = 0.813 with $p < .001$, achieving the "almost perfectly agreed" reliability based on the rule of thumb by Landis and Koch (1977). Disagreements in the subject classification were resolved through discussions and the reconciled result was used for the data analysis.

Data Analysis

The publication, citation, and author counts were examined by year to identify the overall trend of KLIS faculty research and by subject areas to discover any subject-specific patterns. In particular, the author count in subject areas, which can reflect popularity of the areas, was used to figure out the average productivity and impact of subject areas. After analyzing citation, publication, and author counts by year and subject area, we cross-mapped the data by year and subject area to ascertain subject-specific trends. A non-parametric (i.e., Kruskal-Wallis H test) statistical analysis was used to check the differences in citation patterns across subject areas. The study data was also examined by two five-year time frames (i.e., 2001–2005 and 2006–2010) so as to better understand the changing patterns of research.

FINDINGS

Publication, Citation, and Author Counts by Year

To get a general overview of Korean LIS research for the study period of 2001 to 2010, we first examined the numbers of publications, citations, and authors (Table 1). Overall, 176

faculty members produced 2,351 unique papers during the study period of 10 years, which were cited 9,922 times. When the study data was restricted to domestic journal articles published by active faculty members for the purpose of subject-specific analysis, counts were reduced to 6,838 citations of 1,986 domestic papers published by 163 authors[5].

Figure 1, which plots the numbers of publications, citations, and authors (i.e., number of faculty members who had authored or co-authored at least one paper) by year, displays temporal changes in productivity, impact, and popularity of domestic KLIS research. At first glance, the number of publications and the number of authors, each with a generally increasing pattern, suggest an increasing trend in research productivity and popularity, while the number of citations with a spike in 2007 suggests a research impact pattern incongruent with productivity. Such incongruity between research productivity and impact may be attributed to the citation lag and the incomplete status of data source at the time of data collection.

Table 1: Publication, citation, and author counts by year

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Total
pcnt[1]	127	149	158	193	196	199	216	234	269	245	1986
ccnt[2]	557	439	453	570	774	791	943	892	783	636	6838
aucnt[3]	79	88	90	98	104	99	102	115	114	111	163

[1]pcnt = number of unique publications
[2]ccnt = number of unique citations
[3]aucnt = number of unique authors (i.e., faculty who published)

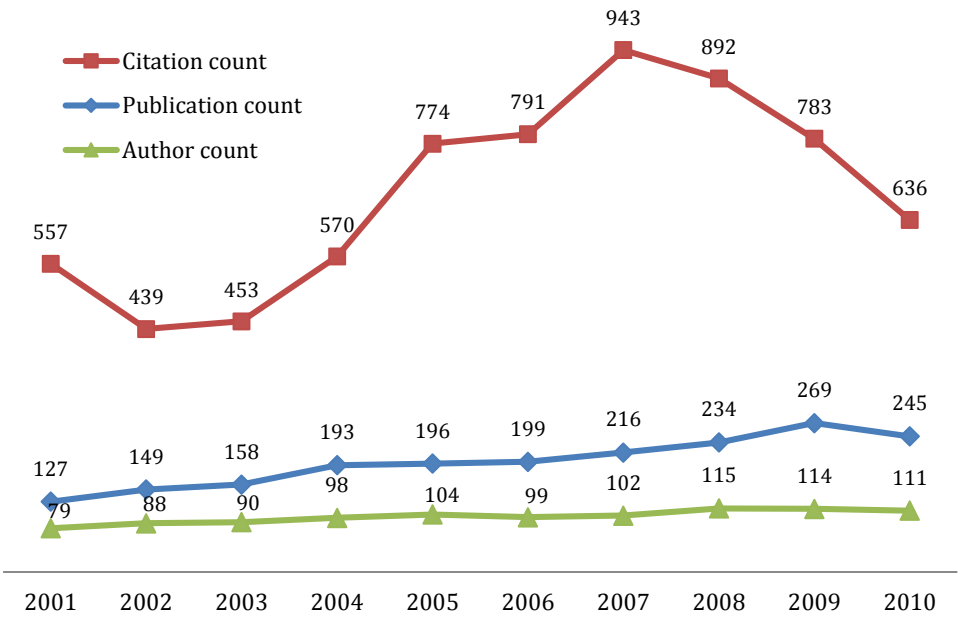

Figure 1: Publication, citation & author counts by year

[5]Two of 165 active faculty members did not publish any articles in domestic journals at the time of data collection.

Author, Publication, and Citation Counts by Subject Areas

*Author Count***.** Based on the number of authors in subject areas (Table2), the most popular subject area appears to be *Information Science*, where a majority of faculty authors (121 out of 163) published at least one paper, followed by *Library & Information Services* (100).

To assess the change in popularity over time, we examined the unique number of authors who published (i.e., *aucnt*) and the average number of *aucnt* per year (i.e., *avg_aucnt*) in 2001-2005 and 2006-2010 (Table 2). According to the *aucnt* differences between the first and second five-year periods, *Library Structure* with 89% (17 authors) increase has the highest gain in popularity. The *avg_aucnt* shows *Library & Information Services* and *Library Structure* doubling the average author counts in the second five years. Though *Publishing* doubled and *Library Building & Facilities* increased its *avg aucnt* count by 67% in the second five years, the actual numbers of *avg_aucnt* increase are too small (0.2 and 1.2) to be meaningful. Unique and average author counts in five-year periods point to the rising popularities of *Management and Administration*, *Library & Information Services*, and *Library Structure* that are distinct from mostly stable popularity patterns of the other subject areas. Such trends reflect the growing interests in the research areas that cover the service and organizational aspects of LIS in Korea.

Table 2: Author statistics by subject areas

Subject	aucnt[1]						avg_aucnt[2]				
Areas	'01-'05	'06-'10	Δ	(%)	∩ (%)[3]	All years	'01-'05	'06-'10	Δ	(%)	All years
BIB	24	24	0	(0%)	21 (78%)	27	15.2	15.6	0.4	(3%)	15.4
FND	47	69	22	(47%)	29 (33%)	87	16.2	21.0	4.8	(30%)	18.6
INS	88	90	2	(2%)	57 (47%)	121	40.2	41.6	1.4	(3%)	40.9
IOR	46	56	10	(22%)	26 (34%)	76	19.2	22.4	3.2	(17%)	20.8
LBD	9	13	4	(44%)	4 (22%)	18	1.8	3.0	1.2	(67%)	2.4
LST	19	36	17	(89%)	5 (10%)	50	5.0	10.8	5.8	(116%)	7.9
LSV	52	82	30	(58%)	34 (34%)	100	16.4	34.4	18.0	(110%)	25.4
MNG	47	64	17	(36%)	28 (34%)	83	16.0	24.0	8.0	(50%)	20.0
PUB	1	1	0	(0%)	0 (0%)	2	0.2	0.4	0.2	(100%)	0.3
RCM	13	24	11	(85%)	6 (19%)	31	6.2	8.2	2.0	(32%)	7.2
Total	141	150	9	(6%)	128 (79%)	163	136.4	181.4	45.0	(33%)	158.9

BIB: Bibliographic Studies
FND: Foundations of LIS
INS: Information Science
IOR: Information Organization
LBD: Library Building & Facilities
LST: Library Structure
LSV: Library & Information Services
MNG: Management and Administration
PUB: Publishing
RCM: Record Management

[1] aucnt = number of unique authors (i.e., faculty who published)
[2] avg_aucnt = average aucnt per year
[3] ∩ = number of unique authors who published in 2001-2005 and 2006-2010 (i.e., overlap)

The overlap column (i.e., column ∩) in Table 2 highlights yet another subject-specific characteristic in authorship. The overlap, computed by subtracting *aucnt* for all years from the sum of 2001-2005 and 2006-2010 *aucnts*, reflects the degree of new authorship, where 0% overlap signifies all new authors and 100% overlap means no new authors in the second five years. *Bibliographic Studies* with 78% overlap may be an evidence of a well-established research area with a core set of authoritative faculty authors or a stagnant research area.

Publication count. Table 3 shows the distribution of publication and author counts by ten subject areas. According to publication counts over the ten-year time period, *Information*

Science has consistently been the most productive subject area, while the second most productive area has changed between several subject areas. In terms of publication count differences between time periods, *Library Structure* (113%), *Library & Information Services* (129%) and *Management and Administration* (67%) show highest increases over time[6], in accordance with the popularity trend of those subject areas shown in the previous section.

For a given subject area, *apr(au)*, which estimates the average productivity of an author with the sum of authors' publication counts divided by the number of authors, can be regarded as a measure of research productivity that takes into consideration the number of faculty authors as well as the number of publications in that subject area.

Table 3: Publication and author counts by subject areas

	pcnt[1]				aucnt[2]	apr(au)[3]				
Subject	'01-'05	'06-'10	Δ	(%)	All years	All years	'01-'05	'06-'10	Δ	(%)	All years	(SD)
BIB	127	157	30	(24%)	284	27	5.29	6.71	1.42	(27%)	10.67	(9.50)
FND	89	119	30	(34%)	208	87	1.98	1.97	-0.01	(0%)	2.63	(2.25)
INS	251	297	46	(18%)	548	121	3.19	3.70	0.51	(16%)	5.07	(5.20)
IOR	118	140	22	(19%)	258	76	2.78	2.84	0.06	(2%)	3.78	(4.51)
LBD	10	17	7	(70%)	27	18	1.33	1.54	0.21	(15%)	1.78	(1.20)
LST	23	49	26	(113%)	72	50	1.37	1.83	0.46	(34%)	1.84	(1.60)
LSV	83	190	107	(129%)	273	100	1.67	2.63	0.96	(57%)	3.03	(2.52)
MNG	87	145	58	(67%)	232	83	1.91	2.67	0.76	(40%)	3.14	(3.34)
PUB	1	2	1	(100%)	3	2	1.00	2.00	1.00	(100%)	1.50	(0.71)
RCM	34	47	13	(38%)	81	31	3.00	2.25	-0.75	(-25%)	3.00	(3.04)
Total	823	1163	340	(41%)	1986	163	6.27	8.79	2.52	(40%)	13.51	(10.58)

BIB: Bibliographic Studies
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LSV: Library & Information Services
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[1] pcnt = number of unique publications
[2] aucnt = number of unique authors (i.e., faculty who published)
[3] apr(au) = average productivity of an author (number of all publications / aucnt)

According to this measure, *Bibliographic Studies* was the most productive area with 10.67 papers per author, followed by *Information Science* (5.07 papers). The marked high standard deviation (SD) of *apr(au)* for *Bibliographic Studies* reflects a large variability in research productivity among authors in that subject area. As a matter of fact, *Bibliographic Studies* in Korea is dominated by a handful of renowned scholars whose productivity far overshadows other researchers in the field. In light of the fact that publication frequency tends to be skewed, quartiles were charted in a box-and-whisker plot to confirm the findings. Figure 2, which displays inter quartile range (box) with minimum and maximum values (whisker), also showed *Bibliographic Studies* with the highest median value and the largest dispersion.

[6] *Library Building & Facilities* increased its publication count by 70% and *Publishing* by 100% in the second five-year period, but the increases were too small in magnitude (7 papers by 4 authors and 1 paper by 1 author) to be considered as subject areas with high increases in productivity or popularity.

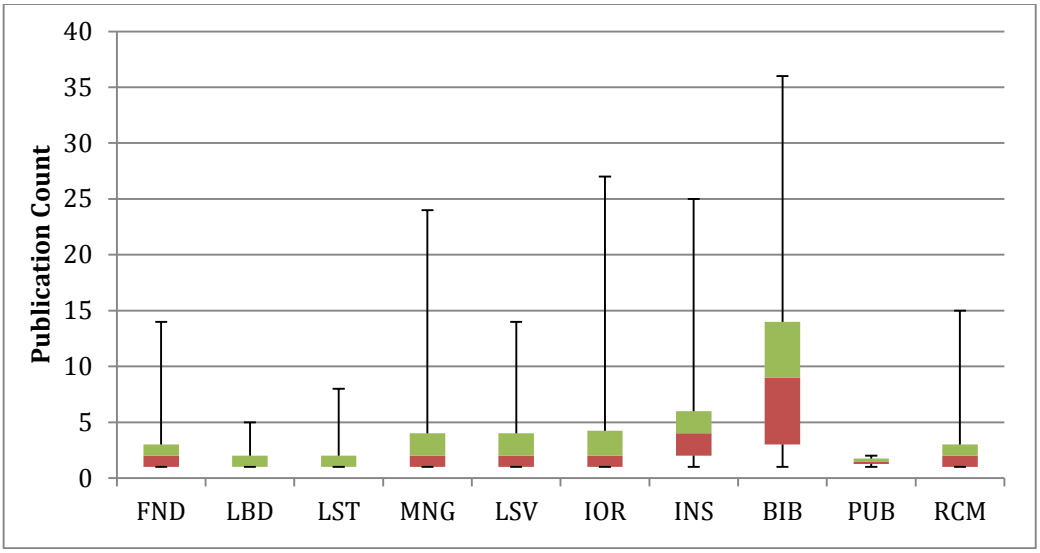

Figure 2. Publication counts by subject areas

Table 4: Subject area rankings by author and publication counts

By Rank	aucnt[1]		pcnt[2]				apr(au)[3]			
	All years	∩%[4]	'01-'05	'06-'10	Δ%	All years	'01-'05	'06-'10	Δ%	All years
1	INS	BIB	INS	INS	LSV	INS	BIB	BIB	PUB	BIB
2	LSV	INS	BIB	LSV	PUB	BIB	INS	INS	LSV	INS
3	FND	IOR	IOR	BIB	LST	LSV	RCM	IOR	MNG	IOR
4	MNG	LSV	FND	MNG	LBD	IOR	IOR	MNG	LST	MNG
5	IOR	MNG	MNG	IOR	MNG	MNG	FND	LSV	BIB	LSV
6	LST	FND	LSV	FND	RCM	FND	MNG	RCM	INS	RCM
7	RCM	RCM	RCM	LST	FND	RCM	LSV	PUB	LBD	FND
8	BIB	LBD	LST	RCM	BIB	LST	LST	FND	IOR	LST
9	LBD	LST	LBD	LBD	IOR	LBD	LBD	LST	FND	LBD
10	PUB	PUB	PUB	PUB	INS	PUB	PUB	LBD	RCM	PUB

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[1] aucnt = number of unique authors (i.e., faculty who published)
[2] pcnt = number of unique publications
[3] apr(au) = average productivity of an author (number of all publications / aucnt)
[4] ∩% = percent of unique authors who published in 2001-2005 and 2006-2010 (i.e., overlap)

Table 4, which lists subject area rankings by various measures, displays several interesting patterns. *Information Science* and *Bibliographic Studies*, ranked at the top by most measures, were clearly the most productive subject areas. They also appear to be the most stable/established subject areas, as evinced by high author overlap (∩%) and small productivity changes over time (Δ%). Where *Information Science* and *Bibliographic Studies* differed was in popularity, as measured by number of authors who published in subject areas (i.e., *aucnt*). In contrast to *Information Science*, which was at the top rank by *aucnt*,

Bibliographic Studies was ranked 8th out of 10 subjects. The fact that BIB still ranked near the top by publication count (i.e., *pcnt*) despite the low author count is a testament to the high productivity of authors in the subject area of *Bibliographic Studies*.

*Citation count***.** In terms of the total citation count of subject areas, *Information Science* (INS) was the most frequently cited area with 2,047 citations (Table 5). The papers on average were cited two to five times with *Record Management* (RCM) and *Foundations of LIS* (FND) at the upper end (4.93 and 4.12) and *Bibliographic Studies* at the lower end (1.95).

In terms of average citation count over the 5-year time period, the majority of subject areas showed increases in average citation count in the second period, which reflects a definitely expanding impact of the subject areas over time. The decreasing citation counts shown in *Library Building & Facilities* (LBD), *Library Structure* (LST), *Library & Information Services* (LSV), and *Management and Administration* (MNG) may indicate the true decline in impact of these subject areas, or it may reflect the effect of longer cited half-life exacerbated by the citation and data lag. In either case, the data shows definite differences in citation patterns across subject areas over time.

Table 5: Numbers of publication and citation counts by subject areas

Subject	Publication count			Citation count			Average citation count		
	'01-'05 (A1)	'06-'10 (A2)	All years	'01-'05 (B1)	'06-'10 (B2)	All years	B1/A1	B2/A2	All years
BIB	127	157	284	238	316	554	1.87	2.01	1.95
FND	89	119	208	337	519	856	3.79	4.36	4.12
INS	251	297	548	896	1151	2047	3.57	3.88	3.74
IOR	118	140	258	294	392	686	2.49	2.80	2.66
LBD	10	17	27	39	61	100	3.90	3.59	3.70
LST	23	49	72	98	155	253	4.26	3.16	3.51
LSV	83	190	273	383	702	1085	4.61	3.69	3.97
MNG	87	145	232	368	480	848	4.23	3.31	3.66
PUB	1	2	3	3	7	10	3.00	3.50	3.33
RCM	34	47	81	137	262	399	4.03	5.57	4.93
Total	823	1163	1986	2793	4045	6838	3.39	3.48	3.44

Interestingly, the two most productive subject areas *Information Science* (INS) and *Bibliographic Studies* (BIB) were ranked low in terms of average impact (Table 6). *Information Science*, despite having the most citations, ranked only 4th in average impact per paper due to the large *pcnt* of 548, which is almost twice the *pcnt* (284) of the second most productive subject area (i.e., *Bibliographic Studies*). *Bibliographic Studies*, which had relatively low citation count to begin with (6th in all time periods), had the smallest average impact of all subject areas.

Low impact scores of *Bibliographic Studies*, along with its high productivity, reflect the characteristics of a subject area with prolific authorship but "narrow" impact patterns. *Bibliographic Studies* research in Korea, which involves enumeration and description of old texts, is a type of field that calls for solitary investigations that are artifact-driven. The field is dominated by a few prominent scholars with largely distinct areas of expertise, whose works are based on diverse sets of artifacts. Consequently, researchers in *Bibliographic Studies*, with a "narrow" pool of prior research to cite from and the penchant for engaging in investigation of new artifacts rather than extending existing work, tend to cite less

frequently than authors in other subject areas. The low number of citations may also reflect the tendency of authors in *Bibliographic studies* to cite more books than journal articles (Lee and Lim 2002).

Table 6: Subject area rankings by publication and citation counts

	pcnt[1]	ccnt[2]			aim(p)[3]		
Rank	All years	'01-'05	'06-'10	All years	'01-'05	'06-'10	All years
1	INS	INS	INS	INS	LSV	RCM	RCM
2	BIB	LSV	LSV	LSV	LST	FND	FND
3	LSV	MNG	FND	FND	MNG	INS	LSV
4	IOR	FND	MNG	MNG	RCM	LSV	INS
5	MNG	IOR	IOR	IOR	LBD	LBD	LBD
6	FND	BIB	BIB	BIB	FND	PUB	MNG
7	RCM	LST	RCM	RCM	INS	MNG	LST
8	LST	RCM	LST	LST	PUB	LST	PUB
9	LBD	LBD	LBD	LBD	IOR	IOR	IOR
10	PUB	PUB	PUB	PUB	BIB	BIB	BIB

[1] pcnt = number of unique publications
[2] ccnt = number of unique citations
[3] aim(p) = average impact of a paper (ccnt/pcnt)

A Kruskal-Wallis H test was conducted to determine if there were differences in citation counts across subject areas. The distribution of citation counts were statistically different between subject areas, $\chi^2(9) = 95.431$, $p < .001$. Post hoc analysis using a Bonferroni correction for multiple comparisons revealed that papers about *Bibliographic Studies* were cited significantly less often than those addressing *Foundations of LIS*, *Library Building & Facilities, Library Structure, Management and Administration, Library & Information Services, Information Organization, Information Science, and Record Management* at $p < .001$. Moreover, papers about *Information Organization* were cited significantly less often than papers related to *Library & Information Services* and *Record Management* at $p < .001$.

DISCUSSION

Regarding the question of which subject areas of LIS were popular (i.e., publication count) and influential (i.e., citation count) in Korea between 2001 and 2010, our study findings showed that the area of *Information Science* was the most popular and influential in terms of the publication and citation counts in the past ten years. The study also found that popularity and impact of subject areas were changing between 2001 and 2010. For example, while there were no notable changes in the popularity (i.e., publication count) of *Information Organization* and *Bibliographic Studies* during the 10-year time window looked at, *Library & Information Services*, *Library Structure*, and *Management and Administration* drew a lot of attention in the recent five years (2006-2010) (Table 3); however, the impact of research as measured by citation counts of the papers published in those areas were shown to have declined, suggesting that increased popularity and/or productivity of research areas do not necessarily guarantee higher research impact.

With respect to the impact of research in subject areas in the past ten years, *Information Science* received the highest citation counts in total. However, research in *Record*

Management received the highest average citation count per publication, followed by *Foundations of LIS, Library & Information Services*, and *Information Science*, which suggests that the overall impact of a subject area may not always coincide with the quality of individual articles in that area. Another noticeable point is that the average citation rate (i.e., citation count per publication) of *Information Organization* and *Bibliographic Studies* remained consistently low across the years, which may reflect the different citation patterns in those research areas. In 2006-2010, *Foundations of LIS* and *Record Management* received relatively more citations than other areas, reflecting the possibility of temporal changes in citation impact of subject areas.

We also found differences in publication and citation rates among subject areas, answering the second research question of whether there are any differences in the publication and citation rates of papers among subject areas. What then are the causes of citation differences in subject areas? According to the normative theory on citing behavior, such differences may reflect the differences in quality or impact of research across subject areas as citations reflect "intellectual or cognitive influence on scientific work" (Bornmann and Daniel 2008, p. 48). However, from the perspective of social constructivists who argue that diverse factors exert influence on citing behavior (Bornmann and Daniel 2008), the citation differences may not be solely caused by quality but influenced by social, political, and economic factors. Furthermore, some other extrinsic factors, such as author-, article-, or journal-level attributes, could be associated with citations (Judge et al. 2007; Peng and Zhu 2012). Therefore, given that we do not have clear understanding of researchers' citing behavior in each subject area, there should be a cautious interpretation of citation differences.

In the evaluative bibliometrics, especially within a single discipline, researchers might be more likely to take the normative approach rather than social constructivist approach. In that regard, the study findings raise the question of whether or not applying the normative approach to evaluate research performances in LIS in Korea is valid. In particular, the study found that the authors in *Bibliographic Studies*, who were almost twice as productive (i.e., publications) as authors in other subject areas, received the lowest citation counts. We posit that the low number of citations to articles does not reflect the quality or impact of research in subject areas with distinctive research scope such as *Bibliographic Studies* as evidenced by a prior study by Lee and Lim (2002), who found the tendency of authors in *Bibliographic Studies* to cite more books than journal articles. In addition, our findings that showed increasing trends in average citation count in six of the ten subject areas and decreasing trends in the rest of areas in the recent five years might not simply be explained by the quality differences. These imply the different citing behaviors of authors across subject areas even within the single discipline, not just across disciplines, which may cause the differences in citation counts across the subject areas of LIS.

LIMITATIONS AND CONCLUSIONS

Since the study used the publication and citation data of LIS faculties in Korea, the findings of the study may not be generalized to LIS in other countries or to other disciplines. Despite the limitations, we have observed the publication and citation trends of LIS papers in Korea for the past decade and found evidences of differences in bibliometric patterns across subject areas that argue against a uniform approach to research evaluation. By examining the publication and citation patterns across subject areas of LIS papers and observing the possible effect of sub-disciplinary culture on citing behaviors, the study

demonstrated the need for subject-specific assessment of multidisciplinary research discipline such as LIS. Subject-specific assessments of research performance, especially in terms of bibliometric analysis, require not only subject-specific rubrics but also an understanding of research pattern differences across subject areas that enable proper interpretations of data.

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