
International Collaboration in Library and Information Science Research in Korea

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ABSTRACT

This study sought to examine five theses from major journals concerning Korea's Library and Information Science, published from 1970 to 2018, so as to diagnose the current stage of International Research collaboration in the field of Korea's Library and Information Science which researchers from two or more different nations jointly conducted. Furthermore, it proposed measures for activating International Research collaboration in the field of Korea's Library and Information Science. First, related conferences should be held and education need to be offered in terms of elevating the awareness of the need and importance of international research collaboration. Second, relevant policies need to be developed and projects should be implemented to strengthen the practical international research collaboration. Third, collaboration with various countries should be pursued in the area of detailed majors of library and information science of greater diversity than now in terms of the detailed majors and countries. Fourth, a research environment supporting the collaboration with various research institutions overseas moving forward will need to be created around the universities.

1. Introduction

In an environment where globalization has had such a tremendous impact across all areas including society, politics, economy, and culture, in reality, many countries around the globe such as the United States and the EU are providing support for the study of international collaboration as a matter of policy implemented at the state level for science and technology (Choi, 2008). In particular, as the global competition accelerates and the useful cycle of technology has shortened in terms of research and development, the need for international research collaboration is consistently growing (Kim, 2012). Furthermore, research through international collaboration across various academic disciplines has yielded many synergies, thereby gaining recognition for its significance.

In addition, during the university evaluation of The Chosun Ilbo and QS Asia in 2018, an international research collaboration index was newly introduced as an evaluation index for evaluating whether

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universities are actively conducting international cooperative research with the universities of other countries. As a result of the survey, Korea was not ranked among the top 20, with Korea University being ranked the 21st, followed by Seoul University being the 31st and Kyung Hee University the 34th, among others (Yang, 2018).

Moreover, the nationality of the editorial committee members of the academic journals ought to be consisted of researchers from various countries, so that international research collaboration may be facilitated. However, in the case of a renowned journal of LIS overseas, the members of the editorial committee are consisted of researchers from various countries, whereas in the case of Korea, they are consisted of those who are Korean. In fact, studies using the Web of Science data to identify the characteristics of the editorial committees of 16 LIS journals revealed that the nationality of the members varied (Wilett, 2013).

That is, it is possible to recognize that international research collaboration has recently become popular and emerging at research organizations (industries, academia and research institutes) across the globe. However, Korean universities and researchers are quite less influential in the world's academia in reality relative to their research productivity, and one of the reasons for this is that they do not much conduct joint research compared to those of other countries (Kim, Dong-Ha, 2017). Even in the realm of library and information science in Korea, there is still such a low awareness of the need and importance of international research collaboration. Hence, it will be necessary to strengthen the international quality aspects of the studies in the Korean library and information science.

Therefore, this study aimed to diagnose for the current status of international research collaboration in the field of library and information science in Korea and to propose a plan to facilitate the international collaboration in Library and Information Science in Korea. In other words, in this study papers of a total of 5 types of renowned academic journals related to the Korean library and information science (*Korean Society of Bibliography, Journal of Korean Society for the Information Management, Journal of Korean Library and Information Science Society, Journal of Korean Society for Library and Information Science, and Journal of the Korean Biblia Society for Library and Information Science*) published from 1970 until 2018 were diagnosed for the current status of international research collaboration in the field of library and information science in Korea, which were jointly conducted by the researchers from two or more countries, while identifying overall research trends. Furthermore, based on the research results, we have proposed a plan to facilitate the international research collaboration in the field of library and information science in Korea.

The results of this study will not only contribute to further facilitating the international research collaboration moving forward, but also to improving the quality of research for the Korean library and information science from the international aspect.

2. Literature Review

In order to understand the trends of international research collaboration research in the field of library and information science in Korea, previous studies of this research were classified into

two major categories: first, research on the research trends of the library and information science for renowned international academic journals, and second, studies on joint research and trends in research collaboration.

2.1 Research trends in the library and information science analyzing international academic journals

Previous studies identifying research trends in the field of library and information science analyzing international academic journals are as follows. Choi (2001) explained research trends of the Korean library and information science scholars by analyzing the papers published in the SSCI, which is a citation index database for internationally renowned journals in the social sciences by author, subject, journal, institution they graduated from, university they are affiliated with, year, age, core subject of major, key author and key journal. As for the research direction for the globalization of the Korean library and information science in the future, we have recommended that, first, more papers should be submitted to international journals rather than domestic journals, and second, they should cite many international journals rather than the domestic, and third, domestic journals should be published in English, and fourth, research expenses should be subsidized when publishing papers in the international journals.

Thereafter, Lee, Jung, and Song (2015) developed a weighted subject-method network targeting the papers published in the well reputed foreign academic journals of library and information science from 1990 until 2014. As a result of which, the top research subjects turned out to be management information system, information requirement analysis, quantitative bibliometrics research, and information policy, etc., and the top research methods turned out to be research collaboration analysis, concept / reference research, web data analysis, and modeling, etc.

Recently, Lee and Park (2016) identified the characteristics of Korean researchers through the quantitative analysis of 384 papers published in international academic journals of library and information science from 2005 through 2014. According to the analytical results, the contribution of Korean researchers turned out to be 342.6 volumes out of the total of 384 volumes, the qualitative level of research in the domestic library and information science was improved in terms of globalization, and the research of library and information science turned out to be closely related to computer engineering, business administration, and communication.

2.2 Trends in joint research and research collaboration of the library and information science

First, the study of the trends in co-authorship and joint research centered on the library and information science is considered as follows. Lee (2010) analyzed the co-authoring network of the papers published in 4 types of journals related to the library and information science in Korea from 2000 to 2009. As a result of the research, the phenomenon of Pareto's law was discovered in terms of the number of papers submitted. That is, the authors who submitted a large number of papers were found to be limited to 20% of all authors. In addition, the authors of greater number of publication were found to have co-authored more than single authored papers, and the authors

of a greater number of publication were also found to have a correlation with most indicators of academic influence.

Limited to the area of digital library, which is a category within the library and information science, Chung (2011) analyzed 1,394 volumes of papers thematized with digital library published from 1997 through 2010 in terms of interdisciplinary joint research. As a result, it was found that the academic disciplines playing a key role in the interdisciplinary joint research for the area of digital library are the areas of library and information science, computer science, and engineering, while the detailed areas of digital library were surveyed to be the core area of digital library, natural science, medicine related area, biology and medical science. That is, it was confirmed that the subject of digital library has been performed across various academic areas besides the library and information science.

Lee (2014) compared centrality index to analyze the joint research network for the papers published in 5 types of academic journals between 2002 and 2011, papers published in the "Collection of Papers for the Architectural Institute of Korea - Structure," a representative journal for architecture (structure) from 2000 until 2004, and the papers published in internationally renowned journals in the area of marketing from 1973 until 2009. According to the analytical results, it was claimed that it is necessary to apply the weighted network centrality index for the joint research network, and to measure the centrality for all areas among the centralities, the triangular centrality index must be used, and to understand the local centrality, the SSR index must be used.

Thereafter, Lee (2016) analyzed 3,661 papers produced in 9 types of journals of the Korean library and information science from 2004 until 2013 and studied the relationship between the centrality of the co-authoring network and the research performance index. Consequently, overall speaking, the extent of the co-authoring activity's correlation with the research performance was not significant, whereas in terms of partial aspects, it was validated that there is a negative correlation. In addition, there is a positive correlation relationship overall between the centrality and the research performance, but the correlation was not surveyed to be significant in the analytical results of only the top 30 authors.

Next, the previous studies analyzing the trends of research collaboration in the area of library and information science are as follows. Kim (2017) identified trends in the research collaboration by comparing the number of joint researchers for the papers published in domestic and foreign journals of library and information science from 2010 until 2016. As a result of the investigation, authoring collaboration is active in foreign journals than Korean journals, and the most common form of author collaboration in the journals related to library and information science ranges from single authorship to 3 person authorship.

In addition, Park and Heo (2017) analyzed the patterns of research collaboration by analyzing the collaboration index in the unit of period by analyzing 7 types of journals listed in the KCI in the area of library and information science in Korea. According to the results of the survey, first, the number of co-authored papers turned out to be large KISTI, Chung-Ang University and Yonsei University. Second, the results of measuring the collaborative coefficient (CC) at all 10 institutions proved to be low overall, and third, the results of applying the co-author index (CAI) and the local collaborative index within the identical institution indicated that the characteristics

of the type of co-authorship varied by each institution.

Recently, Jeong (2017) conducted an experimental research on the geographical approach to analyze the cooperative characteristics and cooperative subjects for 5,390 papers published in 4 kinds of journals related to the library and information science in Korea. From the geographical aspect, it has been proven that collaboration by and among the Jungbu, Honam, and Yeongnam regions around the metropolitan area has been conducted, while the places found to be most active in terms of collaboration by each institution were Konkuk University and Dongwon University for a total of 29 joint studies.

2.3 Implications related to research trends

The implications derived based on the results of the previous studies which analyzed the research which identified research trends of library and information science, joint studies of library and information science, and the trends of research collaboration for internationally renowned academic journals are as follows.

Studies of the trends in co-authorship, joint studies and cooperative research were performed for domestic and foreign academic journals of library and information science along with those analyzing research trends of library and information science for international journals even though they were not performed internationally to date.

However, studies of the trends in international research collaboration conducted by the researchers of 2 or more countries internationally for the core academic journals related to the library and information science in Korea have not yet been conducted in the academic realm of library and information science in Korea.

Therefore, this study analyzed the present phase and the trends of international research collaboration in the area of library and information science in Korea performed jointly by the researchers of 2 or more countries internationally for a total of 5 types of core journals in the area of library and information science in Korea.

3. Analysis of research trends in international research collaboration in the area of library and information science in Korea

3.1 Analytical subject

International joint research among the papers published by a total of 5 types of major academic journals of library and information science, which are Korean Society of Bibliography, Journal of Korean Society for the Information Management, Journal of Korean Library and Information Science Society, Journal of Korean Society for Library and Information Science, and Journal of the Korean Biblia Society for Library and Information Science from 1970 until 2018. However, as for the records management related journal, as a result of analyzing a total of 564 papers published from 2000 until 2018 for records study, there was not even a single international joint study conducted,

and in the case of the Korean Society of Archives and Records Management, we searched it on DBpia and RISS to include it among the analytical subjects, but was excluded since the use of electronic journal is currently not available. Table 1 illustrates the details of the current status of the final academic journal selected for analysis.

As a result of the survey, a total of 52 international research cooperative papers were collected from the area of library and information science in Korea, whose research were jointly conducted by the researchers from 2 or more countries internationally from 1970 until 2018. Based on which, this study has identified the overall research trends by highlighting the current phase of the international research collaboration in the area of library and information science in Korea.

Table 1. Overview of the academic journals subject to analysis

Name of Journal	Year of Founding	Publishing Period	Issuing Period	Total No. of Papers
<i>Korean Journal of Archival Studies</i>	2000	Quarterly	2000-2018	564
<i>Korean Society of Bibliography</i>	1986	Quarterly	1986-2018	983
<i>Journal of Korean Society for the Information Management</i>	1984	Quarterly	1984-2018	1,372
<i>Journal of Korean Library and Information Science Society</i>	1974	Quarterly	1974-2018	1,753
<i>Journal of Korean Society for Library and Information Science</i>	1970	Quarterly	1970-2018	1,688
<i>Journal of the Korean Biblia Society for Library and Information Science</i>	1972	Quarterly	1972-2018	925

3.2 Analysis of the research trends

3.2.1 Analysis of the current status of international research collaboration

Table 2 illustrates the analytical results of international research collaboration for each academic journal. As a result, during the period running from 1970 until 2018, the total number of papers produced in a total of 5 kinds of representative journals related to the library and information science was surveyed to be 6,721. As for each journal, there were 925 papers of *Journal of the Korean Biblia Society for Library and Information Science*, 983 papers of *Korean Society of Bibliography*, 1,372 papers of the *Journal of Korean Society for the Information Management*, 1,688 papers of the *Journal of Korean Society for Library and Information Science*, and 1,753 papers of the *Journal of Korean Library Information*. Overall, the number of international joint research among the total of 6,721 papers related to the library and information science was a total of 52 (0.8%), which is very low.

Specifically, out of the total of 1,372 papers, the *Journal of Korean Society for the Information Management* had the largest number of 22 papers (1.6%) of international joint research, followed by 13 papers of international joint research (0.7%) out of the total of 1,753 papers for the *Journal of Korean Library Information*, 6 papers of international joint research (0.6%) out of the total of

925 papers for the Journal of the Korean Biblia Society for Library and Information Science, 10 papers of international joint research (0.6%) out of the total of 1,688 papers for the *Journal of Korean Society for Library and Information Science*, and 1 paper of international joint research (0.1%) out of the total of 983 papers for the Korean Society of Bibliography, respectively.

Table 2. Current status of international research collaboration by each academic journal

Name of Journal	Total No. of Papers	No. of International Joint research	Ratio of International Research collaboration
<i>Korean Society of Bibliography</i>	983	1	0.1
<i>Journal of the Korean Biblia Society for Library and Information Science</i>	925	6	0.6
<i>Journal of Korean Society for Library and Information Science</i>	1,688	10	0.6
<i>Journal of Korean Library and Information Science Society</i>	1,753	13	0.7
<i>Journal of Korean Society for the Information Management</i>	1,372	22	1.6
Total	6,721	52	0.8

In addition, Table 3 illustrates the overall status of international joint research for each academic journal. As a result of the survey, the Journal of Korean Society for the Information Management had the largest number of 22 papers (42.3%), followed by the Journal of Korean Library Information with 13 papers (25.0%), *Journal of Korean Society for Library and Information Science* with 10 papers (19.2%), Journal of the Korean Biblia Society for Library and Information Science with 6 papers (11.5%), and the Korean Society of Bibliography with 1 paper (1.9%), respectively.

Table 3. Overall status of international research collaboration by each academic journal

Name of Journal	No. of International Joint research	Ratio of International Research collaboration
<i>Korean Society of Bibliography</i>	1	1.9
<i>Journal of the Korean Biblia Society for Library and Information Science</i>	6	11.5
<i>Journal of Korean Society for Library and Information Science</i>	10	19.2
<i>Journal of Korean Library and Information Science Society</i>	13	25.0
<i>Journal of Korean Society for the Information Management</i>	22	42.3
Total	52	100.0

Based on the analytical results of the current status of international research collaboration in the above, the implications derived may be presented as follows. First, it may be derived that

the level of international research collaboration pursued in the area of the Korean library and information science is quite low, and therefore, a plan needs to be made to call for international research collaboration in the area of Korean library and information science moving forward.

Second, it was found that the Korean Society of Bibliography was least active while the Journal of Korean Society for the Information Management was most actively in terms of academic journal. This appears to be a result of the fact that the latest information and international collaboration related to information system and information and communication technologies, etc., is needed for the characteristics of an academic discipline called information science relative to other detailed majors of the library and information science. That is, as such, the Journal of Korean Society for the Information Management seems to be most active in conducting international research collaboration, which is published mainly on the information science papers.

However, the Korean Society of Bibliography is a most representative journal of Korean Society of Bibliography in Korea, and so it was thought that international collaboration with China and Japan, etc., would have been pursued for the nature of the major, but it was analyzed that only a single paper of international joint research was published in conjunction with Japan. Therefore, in the area of Korean Society of Bibliography, more active international joint research with East Asian countries such as China and Japan must be conducted moving forward beyond domestic research collaboration.

3.2.2 Analysis of the current status for each year

Fig. 1 illustrates the current status of international research collaboration in the area of library and information science conducted in Korea for a total of 5 types of academic journals from 1970 until 2018. As for the analytical result, from 1970 until 1993, it was discovered that international research collaboration was not attempted within the realm of the Korean library and information science, and it was in 1994 when the international joint research was conducted for the first time with China. In addition, it was found that 5 papers were implemented by international research collaboration most actively each in 2006 and 2011, respectively. And in 2011, the identical researchers from 2 or more countries during the same year conducted a lot of international joint research yielding results.

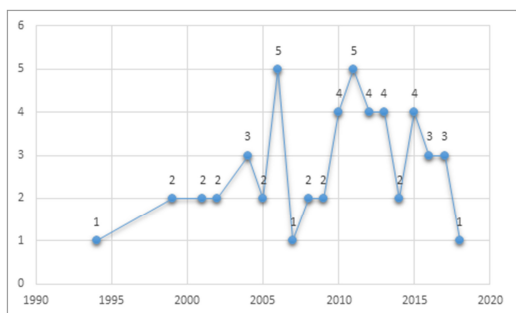


Fig. 1. Current status of international research collaboration by year

Unit: Paper

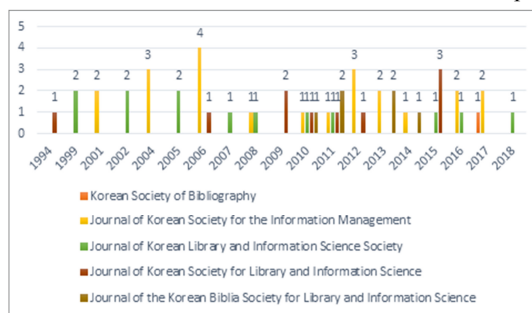


Fig. 2. Current status of international research collaboration for each academic journal by year

Fig. 2 illustrates the current status of international research collaboration for each academic journal by year. Reviewing 2006 and 2011 for each journal as they were the years in which international research collaboration took place most actively, in the case of 2006, it was found that, out of the total of 5 papers, 4 papers (80%) were conducted through international joint research for the *Journal of Korean Society for the Information Management* and 1 paper (20.0%) for the *Journal of Korean Society for Library and Information Science*, whereas in the case of 2011, out of the total of 5 papers, 2 papers (40.0%) were conducted through international joint research for the *Journal of the Korean Bibliography Society for Library and Information Science*, whereas 1 paper (20.0%) was conducted each for the *Journal of Korean Society for the Information Management*, *Journal of Korean Library Information*, and the *Journal of Korean Society for Library and Information Science*, respectively.

In addition, reviewing the frequency of international research collaboration, international research collaboration was found to be most active for the *Journal of Korean Society for the Information Management* for a total of 11 years including 2011, 2004, 2006, 2008, 2010, 2011, 2012, 2013, 2014, 2016, and 2017, while the *Korean Society of Bibliography* was had international joint research conducted only in 2017. In 2018, only 1 international joint research was found to have been conducted for the *Journal of Korean Library Information*, respectively.

The implications derived based on the analytical results of the current status of international research collaboration for each year are as follows. Overall, it may be known that the level of international research collaboration in the area of library and information science in Korea is still quite low. However, despite such a small number of international joint research, it is noteworthy that it has been consistently conducted for 5 types of diverse, renowned academic journals related to the library and information science. Therefore, it will be necessary to actively seek ways to facilitate international research collaboration in the area of library and information science in Korea. That is, it will be necessary to build policies to strengthen international research collaboration in the area of library and information science in Korea and also pursue practical and related projects, among others.

3.2.3 Analysis by researcher

The analysis by researcher was largely divided into the 2 kinds of main author and joint researcher, and specifically, we have examined each researcher's country, affiliated institution, identity, and major.

1) Analysis by main author

For main author, we have classified them into the first author and corresponding author, while analyzing each researcher's country, affiliated institution, identity, and major.

(1) Analysis by country

Fig. 3 illustrates the distribution of the first author and corresponding author by country. First, analyzing the first author showed that, out of the total of 52 people, Korea had the largest number of 34 people (65.4%), followed by 11 people from the US (21.2%), 3 people from China (5.8%), 2 people from Japan (3.8%) and 1 person each from Indonesia and Canada (1.9%), respectively.

In addition, a total of 17 papers were indicated with corresponding authors, whose distribution by country is illustrated by Fig. 4, and as a result of the survey, out of the total of 17 corresponding authors, 10 were from Korea (58.8%) and 7 were from the US (41.2%), respectively.

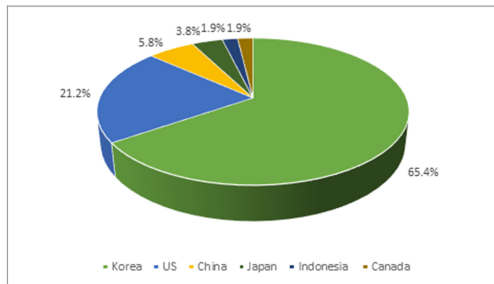


Fig. 3. Distribution of first author by country

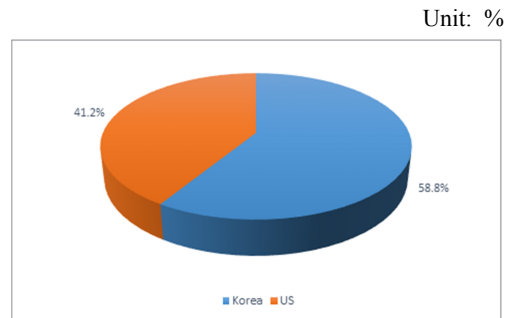


Fig. 4. Distribution of corresponding author by country

(2) Analysis by affiliated institution

Reviewing the current status of the first author and the corresponding author’s affiliated institution, the details are illustrated by Fig. 5. In the case of the first authors, out of the total of 52 first authors, the largest number of 49 people (94.2%) were the researchers who were affiliated with universities, followed by 2 researchers (3.8%) and 1 librarian (1.9%), each respectively. In addition, in the case of the corresponding author, the total of 17 people were all found to be affiliated with universities (100%).

(3) Analysis by identity

Fig. 6 illustrates the identified distribution of the first author and the corresponding author’s identity. Out of the total of 52 people, as for the first author, the largest number of 35 people were professors (67.3%), followed by 7 others (13.5%). 6 students (11.5%), 3 researchers (5.8%), and 1 librarian (1.9%), each respectively. In addition, the total of 17 corresponding authors were all analyzed to be professors (100%).

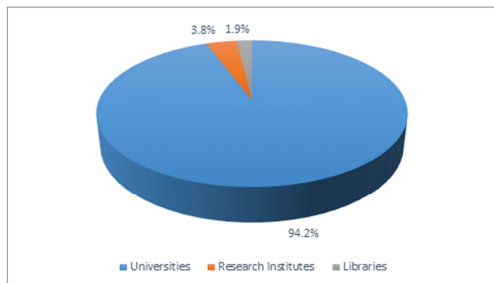


Fig. 5. Current status of first author by affiliated institution

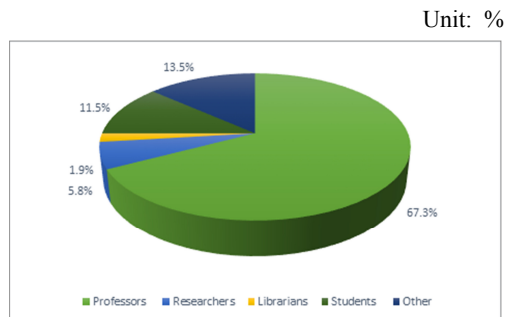


Fig. 6. Distribution of first author by identity

(4) Analysis by the researcher’s major

Fig. 7 and 8> illustrate the current status of the first author and the corresponding author by major. In the case of the first author, the total of 52 people had largely 7 majors (business administration, records management, other, library and information science, information science, communication, and computer science), with the largest number of 40 people majoring in library and information science (76.9%). They were followed by 4 people majoring in others (7.7%), 3 people majoring in information science (5.8%), 2 people majoring in business administration (3.8%), and 1 person each in records management, communication, and computer science (1.9%), each respectively. In addition, in the case of corresponding author, a total of 17 people majored in 4 types (others, library and information science, information science, and communication), with the largest number of 14 people majoring in library and information science (82.4%), followed by 1 person each majoring in information science, communication, and others (5.9%), respectively.

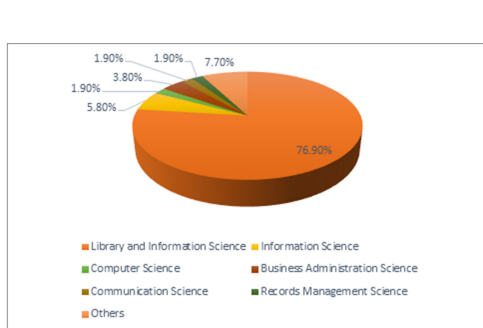


Fig. 7. Current status of first author by major

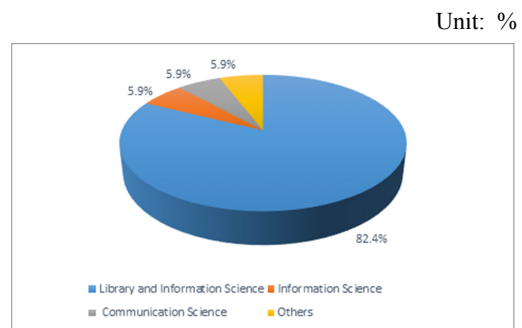


Fig. 8. Current status of corresponding author by major

2) Analysis by joint researcher

(1) Analysis by country

Fig. 9 illustrates the distribution of the joint research by country. Out of the total of 65 joint researchers found, Korea had the largest number of 34 people, followed by 23 people from the US, 4 from China, and 2 people from Indonesia and Japan each, respectively. That is, a total of 4 countries had researchers conducting joint research with Korean researchers of library and information science, including the US, China, Indonesia, and Japan. Of which, the US had the largest number of 23 researchers (35.4%), followed by 4 from China (6.2) and 2 from Indonesia and Japan each (3.1%), respectively.

(2) Analysis by affiliated institution

Reviewing the current status of the joint researcher’s affiliated institution, the details are illustrated by Fig. 10, and out of the total of 65 joint researchers, the large number of 53 people were researchers affiliated with universities (81.5%), followed by 7 researchers (10.8%), 4 librarians (6.2%), and 1 other (1.5%), respectively.

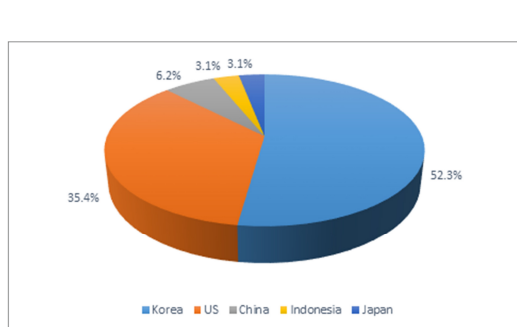


Fig. 9. Distribution of joint researcher by country

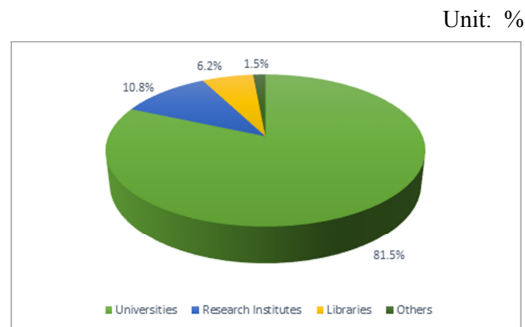


Fig. 10. Current status of joint researcher by affiliated institution

(3) Analysis by identity

Fig. 11 illustrates the distribution of joint researchers by identity. Out of the total of 65 people, the largest number of 37 people were professors (56.9%), followed by 9 others (13.8%), 8 students (12.3%), 6 researchers (9.2%), and 5 librarians (7.7%), respectively.

(4) Analysis by the researcher's major

Fig. 12 illustrates the current status of the joint researcher by major. The total of 65 people had largely 6 majors (others, business administration, library and information science, information science, political administration, and computer science), with the largest number of 44 people majoring in library and information science (67.7%). They were followed by 7 people majoring in information science and computer science each (10.8%), 5 people majoring in others (7.7%), and 1 person each majoring in business administration and political administration (1.5%), respectively.

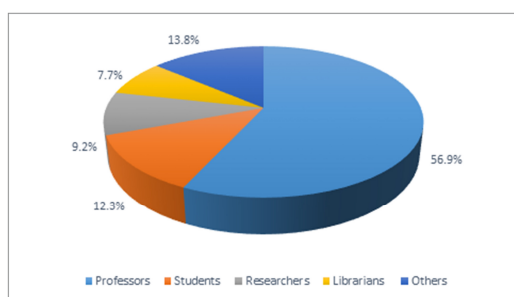


Fig. 11. Distribution of joint researcher by identity

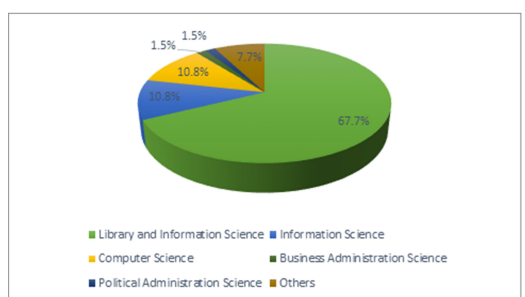


Fig. 12. Current status of joint researcher by major

The implications derived from gathering the analytical results by each author from among the main author and joint researcher are as follows. First, reviewing the distribution of major author and joint researcher, including the first author and corresponding author, a total of 5 countries conducting international joint research with Korea were found to be the US, China, Indonesia, Japan, and Canada. Accordingly, moving forward, it will be necessary to make attempts to pursue

international research collaboration with various advanced countries which are more developed than Korea in connection with the library and information science and libraries.

Second, as a result of analyzing the current status of the affiliated institution and identity of main author and joint researcher, the affiliated institution and identity of domestic and international researchers of international joint research published in major journals related to the Korean library and information science are found to be dominated by the group of university professors and the group of students pursuing their master's and doctoral programs. Besides, the group of researchers and librarians along with the researchers of other institutions were found to have conducted international joint research. Therefore, a research environment supporting collaboration with various research institutions overseas (universities, research institutes, and libraries, etc.) would need to be created with universities playing a central role, as they are the core institutions for international research collaboration in the Korean realm of library and information science.

Third, as a result of analyzing the distribution of main authors and joint researcher, the majors of foreign researchers who have cooperated on research with Korean researchers of the library and information science have turned out to be diverse to include, besides library and information science, information science, communication, computer engineering, business management, and political administration. International research collaboration with overseas researchers who majored in such diverse academic disciplines will likely help to improve the quality of research related to the area of library and information science in Korea. Therefore, moving forward, it will be necessary for the Korean academia of library and information science to clearly recognize the need for international research collaboration and actively prepare the policies and research systems to help strengthen such recognition.

3.2.4 Analysis by detailed major

Fig. 13 illustrates the detailed majors of the library and information science for the total of 52 international joint research produced from a total of 5 types of renowned academic journals related to the library and information science from 1970 until 2018 in Korea.

The research results indicate that international joint research have been conducted largely on 8 detailed majors of the library and information science, and the detailed majors turned out to be records management, library management, reading education, bibliography, general, data organization, information service, and information science. Of which, 26 research were related to information science, which account for the largest of 50.0%, followed by 16 research in information service (30.8%), 4 research included in the general area of library information science (7.7%), 2 research related to reading education (3.8%), and 1 research each related to records management, library management, bibliography and data organization (1.9%), respectively.

The implications derived from the analytical results of each detailed major of the library and information science are as follows. While the information science related research account for the largest proportion of 50%, it is noteworthy that international joint research corresponding to various detailed majors of the library and information science exist regardless of their small number. That is, moving forward, it will be necessary to facilitate international joint research for various areas related to the detailed majors of the library and information science beside information science, so that the

research related to the Korean library and information science will improve their quality internationally.

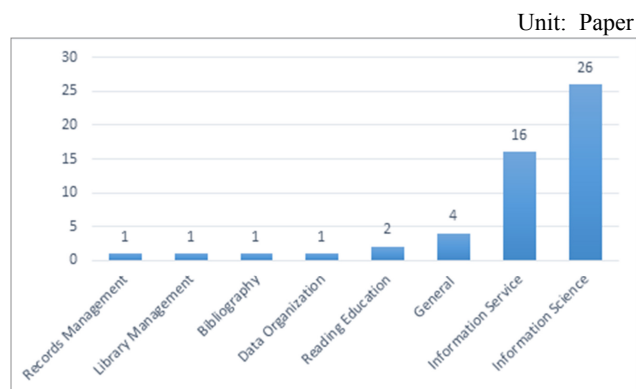


Fig. 13. Distribution by detailed major

3.2.5 Analysis by research subject

Based on the corresponding keywords of each of the papers provided by the researchers listed in the total of 52 international joint research selected as the subject of this study, we have performed analysis for each research subject. In addition, the top 5 keywords provided by the researchers were selected, and they were classified by the research subject in line with the 8 detailed majors of library and information science (information science, information service, general, reading education, records management, library management, bibliography, and data organization), whose results are illustrated in Table 4.

Table 4. Current status by research subject

Subject Category	Research Subject
Information Science	Search engine, quantitative bibliography, joint research, globalization, network, multi-media data, database, book search, digital library, (institutional) repository, linked data, meta data, document standard, user interface, social media, research data, ontology, clustering of terms, image search, citation analysis, web(site), recall factor, electronic book information search system, information (knowledge) structure, information exploration, information utilization capability, rate of accuracy, knowledge management, information sharing, academic exchange, collaboration, RDF / XML
Information Service	Virtual reference books, health information service, (consumer) health information, multi-cultural library, multi-cultural service, multi-cultural program, library anxiety (scale), reference duplication service, interlibrary book loan, social media, user information behavior, Internet information service, information sharing, information user research, information failure, information utilization education, reference information source
General	Theories of library and information science and publication of magazine
Reading Education	Reading education, reading policy, and school library
Records Management	Repository and long-term preservation
Library Management	Virtual university and library's role
Bibliography	Gabjabon, Daedongyeojido, and Shinyubon
Data Organization	Method of reference classification

The survey results indicated that, first, the research subjects of the international joint research conducted for the area of information science include search engine, quantitative bibliography, joint research, globalization, network, database, book search, digital library, (institutional) repository, linked data, meta data, user interface, social media, research data, ontology, clustering of terms, image search, citation analysis, web(site), electronic book, information search system, information (knowledge) structure, information exploration, information utilization capability, knowledge management, information sharing, academic exchange and collaboration, among others.

Second, the research subjects of the international joint research conducted for the area of information service were surveyed to be virtual references, health information service, multi-cultural service, library anxiety, social media, user information behavior, Internet information service, information sharing, information user research, and information utilization education, among others.

Besides, third, it was confirmed that the research subjects of international joint research conducted for the general area of library and information science were theories of library and information science and publishing of magazines. Fourth, research subjects of international joint research pursued for the area of reading education were reading education, reading policies, and school library. Fifth, research subjects of the international joint research conducted for the area of records management were investigated to be repositories and long-term preservation. Sixth, the research subjects of the international joint research conducted for the area of library management turned out to be virtual universities and libraries' role. Seventh, the research subjects of the international joint research conducted for the area of bibliography were confirmed to be Jabjabon, Daedongyeojido, and Shinyubon. Eighth, the research subject of the international joint research conducted for the area of data organization was analyzed to be the method of reference classification.

The implications derived based on the analytical results for each research subject are as follows. First, among the international joint research conducted for the areas of information science and information service, it is noteworthy that the research subjects related to international research collaboration such as globalization, joint research, information sharing, academic exchange, and collaboration have been found.

Second, the research subjects of social media, web(site) and information sharing overlap with international joint research conducted for the area of information science and information service, while the (institutional) repository overlaps with international joint research conducted for the area of information science and records management. Therefore, it will be necessary to strengthen international research collaboration for the research subjects related to the social media, web(site), information sharing, (institutional) repository which overlap in the areas of detailed major in the future, which will likely contribute to facilitating international joint researchers in the area of library and information science in Korea.

Third, the research subjects of multi-cultural service and health information service among the research subjects of the international joint research conducted for the area of information service are available at many advanced countries which may be examples to Korea, so it will be necessary to improve the international qualitative aspect of the research. That is, the strengthening of international research collaboration on multi-cultural service and health information service will not only facilitate improving the quality of research related to multi-cultural service and

health information service in the future, but will also further facilitate multi-cultural service and health information service.

4. Discussion & Future Studies

Based on the implications derived from the research results, we propose a plan and future research to facilitate international research collaboration in the area of library and information science in the future.

First, as a result of this study, it has been found that the international joint research performed in the area of library and information science in Korea is very scarce. Therefore, to facilitate the international research collaboration in the academic realm of Korean library and information science, it would be necessary to hold related conferences and offer education in order to elevate the awareness of the need and importance of the international research collaboration above and beyond everything.

Second, attempts should be made to develop related policies and implement projects from the perspective of strengthening the practical international research collaboration. That is, if the Library Information Policy Committee would develop a policy for international collaboration as one of the comprehensive plans for the library development and implement related projects, or implement international research collaboration projects related to the area of the library and information science by the National Research Foundation of Korea, which is a core research institute in Korea, the international research collaboration would likely be better facilitated in the academic realm of library and information science.

Third, the survey results of this study indicate that the international joint research published in renowned journals related to the library and information science in Korea have been pursued in their largest number in the area of information science by the detailed major, and by country, the collaboration with the US has been critical. Therefore, moving forward, it will be necessary to facilitate the international joint research in areas of major such as information service other than information science, library management, data organization, bibliography, reading education, and records management. In terms of country, more international research collaboration would need to take place with countries other than the US. That is, if collaboration with various countries is pursued in the areas of detailed majors of the library and information science, the qualitative aspect of research may be improved for each area of detailed major. For instance, in the case of bibliography, if any further strengthened international joint research would be conducted with other East Asian countries such as Japan and China, qualitative improvement for the Korean bibliographic research could be achieved.

Fourth, as a result of this study, it has been revealed that the group of university professors and the group of students pursuing their master's and doctoral programs account for the majority of the affiliated institution and identify for the domestic and foreign researchers of the international joint research published in major academic journals related to the Korean library and information science. Therefore, in terms of affiliated institution and identity, research systems supporting the collaboration with various research institutes overseas (universities, researchers, and libraries, etc.)

will need to be established with the universities, which currently are the core institutions of international research collaboration in Korea.

5. Conclusion & Recommendation

The major results of this study are following. First, a total of 52 international research cooperative papers were collected from the area of library and information science in Korea, whose research were jointly conducted by the researchers from 2 or more countries internationally from 1970 until 2018. Based on which, we have learned that the level of international research collaboration for the Korean library and information science is quite low. Therefore, ways to facilitate the international research collaboration for the area of Korean library and information science should be actively sought moving forward.

Second, it was found that 5 papers were implemented by international research collaboration most actively each in 2006 and 2011, respectively. And despite such a small number of international joint research, it is noteworthy that it has been consistently conducted for 5 types of diverse, renowned academic journals related to the library and information science. Reviewing the distribution by academic journal, the largest number of 22 international joint research (42.3%) have been conducted by the Journal of Korean Society for the Information Management, whereas 1 international research collaboration (1.9%) was pursued by the Korean Society of Bibliography, according to the survey.

Third, by the analysis for each researcher, in terms of the current status by country, a total of 5 countries have conducted international joint research with Korea, including the United States, China, Indonesia, Japan, and Canada. Reviewing the distribution of researchers by the affiliated institution and identity, it was found that the group of university professors and the group of students pursuing their master's and doctoral programs accounted for the majority of the researchers domestic and overseas whose international joint research were published by major journals related to the Korean library and information science. The current status of each major was analyzed to be such a variety of academic disciplines such as information science, communication, computer engineering, business administration, and political administration, besides library and information science for the majors of the overseas researchers who have pursued international research collaboration with the researchers of the Korean library and information science.

Fourth, the analysis for each detailed major indicated that there were largely 8 detailed majors of records management, library management, reading education, bibliography, general, data organization, information service and information science. among which there were 26 papers published on information science for the 1st place (50.0%), followed by 16 papers on information service (30.8%), 4 papers on the researchers corresponding to the general area of the library and information science (7.7%), 2 papers on the researchers related to reading education (3.8%), and 1 paper each on the research related to the records management and library management, bibliography and data organization (1.9%), respectively.

Fifth, as a result of analyzing each research subject, it is noteworthy that research subjects related to international research collaboration such as globalization and joint research, information sharing,

academic exchange and collaboration among the international joint research conducted in the areas of information science and information service, while the research subjects of web(site) and information sharing overlapped with the international joint research conducted in the areas of information science and information service, and the (institutional) repository overlapped with the international joint research conducted in the areas of information science and records management.

Also the results clearly suggest the low level of international collaboration among Korean domestic research in LIS journal as follows. First, related conferences should be held and education need to be offered in terms of elevating the awareness of the need and importance of international research collaboration. Second, relevant policies need to be developed and projects should be implemented to strengthen the practical international research collaboration. Third, collaboration with various countries should be pursued in the area of detailed majors of library and information science of greater diversity than now in terms of the detailed majors and countries. Fourth, in terms of affiliated institution and identity, a research environment supporting the collaboration with various research institutions overseas (universities, researchers, and libraries, etc.) moving forward will need to be created around the universities, which are the core institutions of international research collaboration in the academic realm of the Korean library and information science.

This study will contribute not only to facilitate the international research collaboration within the academic realm of the Korean library and information science, but also overall to improving the quality of the research of the Korean library and information science.

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