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A Snapshot of Library and Information Sciences Studies in Taiwan: From the View of Journal of Library and Information Studies

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Abstract

Bibliometrics and content analysis approaches were adopted in this study to review the papers issued in Journal of Library and Information Sciences from 1999 to 2020 to draw the landscape of library and information science studies, including research population, research subjects, research approaches and theories used. The results showed the growth of the research population, but the high percentage of one-time authors who lacked sustainable research efforts. Classical LIS topics, such as information behavior and information organization with mixed and newly developed approaches were the center of research. Research evaluation by bibliometrics approach expanded the scope of LIS studies. The presentation of theory linkage appeared limited, but increased in later published papers.

Keywords: Research Trends; Research Population; Co-authorship; Research Subjects; Theory Use

1. Introduction

Analysis of published literatures in a discipline is valuable since the results provide researchers information regarding the research trends, including topics of interests, popular research methods and shifts of research paradigms. The results could be used to further assess maturity of scholarly works, and responsiveness of researchers to concerns of the community (Julien, Pecoskie, & Reed, 2011). Although Library and Information Science (LIS) is a subject area started from practitioner sector, it has been moved toward academic research and emphasized to introduce theories into LIS practitioners' works and researches, or to construct theories through practice. Research trends and theory adopted level are seen as core elements of a discipline, which summarize existing knowledge and predict the unobserved events and relations (Connaway & Powell, 2010).

The development of library and information science started from the very practical ground and transformed into a discipline, as this subject grows and expands to respond to the needs of solving information problems of elites, providing support to generalization of education, bringing improvement to democratic society, and backing up lifelong learning (Rubin, 2010). The previous studies that have been carried out have drawn pictures of growth and changes of LIS researches (Larivière, Sugimoto, & Cronin, 2012), evolution of research topics (Chang, Huang, & Lin, 2015; Ke & Sie, 2019), methods adopted in the LIS studies (Ma & Lund, 2020; Ullah & Ameen, 2018), and attributes of LIS studies, such as theory use (Kim & Jeong, 2006), interdisciplinary (Chang & Huang, 2012), and characteristics of research population of LIS studies (Chang, 2019) to reflect the foundation of LIS and discipline or technique from a macro sense.

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LIS studies in Taiwan have been facing the paradigm shifts, including from practitioner work to academic studies and growing from a single field to cross-domain discipline, and been struggling with the challenges of whether LIS is a discipline or a technician, as well as if there are LIS theories to support the researches and professional work. Members of the LIS community have been monitoring the development of LIS research. Lin (2012) took the bibliometrics approach to examine journal articles, theses and research projects issued during the period from 2001 to 2010 in Taiwan to reveal the research subjects included in LIS research in Taiwan; Chang (2012) adopted the similar research strategy to examined the journal articles by the members of Taiwan LIS community that were included in WOS and PerioPath to reveal the study trends of scientometrics in Taiwan, and Wu, Liang, Hsieh, and Lee (2017) further took content analysis approach to review the papers published in leading LIS journals in Taiwan to unclose the theory used in the works.

In this study, the author tried to draw the landscape of LIS studies in Taiwan by taking a snapshot of papers issued in Journal of Library and Information Studies (JLIS) for the past 22 years, not only to observe the development of LIS studies in Taiwan through JLIS's view, but also pay tribute to this scholarly journal.

JLIS is an open access international journal published twice a year by the Department of Library & Information Science of the National Taiwan University, the most prestigious LIS curriculum program in Taiwan. JLIS publishes empirical research reports, literature reviews, theoretical discussion papers in library and information science, computer science, bibliography, documentations, archives, instructional technologies and other related subjects. JLIS, formerly known as the National Taiwan University Journal of Library Science, was first published in 1967 and it was the first scholarly journal focused on library science research in Taiwan. The journal was renamed and reformed in 1999 to expand scope and diverse interests in the current library and information communities. JLIS is considered as one of the top LIS scholarly journals in the Chinese speaking world, and it has been ranked as a top class journal in humanities and social sciences by the Ministry of Science and Technology (MOST), Taiwan, and attracts outstanding researchers who publish their scholarly works in JLIS. Besides being ranked by the MOST as one of the top class journals in humanities and social sciences, JLIS is also indexed in international well-known databases, including Web of Science Emerging Sources Citation Index (ESCI), Scopus, Library and Information Science Abstracts (LISA), and Library, Information Science and Technology Abstracts (LISTA). By examining the works published in JLIS, the readers could get a good sense of how LIS researches have been carried out by the members of the LIS community in Taiwan, as well as research works done by international scholars. The topics covered in the international authored works also reflected the concerned LIS issues within the Taiwanese professional community (Journal of Library and Information Studies, n.d.).

Through reviewing the papers issued in this journal during the past 22 years, the author hopes to get a clearer picture of the growth and changes of research population, research

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topics, as well as the research approaches and theory used in LIS studies. The single journal analysis strategy allowed this study not only to take the bibliometrics approach, but also the content analysis to examine the full text contents thoroughly to reveal the methods and theories applied by the authors of the various studies. Furthermore, it gave the flexibility to reference the educational and research path of the authors to label the origins of the works and types of collaboration, which was not easily done in other researches.

2. Methods and Data

In this work, bibliometrics and content analysis approaches were adopted. The former was applied to reveal research populations and changes of authoring types, and the latter along with the bibliometrics methods was used to identify the subjects covered and levels of theory touched in the works. These two classic strategies have been taken by previous studies (Lin, 2012; Ullah & Ameen, 2018). In order to reveal the social relationship among co-authors and the origins of co-authored works, co-authorship analysis was also applied in this study, and the database for theses/dissertations, National Digital Library of Theses and Dissertations in Taiwan (https://ndltd.ncl.edu.tw/) and websites of authors' affiliations were visited to obtain information about authors as evidence to define relationship among authors as well. Since the information about research methods applied, studied targets and uses of theories in the works were not fully enclosed in neither the bibliographic data nor abstracts, full texts of papers were obtained and read through in this study and two part-time investigators to label the subjects of works and levels of theories used.

There were 28 issues published during the period from years 1999 to 2020 and 231 papers were obtained from the issues for this study. Bibliographic information and full text of the 231 papers, including an annotation for a special issue found, were downloaded for further analysis. The counting was done for works of 22 years then further broken down to two 11-year windows, five 4-year windows and one 2-year window to observe the shift of research trends, including research population, co-authorship, topics, research methods, and levels of theory touch.

JLIS was first published in 1967 and went through several transformations. In 1999, JLIS drafted the major publishing policy and assigned a new editorial board, issued the first issue after the latest changes as well. This study collected data from 1999 to 2020 to observe the development of LIS studies in Taiwan presented under the lens of JLIS. This study took both macro and micro levels to view the changes of research productivity. Macro refers to the overall status and micro level takes 4 years as a time unit and observes the changes every four years. There are a couple reasons to take 4 years as the time slot for micro-level analysis. One is considering the time frame for research design, funding application, conducting research and publishing research results, and another reason is that there were changes occurring in issue frequency to the Journal about 3 to 4 years. For example, the first change after 1999 happened in 2003, the publishing frequency changed from annual to semiannual and changed again in 2006, and the third one occurred in 2010. By taking the micro-level analysis, it allows this study to observe the LIS research by different time windows shown in the selected Journal.

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2.1 Data collection and analysis

Bibliographic information, including titles, authors, abstracts, keywords, and source data of target journal papers were gathered from "The PerioPath: Index to Taiwan Periodical Literature System" (https://tpl.ncl.edu.tw/NclService/), a database that provides information about the papers of journals published in Taiwan since 1970. Full texts of papers were collected from JLIS website (https://jlis.lis.ntu.edu.tw/html/index.html), and information of authors' affiliations was extracted from full text. The data and full text were examined by the author and two investigators. The inconsistent labeling was re-examined and reached agreement after discussion. Authorship, subject, method, theory touched level analyses were done to all papers. The next session provides information on how the analyses were done.

2.2 Data coding

The data process done on authorship, subjects covered, research methods and theories applied will be described in the following.

2.2.1 Authorship

Author counting was done to each paper. The authors of the targeted papers included in the dataset could publish works in either Chinese or English. If the authors use different languages for their works, the works and authors' names in different languages would be counted under one chosen name. The co-authored works were marked for the papers that were written by multiple authors and type of co-authorship was labeled as well. Besides the domestic authors, the authors affiliated institutions based outside Taiwan were defined as international authors, and the non-LIS affiliations or with the non-LIS education background were labeled cross-disciplinary. There were two categories and five types of co-authorship identified in this study, including (1) cross institution, intra vs. inter; (2) cross sectors, such as academic with academic, academic with practitioner, and practitioner with practitioner. The authors affiliated with education organizations were marked academics and the authors whose position was with the administrative unit of education institutions would be categorized as practitioners. The affiliates with non-education organizations were seen as practitioners.

Although from the affiliations of authors, it did show cases of members from academia working with practitioners, and co-authorship among practitioners, but those papers were reclassified after the origins of the works were investigated. For example, the paper that was co-written by faculty and student, and the student listed the institution that work for as affiliation, "inter" was coded for the collaboration type originally. The paper was re-coded to "intra" after confirming the paper was the production of the work that was produced due to the academic linkage. Only a very limited number of papers were "true" academia and practitioner or practitioner and practitioner collaborations. Considering the unity in collaboration types, no separate section was designated to this issue for discussion. Appendix A shows the coding details of the types of co-authorship.

To ensure the validity of the results of paper count for each author, authority control was done to the author information. Besides the authors' names shown in different languages, the same name presented in different formats were merged

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under the chosen name for the counting. Affiliation information was also applied to confirm authors' identities. For collaboration analysis, authors' education background was also consulted for the co-authored papers.

2.2.2 Research subjects

Data streaming and the first-round of subject terms assigning based on titles, keywords and abstracts were handled after the data cleaning was done. There were 50 subject terms, such as information behavior, knowledge management, assigned to the papers. The terms used in this study referenced the subject schemes applied in previous study done by the author of this study with other co-authored (Chen, Lo, & Lin, 2002), and the categories constructed in other studies (Ke & Sie, 2019; Lin, 2012). Each paper was assigned primary and secondary subject terms, and if it was necessary, the labels for library types (e.g., academic library), material types (e.g., journal), user types (e.g., young adult), geographic areas (e.g., Taiwan) were marked accordingly that were designed based on the concept of facet analysis to add the facet attributes to the topical analysis to present the research subjects. The primary subject terms were further categorized into 8 themes (e.g., technical services) including one label 'Other' for two papers that covered the topics that could not fit into any of the other themes. There were secondary terms (e.g., 'information retrieval' is the secondary term for 'information behavior') used to show the specific research topic in the papers (Table 1). The coding schemes for subjects were constructed based on the topics covered in the papers. It was not the author's aim to construct a detailed and complete subject list to present LIS topics thoroughly.

2.2.3 Research methods

The data regarding research methods applied mainly on the extraction of "Research Design" or "Research Methods" sections in the papers. All the methods were marked after confirming the usage in the research. The descriptions given by the authors on research design and methods for data collection were quite synchronized. It did not require further relabeling for most of the papers, and the encoding framework was constructed by referencing the descriptions on the research methods and data collection techniques provided by Connaway and Powell (2010) in their work. The only notion needed was differentiating research design, such as experiments, usability test, case study; and methods for data collection, including questionnaire, interviews, observation, system log, which might not be treated separately in some papers. Data mining, social network analysis, content analysis and statistical approach were marked for data analysis.

2.2.4 Theory touch level

To show theories used in the papers, this study adopted the idea mentioned in Kim and Jeong's work (2006). The author of this study along with two invited investigators went over the contents paper by paper to confirm the subject labels gained from the first phrase analysis, and to mark the theory touch level of papers, based on the appearance of theories in the sections by following the IMRAD structure: Introduction (including literature review, LR), Methods (including research design, RD), Results, and Discussion (D). There were two categories and seven labels assigned to present the use of theories in the text. The papers covered discussion on theories in introduction, literature review, and

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Table 1. Examples of Five Main Themes with Primary and Secondary Subjects

Main theme	Primary subject	Secondary subject
Information System	information system	
	library automation system	
	system evaluation	web accessibility
Library Management	library management	
	library service evaluation	
	professionalism	work satisfaction
	risk management	
Public Services	information behavior	information retrieval, information sharing
	information literacy	library instruction
	library services	reading therapy, reference services/interview
	user behavior	
Research Evaluation	indicators	
	journal ranking	
	research impact	
	research productivity	
Technical Services	archive	
	collection development	
	information organization	cataloguing (information organization), knowledge organization, metadata
	information resources	
	knowledge management	
	subject analysis	classification, subjects, thesaurus

discussion, but not related to research design or results discussion, were categorized as "Theory Mentioned." The ones that revisited the theories mentioned in introduction or literature review in the description of research design or discussion on research results, and could link to the research design, were labeled "Research Impact." To give the theory touch a quantitative presentation, two indicators, Theory Touch Paper Index (TTPI) and Theory Touch Level Index (TTLI) were applied in the study. Table 2 lists the levels of theory touch and related labels, as well as the definition and level value.

3. Results and Observations

The study included 231 papers contributed by 225 authors from JLIS over the past 22 years. The papers were contributed by a single author up to five authors. The analysis result showed that the papers were contributed by a single author or

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Table 2. Theory Touch Levels

Level	Related labels	Definition	Level value
Theory Mentioned	LR	Theories mentioned in introduction/literature review	1
	LR/D	Theories mentioned in introduction/literature review and discussion	2
	D	Theories mentioned in discussion only	1
Research Impact	LR/RD	Theories mentioned in introduction/literature review, and research design	2.5
	LR/RD/D	Theories mentioned in introduction/literature review, research design, and discussion	3.5
	RD	Theories mentioned in research design only	1.5
	RD/D	Theories mentioned in research design, and discussion	2.5

Note. Theory Touch Paper Index(TTPI) = (Number of paper with theory touch level x / Total number of papers) × 100
Theory Touch Level Index(TTLI) = TTPI × Level value

smaller group of authors during the earlier years, and more collaborative works were seen in later years. Among the 225 authors, a high percentage of the authors only contributed one work to JLIS, and 16 authors had at least 5 papers published in JLIS. It was found that the majority of the authors were affiliated with LIS related institutions, mainly from the academic sector, and there were limited numbers of international authors and authors affiliated with non-LIS institutions, neither LIS related schools nor libraries. The research subjects presented in JLIS papers were mainly in "Public Services," especially the issues related to "Information Behavior," covered information retrieval, information sharing and reading behavior, and the long-term topic, "Information Organization," remained one of the major topics. The shifts of discussion focus on "Information Organization" covered in the papers, the related concepts and terms transformed from cataloguing, information organization and move onto knowledge organization. "Research Evaluation" was another topic that attracted researchers' interest. It might be due to the overall attention to the evaluation of higher education, as well as a newly developed research interest in the LIS community in Taiwan. As the shifts of research subjects, the changes in research design were also seen in the works. It was found that mixed research approaches and multiple methods for data collections were adopted in those studies. In the studies taken in the earlier stage, literature review and questionnaire were the major methods applied, and later the diversity of research approaches could be observed. Despite LIS being grounded in practitioner work, discussion on and use of theories did appear in the presentations of research works and results. However, the observation could only conclude that there was not descriptive evidence to show the strong theoretical linkage in

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LIS studies presented in JLIS, but could not imply that the authors made the research design without any research frameworks or theories foundations in mind either.

The following are elaborate discussions on the observations of authorship and research evolution, based on the analytical results of collected data.

3.1 Authorship

There were 225 authors identified, and the authors contributed from 1 paper to 13 papers. More than three quarters of authors published a single paper in JLIS and there was only a limited percentage of authors who contributed more than 5 papers to the Journal. The study took two views to investigate the authoring in JLIS, including the input of the research force and the research productivity of the authors. The former is the number of authors per paper, and the latter is the number of papers per author.

3.1.1 Single authorship and co-authorship in LIS studies

Looking into the number of authors per paper, the results showed that the LIS research works presented in JLIS were mainly contributed by single or duo authors. The works included in this study, there were 116 (50.22%) papers were authored by a single researcher, 86 (37.23%) papers were co-written by two authors, and 22 (9.52%) papers contributed by the joint effort of three authors. There were a limited number of works (7, 3.03%) were done by more authors (four and five authors) effort. This study reviewed the authorship of the works and found that, even though the authoring of the works in JLIS stayed contributed by single or two authors, there was still a change in the numbers of authors per paper. It was found that there were more works by single authors before 2010, and numbers of papers done with co-authorship increased after 2010. Table 3 and Figure 1 present the numbers of papers of single author and co-authorship.

3.1.2 Attributes of co-authorship works in LIS studies

One hundred and fifteen JLIS papers were co-authored works, and the numbers of authors from 2 authors up to 5 authors, but mostly they were duo-co-authorship. This study took a further investigation to trace the career paths of authors and origins of the papers to identify the collaborative types of the works. According to affiliations, the author divided the collaborative

Table 3. Percentages of Single-authored and Co-authored Papers Counting

Year	Single author (%)	Co-author (%)				
		2	3	4	5	Total
1999-2002	**74.19**	12.90	9.68	3.23	0.00	25.81
2003-2006	54.90	23.53	**17.65**	3.92	0.00	45.10
2007-2010	55.56	37.04	7.41	0.00	0.00	44.44
2011-2014	41.67	**52.08**	6.25	0.00	0.00	**58.33**
2015-2018	40.00	50.00	8.00	0.00	2.00	60.00
2019-2020	41.67	41.67	4.17	**8.33**	**4.17**	**58.33**
Total	50.22	37.23	9.52	7	3.03	

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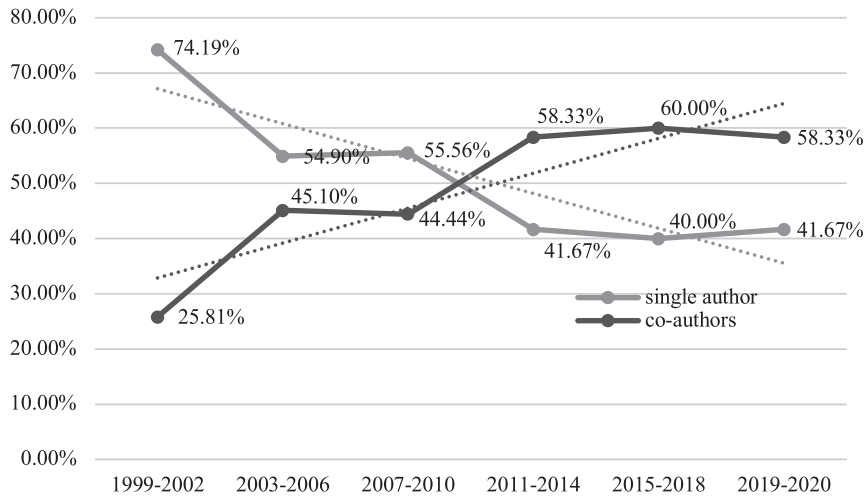


Figure 1. Distributions and Shift of Single-authored and Co-authored Papers

type into intra or inter collaborations. The intra collaboration means that the authors are from the same institution, and inter collaboration applies to the counterparts affiliated with different institutions. There was also a mixed type, in which the works were done by the authors from different institutions, but at least one author affiliated with multiple institutes, and one of the affiliations was the same as the affiliation that counterpart belongs to.

The results showed that there were 65 intra-collaborative only works, 21 inter-collaborative only works, and 29 were mixed type works. Among the 72 out of 86 duo-co-authored works were either intra or mixed types of collaborations, mainly faculty-student combination, and 50 out of 72 papers were rewritten works of theses; and other 22 papers involved either the setting or domains that one of the authors were familiar with. Further study found that even the 14 works marked as inter-collaborations only, could also trace the links of education experience between authors, even though the affiliations listed on the manuscripts indicated the authors were from different organizations.

For the 22 works done by the group of three authors and 5 works by four authors, except the 6 works were rewritten from theses, the co-authored works mainly involved the inputs of different knowledge and skill domains, and there were a few works required multiple researchers to processed and analyzed the research data for supporting the research design, such as triangulation method, or quantity of massive data process. Compared to the duo-co-authored works, there was a higher percentage of inter and mixed collaborations among the works done by larger authoring groups. There were two works contributed by a group of 5 authors, one work focused on proposing a data mining framework and another one was discussion on dialogue system designing. Both researches involved specialties from various domains, such

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as LIS, CS and education, and required input via collaboration among authors from different knowledge domains. Table 4 shows the collaboration types without taking the number of the co-authors into consideration, and table 5 lists the results of paper count by the number of co-authors.

3.1.3 Cross-disciplinary of and internationalization of authorship

With the merging of disciplines and globalization movement, it was expected the cross-disciplinary and internationalization would also reflect in the authorship. From the co-authorship, it could be observed the inter-collaboration relationships. The question was if cross-disciplinary and internationalization were shown in the inter-authorship. The further checks on the affiliations and where the affiliations located were conducted for the answers. The former presents the disciplines of authors belonging to and the different disciplines showed the cross-disciplinary collaboration, and the latter was taken as a token to measure the level of international collaboration.

The 225 authors were mainly from the public sector, universities and research institutions (212 authors), only a limited number of authors (13 authors) were practitioners. Based on the attributes of the affiliations, it was found that 43 authors were from non-LIS fields and contributed 50 papers in JLIS. Information Management and Business Administration were the two noticeable fields that non-LIS authors affiliated with. Nine authors from Information Management contributed 14 papers and 7 authors from Business Administration issued 7 papers.

As for the internationalization level, 33 authors affiliated with the institutions based at 9 regions outside Taiwan, such as Belgium and Canada, contributed 38 works in JLIS. The United

Table 4. Papers Count by Collaboration Types

Types of collaboration	No. of papers
Work with Intra-collaboration (intra only)	94 (65)
Thesis-intra	36
Work with Inter-collaboration (inter only)	50 (21)
Thesis-inter	19
Intra-Inter-collaboration (mixed type)	29

Table 5. Papers Count by the Number of Co-authors

No. of co-authors	Total papers	Intra		Inter		Intra-Inter (mixed type)	
		papers	%	papers	%	papers	%
2	86 (74.78%)	54	62.79	14	16.28	18	20.93
3	22 (19.13%)	11	50.00	4	18.18	7	31.82
4	5 (04.35%)	0	0.00	2	40.00	3	60.00
5	2 (01.74%)	0	0.00	1	50.00	1	50.00

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States (US) was the main area, 11 authors were affiliated with the institutions in the US. The next major region was China, in which there were 10 authors affiliated with the organizations. Among the authors affiliated with institutions based outside Taiwan, 22 were overseas Taiwanese and Chinese by names and origins checking. Besides LIS, the knowledge backgrounds covered including Chinese literature, education, history and information management.

3.1.4 Research productivity—Analysis of JLIS authors

Observing the scale of the authoring population, it was found that 94 authors contributed their 151 works (Note 1), which is 1.61 papers in average per author to JLIS during the first 11 years (1999-2009), and 154 authors contributed 233 works, which is 1.51 papers in average per author to JLIS during the second 11 years (2010-2020). There were 70 authors out of 94 authors from the first 11-years who have no research tracks shown in JLIS after 2010; 130 out of 154 authors did not show the research marks during the first 11 years. Comparing the numbers of authors in two time periods, the author population increased 63.83% in the second 11-year period, and the number of papers increased 54.3%, but the average number of papers per author decreased 5.81%. Different from the authors who were active in submitting works to JLIS in the one-time zone, it was found that there were 24 authors continuously active in authoring in JLIS, contributing 66 and 70 works presented during the first and second 11-year periods in JLIS. Figure 2 presents the changes of authoring population and numbers of papers produced in the two 11-year periods.

The JLIS authors published from 1 to 13 papers in JLIS in 22 years. There were over 76.44% (172) of authors had one paper in JLIS, especially the first author of the co-authored works based on the previous research for theses, and most of them had no other publication record seen in JLIS afterwards. 10.22% (23) of authors

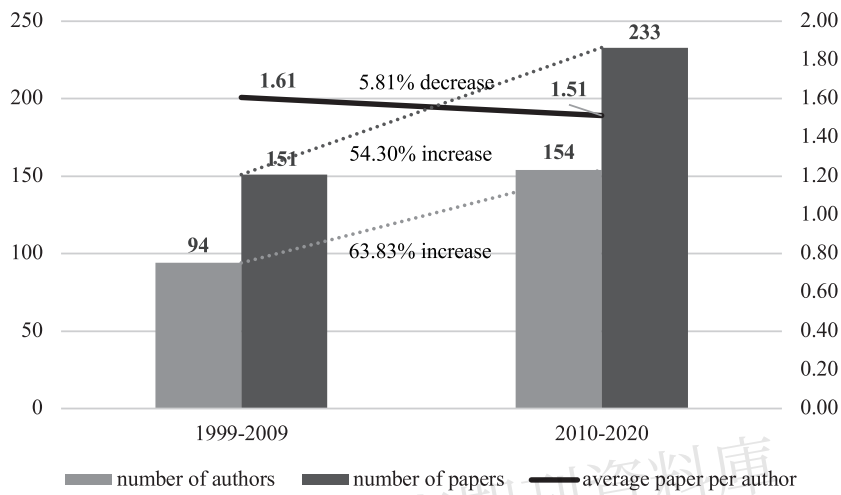


Figure 2. Sizes and Changes of Authoring Population and Research Productivity

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issued 2 papers, and 4.89% (11) of authors published 3 papers. Compared to the authors who had limited numbers of works in JLIS, there were 5.33% (12) authors who contributed more than 6 (including) papers in JLIS, publishing 101 papers in total. Comparing the productivity of authors in two 11-year time slots and the distribution of papers produced per author in JLIS, there was no significant difference found in the results. The number of authors who issued a single paper in JLIS, both took over 76% (77.89%, 76.13%) of the author population, and also limited numbers (4, 3) of authors published more than 6 (included) papers in JLIS (Table 6).

(1) Productive JLIS authors

The 12 productive JLIS authors issued 101 works, in which 4 authors had 6 papers, 2 authors had 7 papers, 1 author had 8 papers, 1 author had 9 papers, 2 authors had 10 papers, and 2 authors had 13 papers published. The productive authors were mainly from LIS-related affiliations, except one author was from non-LIS field, but co-authored works with LIS authors intensively.

By tracing the JLIS authoring activities of those authors, it was found that 4 authors started to submit and issued works to JLIS in 1999, the year when JLIS transformed to current publishing policy, and continued the authoring activities till 2015 and 2016, except for one author having no new work shown in JLIS after 2010. There were also 6 authors who started the authoring activities in JLIS in early 2000s, and continued to have papers published every other year. Overall, the authoring life of productive JLIS authors last over 10 years, except one author from China, the only productive author not based in Taiwan, whose first JLIS paper was published in 2007 and still continued to publish works till 2020. Following the authoring activities of the productive authors not having publishing track in JLIS for the recent two years, the authors have published works in other journals, including international LIS journals.

Co-authorship also showed in the authoring activities. Those authors could be put into two groups based on the frequency of co-authored works, one group includes 5 authors, which had higher numbers of co-authored works, and another group includes 7 authors with the close numbers of single-authored and co-authored works. For the

Table 6. Authors Count by Numbers of Papers

No. of papers	1999-2009 (97)		2010-2020 (134)		1999-2020 (231)	
	Authors	%	Authors	%	Authors	%
1	74	77.89	118	76.13	172	76.44
2	10	10.53	20	12.90	23	10.22
3	5	5.26	6	3.87	11	4.89
4	0	0.00	6	3.87	3	1.33
5	2	2.11	2	1.29	4	1.78
6+	4	4.21	3	1.94	12	5.33
Total	95		155		225	

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co-authored works, intra-collaboration was the dominant type for both groups.

(2) Research subjects of productive JLIS authors

From the research subject point of view, the papers authored by the productive JLIS authors mainly covered multiple topics in their papers, except two authors focus the discussion on a single topic in their JLIS works, five authors covered two topics, and two authors discussed three topics. The change of the research topics could also be observed along with their authoring paths. Instead of focusing on certain research topics, it was found that there were three authors who had their works distributed on various LIS related issues. If the papers were single-authored, the papers might relate to their practitioner works, and if the papers were co-authored, it was very likely that they were intra-collaborative works based on the theses.

The research methods adopted by the productive JLIS authors had strong links to the research topics, such as bibliometrics was the most applied method for the studies on "Research Evaluation", and questionnaires and interviews were the common methods for data collections by the studies on "Information Behavior." The changes of adopting methods were observed, in the earlier published papers, literature review was the main method and different strategies were adopted in the later empirical studies. For the authors that had papers in scattering topics, the methods adopted were also various.

3.2 Research subjects and research design

3.2.1 User behavior, technical services and research evaluation were main sceneries in the landscape of LIS studies

To get a better view of landscape of LIS studies, the 231 papers were classified manually based on subject terms assigned to each paper according to the titles, abstracts and keywords; full text was checked in some cases if it was necessary. Eight subject categories were labeled, including "Public Services," "Technical Services," "Research Evaluation," "Library Management," "Information System," "Documentation," "Scholarly Communications" and "Others." There were 50 subject terms listed under the subject categories. Each paper could be assigned one main subject term and one to two secondary terms. Terms related to library types, user types and material types were also marked if it was applicable.

Among the subject categories and subject terms, the results showed that "Public Services," especially information behavior was the major issue discussed by the JLIS authors throughout the 22-years period. There were 81 papers were in "Public Services" with special devotion on information behavior, including information needs, selection and use, and e-resources use behavior. E-resources use behavior was the center of the discussion, and information behavior of the users who were members of scholar communities, comparing to young adults and elderly users, draw more JLIS authors' attention. The knowledge domains of studied targets scattered, it was found that health information was the subject covered by multiple JLIS papers. The JLIS authors of the related papers took questionnaire, interview or mixed approaches to gather the data to construct the evidences for answering the research questions.

"Technical Services" and "Research Evaluation" were the two subjects that attracted research interests next to the issues related to "Public Services." There were 40 papers devoted to the discussion of Technical Services, mainly

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related to information organization (11 papers), subject analysis (8 papers) and collection development (6 papers). "Research Evaluations" was another issue that gained research interests, bibliometrics approach was adopted mostly. Besides applying the method to measure the research productivity, factors influence citation behavior and indicators also appealed to JLIS authors. In those studies, journal papers were still the main token used, but other types of materials, such as patents were also considered. From the subject area point of view, the authors tend to view humanity and social science studies as a whole to study, but for science areas, examine research progress of disciplines separately.

3.2.2 Research subjects changed in LIS studies

Like other disciplines, there are classic research issues in LIS studies, such as information behavior of "Public Services," information organization of "Technical Services." Those issues were long-term studied topics attracted JLIS authors' attention. Among the 8 subject categories, there were research shifts observed with the paper counts by smaller time windows. Different from "Public Services" and "Technical Services," "Research Evaluation" gained more attention after 2010 although there was record for paper in 2002, and there were more studies on library management from years 2000 to 2004, and very limited number of studies during the period of 2005 to 2014, before regained research attention after 2015. Table 7 shows the statistical results.

To investigate the focus of research subjects, the micro-level analysis was carried out. The observations on distribution of research subjects were made by 4-years windows. There were papers discussed issues in "Public Services" in each time section, but higher percentages of the papers relevant in the periods 2003-2006 (Figure 3b), 2011-2014 (Figure 3d), and 2019-2020 (Figure 3f). Other research subjects appeared in alter time periods, such as "Technical Services" and "Library Management" during the years 1999 to 2002 (Figure 3a), "Research Evaluation" during the years of 2007 to 2010 (Figure 3c), and "Technical Services" and "Library Management" returned to the themes during the years of 2015 to 2018 (Figure 3e).

Topic (presented by subject term) shifts also occurred within subject categories. For example, the scope of the issues related to how

Table 7. Papers Count by Subject Categories and Time Zones

Subjects	1999-2002	2003-2006	2007-2010	2011-2014	2015-2018	2019-2020	Total
Public Services	9	22	5	21	14	10	81
Technical Services	8	8	5	5	12	2	40
Research Evaluation	1	5	9	11	5	0	31
Library Management	8	10	4	1	4	2	29
Information System	4	3	1	4	4	3	19
Documentation	1	0	0	4	6	4	15
Scholarly Communication	0	2	3	1	5	3	14
Others	0	1	0	1	0	0	2

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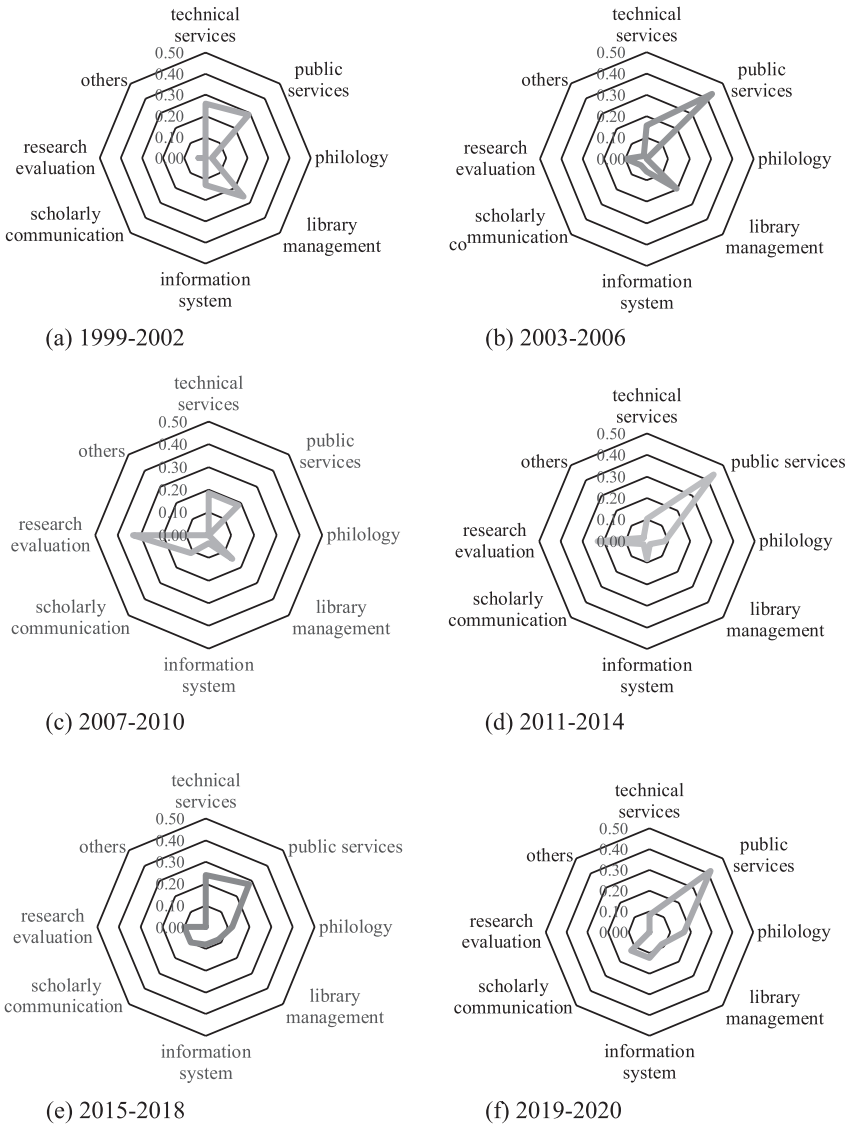


Figure 3. Subject Distributions: Micro Level Observations

librarian creates surrogates for library collections was changed from catalogue to information organization in the first 11-year period to broaden the scope of discussion, and the scope was switched again during the second 11-year period from information organization to knowledge organization to pay more interest in the contents. Information System ranked the fifth on the discussed topics, and a shift was also found in the focus of studies: the discussion on this issue

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moved towards system evaluation from system design over time.

3.2.3 Research methods, from single method to mixed approach

Research methods applied in LIS studies was also an important issue concerned by the members of the LIS research community. Research methods applied in the JLIS studies, including research design and data collection, were recognized and tagged manually by content analysis techniques. There were 7 research designs, 8 methods for data collection, and 3 types of data analysis identified. It was found that "Bibliometrics" and "Case Study" were the highly applied approaches in JLIS papers. The research design reflected the research topics. For example, "Bibliometrics" was the most adopted research design by the JLIS authors, who targeted the research subjects on "Research Evaluation" and "Scholarly Communication." Paper and citation counts were major approaches for data collection and analysis, and later works started to apply social network analysis for analyzing research correlation. For other research subjects, various research designs were adopted by the authors, such as "Case Study" was applied by the researchers to reveal the evidence to answer research questions in information behavior studies. Even though research design, "Survey," was labeled as "Questionnaire Survey," "Questionnaire," or not-labeled in part of JLIS papers, and those studies applied questionnaires as data collecting method, this study synchronized the label. The two-tier approach was taken and "Survey" was used for the research design and "Questionnaire" was applied for data collection. It is also found that both random or purposive sampling techniques could be seen in those works. Since information systems were adopted for library services, the authors of related papers also conducted the research by designing and implementing pilot systems. For the research design, the authors tended to take a single approach for the research.

For data collection, it was observed that authors altered between single method approach and mixed methods approach in research design. Among the 231 papers, 140 papers were done with single methods for data collection and in 90 papers, the authors adopted multiple methods. There was no strong link between the approach taken and research time. The results showed that interview, questionnaire, and literature review were the three highly applied methods for data collection in JLIS papers, especially literature review was adopted as research methods during the earlier years, from 1999 to 2006, and less used during later periods as method for data collection. Both interviews and questionnaires were used heavily, especially by the authors of the studies on information behavior. Throughout the period covered in this study, it is also common that two methods were both applied for data collection in the same study of JLIS papers. For example, questionnaire and interview were two major strategies applied by authors for data collection, and recollection and reorganization information via literature review were highly used with these two methods; or both questionnaire and interview were applied in the same study to cover the grounds of quantitative and qualitative attributes. Similar to research topics, shifts in research data collection with research design were also observed.

Although questionnaire approach was not a dominant method in JLIS papers later published as

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it was in earlier studies, there was still one third of works adopted questionnaire for data collection. With qualitative research design, interview was more often seen in the studies after 2003, but other qualitative data collection approaches, such as observation and think-aloud were only adopted by the authors of a limited number of works. As empirical study became a research trend, literature review was more applied in the first 8 years, but not in the later years. With the growth of data mining and availability of tools, content analysis and data mining took a bigger part in data analysis during the studies published in recent years. Table 8 lists the frequencies of the research designs and methods used every 4 years.

Figure 4 gives a clearer picture of the shifts of top 3 adopted data collection methods applied over time. The figure shows more details about the choices of methods for data collection over time. It indicates that literature review was applied more in the earlier stage, and interview and questionnaire were adopted for data collection after the period of years 2007 to 2010, and interview was used more later in the stages while the usage of questionnaire was decreased.

Comparing the methods for data collections and research subjects, there were two strategies adopted, interview and questionnaire, which were the major methods used by the studies on information behavior. As for the works related to research evaluation and scholarly communication, it is found that bibliometrics was the main strategy taken by the authors, and keywords search was the main method applied to identify the target literatures.

3.2.4 Theory touch in the presentations of studies

To learn better about how the theories used in the researches done with the works, this study took content analysis approach, reading through the papers to reveal the level of theory used in the works. The papers included in this study followed the IMRAD structure for the writing mostly, and the level of theory touch was marked based on the sections where the

Table 8. Research Designs and Data Collection Methods Applied in JLIS Papers

	1999-2002	2003-2006	2007-2010	2011-2014	2015-2018	2019-2020	Total
Research design							
Bibliometrics	2	5	**12**	**9**	**11**	1	40
Case Study	3	3	3	2	4	0	15
System Design	2	5	1	1	0	0	9
Data collection							
Interview	5	**14**	4	**13**	**16**	7	59
Literature Review	**17**	**20**	2	4	4	5	52
Questionnaires	7	9	8	**18**	7	3	52
Document Analysis	**12**	5	1	4	4	5	31
Observation	5	3	1	2	3	1	15
Log	4	0	1	3	2	0	10

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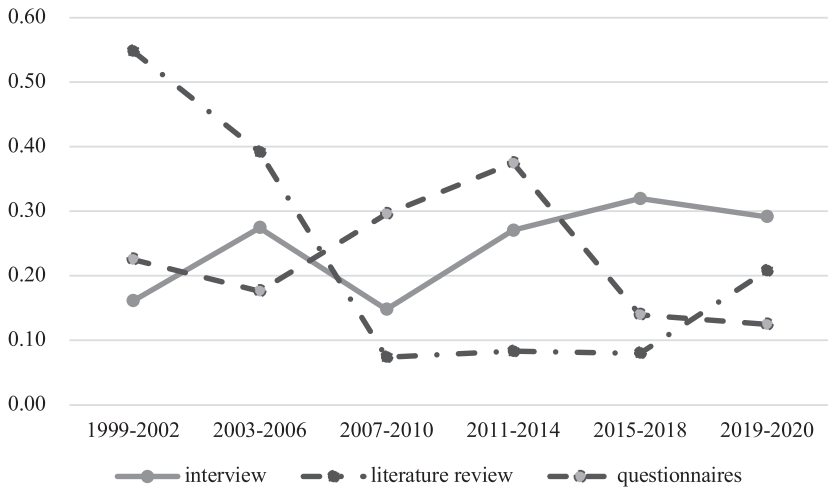


Figure 4. Shifts of Top 3 Research Methods Adopted over Time

discussion of theories appeared. For example, reviews or summaries of related studies were either included and integrated with the sections of motivation for studies in "introduction," or presented in a separate section, "literature review/ related studies," which was marked theory touch, LR. Those papers that covered the materials that included contents related to theories as related works, but not focused on theories, were not taken in for later discussion. Papers applied regulations, standards or data collection tools in the studies were not included in the analysis either. The results showed that 114 (49.8%) papers had paragraphs about theories in the contents, and among those works, there were 55 papers theory touched with providing background information of the researches or including related works in the texts as review or discussion with research results, but did not present strong links to theory applications in the research design. Of course it does not mean the authors of those works did not apply any theories. The results only indicate that the links between the works and theories could not be recognized via writing. Different from those 55 papers, there were 60 papers that included the discussion of theories in the sections of research design, either as research framework or foundation for data analysis. Table 9 presents the numbers of papers that were with different levels of theory touch.

To further uncover the changes of levels of theory touch over time, the theory touch indexes, Theory Touch Paper Index (TTPI) and Theory Touch Level Index (TTLI) were applied. The indexes were weighted by percentage of the papers with theory touch (TTPI), and level values (TTLI). The results show there was an increase in percentage of papers with theory touch. In the earlier stage, only 22.58% (7) of papers mentioned theories in the texts of the papers issued during the years from 1999 to 2002, and the theory touch ratio increased to over 50% of papers almost all the years afterwards. To present

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Table 9. Theory Touch Levels, Number of Papers per Type

Level types	Theory touch	Definition	No. of papers	Sub-total
Theory Mentioned	LR	Theories mentioned in introduction/ literature review	24	55
	D	Theories mentioned in discussion only	1	
	LR/D	Theories mentioned in introduction/ literature review and discussion	30	
Research Impact	LR/RD	Theories mentioned in introduction/ literature review, and research design	8	60
	LR/RD/D	Theories mentioned in introduction/literature review, research design, and discussion	44	
	RD	Theories mentioned in research design only	5	
	RD/D	Theories mentioned in research design and discussion	3	

the levels of the theory touch, points were assigned to the different types of theory touch to rate the levels. Table 10 shows the results of TTPI and TTLI every four years.

Before 2007, more works included information on theories were mostly cited to provide background information or just mentioned in the context, rather than influence research design. Level of theory touch changed after 2007, there were higher percentages of theories applied in research designed along with mentioned to provide background information in the papers, except during the period of 2015 to 2018. The point was assigned to each theory touch type and calculated Level Indexes. The results showed that there were higher theory touch levels after 2003 (Figure 5).

Observing the levels of theory touch in the works that covered the major subjects, such as information behavior, information organization and research evaluation, the results showed that the works targeted information behavior had higher theory touch level, over 70% of the papers included discussion on theories in the works, both in paper index and level index, and the latter works demonstrated higher theory touch level compared than the works done in the earlier stages. For the works targeted research evaluation and information organization, there were with 34.8% and 17.4% of the works covered the discussion on theories. Comparing the methods adopted in the works, for the ones related to research evaluation, which applied bibliometrics techniques, the common methods and indicators applied in prior studies would be seen in the works. For the works focused on information organization, literature review and document analysis were the major methods, which were not necessary to mention nor apply theories in the works.

4. Discussion

The core of classic LIS topics, information behavior and information organization, were the main themes in the 1999 to 2020 JLIS landscape,

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Table 10. Theory Touch, TTPI and TTLI

Theory Touch (TT)	1999-2002		2003-2006		2007-2010		2011-2014		2015-2018		2019-2020	
	PI	LI	PI	LI	PI	LI	PI	LI	PI	LI	PI	LI
Theory Mention (%)												
LR	3.2	3.2	11.8	11.8	11.1	11.1	12.5	12.5	14.0	14.0	4.2	4.2
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	0.0	0.0
LR/D	9.7	19.4	9.8	19.6	11.1	22.2	14.6	29.2	16.0	32.0	16.7	33.3
Sub-total	12.9	**22.6**	21.6	31.4	22.2	33.3	27.1	41.7	32.0	48.0	20.8	37.5
Research Impact (%)												
RD	3.2	4.8	0.0	0.0	0.0	0.0	0.0	0.0	4.0	6.0	8.3	12.5
LR/RD	6.5	16.1	2.0	4.9	0.0	0.0	4.2	10.4	6.0	15.0	0.0	0.0
RD/D	0.0	0.0	3.9	9.8	0.0	0.0	0.0	0.0	2.0	5.0	0.0	0.0
LR/RD/D	0.0	0.0	11.8	**41.2**	33.3	**116.7**	29.2	**102.1**	16.0	**56.0**	29.2	**102.1**
Sub-total	9.7	21.0	17.6	**55.9**	33.3	**116.7**	33.3	**112.5**	28.0	**82.0**	37.5	**114.6**
TT Total (%)	22.6	43.5	39.2	87.3	55.6	150.0	60.4	154.2	60.0	130.0	58.3	152.1

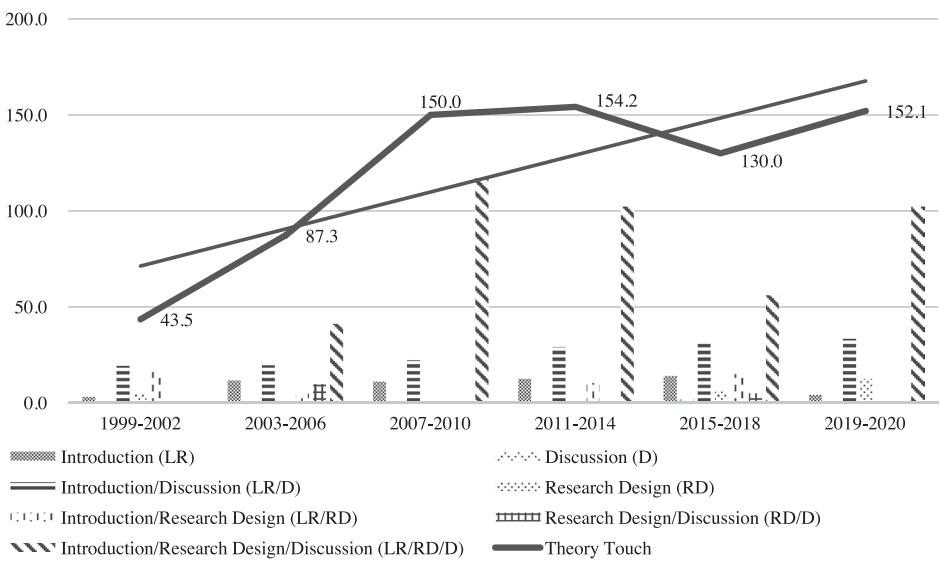


Figure 5. Theory Touch Level, Paper Index and Level Index

which synchronized the global landscape of LIS study that was uncovered in previous studies (Chang et al., 2015; Ma & Lund, 2020). Those studies related to research evaluation added different scenery to the research, and change the landscape after 2018 as the works' authors

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shift the communication channels for research outputs. Unlike other topics, the studies related to documentation, bibliographies, and philology were mainly done by researchers from China, only a few works were done by local authors or authors from other regions. It showed a limited number of researchers in the Taiwan LIS community devoted to this area, or JLIS was not a preferred platform of information sharing for authors who worked on the subjects. Mixed research design and multiple data collection methods enriched LIS studies and theory linkage strengthened the research foundation; but the evidence of the linkage remains implicit for certain amounts of works, even the results showed a higher percentage of JLIS works with theories inclusion in the works comparing to the findings in the previous work (Wu et al., 2017).

Growing numbers of author population showed the expanding of LIS study ground, and more co-authored papers could be observed in the latter years which indicated the shift of authoring styles. JLIS provided a publication platform not only to the members affiliated with NTU, it also attracted the researchers from various institutes, especially the members from other major LIS educational programs in Taiwan. However, the high percentage of one-time authors, especially authors of intra-co-authorship groups, which implies short of sustainable research and publications, might ring a bell to the development of future LIS. Encouragement for continuous research efforts should be put in to ensure the fruitiness and diversity of LIS research to come. As a field with interdisciplinary characteristics, there is room for LIS researchers to work with non-LIS researchers in classics and innovative issues.

JLIS has been an important promoter for LIS studies in Taiwan. The 231 papers draw not only but an essential picture of LIS study in Taiwan for the past 22 years. With the growing research population and area expanding, strengthening research design and theory linkage, the next drawing of LIS landscape is worth to expect.

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Notes

Note 1 The paper count was author count. There was no fraction count taken for the collaborative works in this action.

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Appendix A

Types of Co-authorship

Types of co-authorship	Description	Example
Intra	Co-authors were affiliated with same institution	Department of Library and Information Science, National Taiwan University; Department of Library and Information Science, National Taiwan University
Inter	Co-authors were affiliated with different institutions	(1) Department of Library and Information Science, National Taiwan University; Department of Bio-Industry Communication and Development, National Taiwan University (2) Department of Library and Information Science, National Taiwan University; Department of Information Management, Fu-Jen Catholic University
Academic/Academic	Co-authors were affiliated with institutions of academic sectors	Department of Library and Information Science, National Taiwan University; Department of Information Management, Fu-Jen Catholic University
Academic/Practitioner	Co-authors were affiliated with institutions from academic and practitioner sectors	Department of Library and Information Science, National Taiwan University; Emergency Medicine, Mackay Memorial Hospital
Practitioner/Practitioner	Co-authors were affiliated with institutions of practitioner sectors	Emergency Medicine, Mackay Memorial Hospital; Medical Library, National Taiwan University

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圖書資訊學刊所揭露的臺灣圖書資訊學研究樣貌

A Snapshot of Library and Information Sciences Studies in Taiwan: From the View of Journal of Library and Information Studies

羅思嘉[1]

Szu-Chia Lo[1]

摘　要

本研究採用書目計量和內容分析方法，分析圖書資訊學刊於1999至2020年刊登的文章，以勾勒臺灣圖書資訊學研究的樣貌。觀察重點包括研究人口規模、合著程度、研究主題、研究方法以及理論運用。結果顯示國內圖書資訊學領域研究人口在過去20多年有所成長，但其中以進行單次研究與發表的作者比例較高。資訊行為與資訊組織為主要研究主題；除質與量混合設計，新興研究方法也可見於相關研究中。值得注意的是，除研究續航力，圖資研究的理論依附度有限，內容雖提及理論，但與研究設計架構及結果論述關聯不高，多僅限於提及或用以描述研究背景。結果也發現，研究者將書目計量方法運用於不同學科領域研究成果分析，擴展研究的學科範圍，增加與域外領域的連結度。

關鍵字：圖書資訊學研究趨勢、研究人口、合著程度、研究主題、理論運用

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