On the Evolution of Library and Information Science Doctoral Dissertation Topics in China

Abstract

Previous Studies presented a radical change in Library and Information Science (LIS) research topics in North America. This paper investigates LIS doctoral dissertations in China in terms of their topics and interdisciplinarity in the past 20 years. Results don't find the significant change of LIS dissertation topics in China but reveal that the increase of LIS doctoral research on Information Science is attributed to the increase of admissions to the major Information Science comparing with other majors (Library Science and Archive Studies). This study also shows that the academic background of LIS doctoral advisors does not affect the interdisciplinarity of their student's doctoral dissertations in China.

Keywords:

LIS; Dissertations; Diversity; Advisors; Research Topics

Introduction

Since the 1960s, Library and Information Science (LIS) has been undergoing a period of change wherein questions continue to be asked about the relationship between the library sciences and information science (Dillon, 2007). It is argued that library science and information science are two different fields that have strong interdisciplinary relations (Saracevic, 1999, Holmes, 2002) rather than being defined as part of the interdisciplinary field of LIS (Tang, 2004).

As an original contribution to the advancement of knowledge (Johnson, 2009, O'Connor and Park, 2001), the doctoral dissertation and its field classification can shed light on the transformations of LIS. Shu et al. (2016) investigate the evolution of LIS dissertation research topics as well as their relations in North America and confirm that LIS is still an interdisciplinary field. Other studies have reported the interdisciplinary relations between graduates and their advisors (Sugimoto et al., 2011a), the decreasing usage of the word *library* in LIS doctoral dissertations (Finlay et al., 2012, Sugimoto et al., 2011a) while *information science* surpassed *library science* and became the major research focus of the field (Finlay et al., 2012, Sugimoto et al., 2011a, Larivière et al., 2012). However, most studies were conducted in North America, and no study has yet investigated the evolution of interdisciplinary relations in LIS doctoral dissertation topics in other continents. The purpose of this study is to establish the prevalence of LIS doctoral dissertation topics as well as how they have evolved in China, and to demonstrate the interdisciplinary relationship between these topics using a research topics co-occurrence map.

Literature Review

Scholars began to investigate LIS doctoral dissertations at the end of 1970s (Anselmo, 1982, O'Connor, 1978, Lane, 1975). Houser (1982) defines the discipline of LIS by analyzing the research interests of all LIS doctoral dissertations, which is also used in this study. After examining the title and abstract of LIS doctoral dissertations between 1930 and 2009, Sugimoto et al. (2011a) report that the main topics in LIS doctoral dissertations have changed substantially during the past 80 years. *Library science* is no longer the major research focus in this field: the usage of the term *library science* and library-related words such as cataloging, reference, and collection are diminishing in LIS doctoral dissertations (Finlay et al., 2012, Sugimoto et al., 2011a, Larivière et al., 2012), as well as in scientific papers (Larivière et al., 2012).

Tang (2004) demonstrates the interdisciplinary characteristic of LIS through citation analysis, and reveals that LIS is a highly interdisciplinary field. Chang and Huang (2012) indicate that the degree of LIS interdisciplinarity has increased since the 1970s by investigating the citation, bibliographic coupling, and co-authorship of LIS PhDs' publications from 1978 to 2007. They also find that LIS PhDs collaborate with researchers affiliated with non-LIS-related institutes more frequently. LIS PhDs can benefit from this collaboration with researchers who are more experienced and established (Larivière, 2012). Prebor (2007) finds that two thirds of doctoral dissertations tagged under *Library Science* or *Information Science* in the ProQuest Thesis and Dissertation Database are contributed by non-LIS students who focus on information system, information technology and management of information (Prebor, 2010).

Sugimoto et al. (2009) reveal a radical change on the interdisciplinary background of LIS doctoral advisors, from history and education to computer science and information technology. Sugimoto et al. (2011b) suggest that the disciplinary background of LIS advisors has an impact on the interdisciplinarity of the LIS doctoral dissertation when examining references of 60 LIS dissertations completed between 2000 and 2009 (40 supervised by LIS background advisors and 20 supervised by non-LIS background advisors). They find that dissertations written under LIS background advisors cite more LIS resources while those written under non-LIS background advisors cite more interdisciplinary resources. Unfortunately, no further investigation sampling more LIS dissertation data and exploring more variables in terms of advisors' academic background has been conducted.

In China, LIS is a level-1 discipline defined by the Ministry of Education (MoE) as *Library Science, Information Science and Archives Management* (Ministry of Education of China, 2018), which consists of three level-2 disciplines (majors): *Library Science*, *Information Science*, and *Archive Studies*. University programs, at both undergraduate level and graduate level, are also developed based on these three level-2 disciplines. The history of China's LIS education began with the first LIS school established in 1920 at Wuhan University; in 1990, the first LIS doctoral program was also launched at Wuhan University where the first LIS PhD graduated in 1994. As of 2018, 18 Chinese universities as well as the Chinese Academy of Science (CAS) offer the LIS doctoral program while 6 universities and CAS offer degrees in all 3 majors. School of Information Management at Wuhan University is the dominant LIS school contributing to more than one third of LIS PhDs in China.

The argument regarding the identity of LIS has also been raised by Chinese scholars (Ma, 2013, Zhao, 2013) although most Chinese scholars believe that LIS is an interdisciplinary discipline rather than three independent fields (Li et al., 2018, Chen et al., 2019, Wang and

Zhao, 2015). Dissertation research topics have also been used to investigate the evolution of research topics as well as the interdisciplinary identity within LIS in China. Previous studies confirm the tendency of LIS dissertation research topics that *Library Science* as well as its related topics are no longer the most prevalent research topics in this field (Hou et al., 2013) while topics regarding technology such as *Data Analysis* and *Data Mining* have gradually become popular (Liu and Chen, 2016). However, a longitudinal study sampling more LIS dissertation data and exploring more variables in terms of advisors' academic background has not been conducted.

The purpose of this study is to investigate the trend of LIS doctoral dissertation topics in China and reveal whether the LIS doctoral supervision correlates the variation tendency in LIS. The study will answer the following three research questions:

1. How have the LIS doctoral dissertation topics evolved in China since the 1990s?
2. How has the interdisciplinarity of LIS dissertation evolved in China since the 1990s?
3. Is there a relationship between the doctoral supervisors' background and interdisciplinarity of doctoral dissertation topics?

Methodology

In this study, LIS dissertation data were retrieved from the Wanfang Database, which is one of the major bibliometric databases in China. A collection of 1,018 LIS dissertations published between 1994 and 2018 were retrieved and categorized into three groups based on their majors: *Library Science*, *Information Science*, and *Archival Studies*. Please note that some LIS dissertations were not indexed by Wangfang as Chinese PhD graduates can keep their dissertations confidential for 5 to 10 years, which is a normal practice in China. In addition, 135 LIS doctoral advisors of these dissertations as well as their dissertations and publications (2,153 first-authored papers) were also collected from CNKI (China National Knowledge Infrastructure) to identify their research background.

For each dissertation, the controlled topical terms that refer to *Keywords* indexed by the Wangfang were also retrieved. These keywords represent the research topics of the dissertation. Among the 1,018 dissertations, 645 (63.36%) were assigned to two or more keywords while the rest were assigned to only one keyword. Among 3,360 different keywords retrieved from the database, 2,707 keywords (51.67%) were assigned to only one dissertation while the remaining were assigned to two or more dissertations. Of these, 128 keywords (2.44%) were assigned to 5 or more dissertations; 35 and 9 keywords (0.67% and 0.17% respectively) were assigned to 10 or more and 20 or more dissertations respectively. These keywords could be categorized into 20 classifications within the LIS based on National Social Sciences Foundation (NSSC) Scheme (Qin, 2013) as shown in Table 1. Each classification represents a major research topic in LIS.

Although Chinese Library Classification (CLC) is the most popular classification scheme in China, it separates *Information Science* from *Library Science* and *Archive Studies*; *Information Science* is classified under the category *Science and Scientific Research* while both *Library Science* and *Archive Studies* are classified under the category *Information and Communication Studies*. Thus, in this study, we decided to select the NSSC scheme that classifying these three into the same category *Library Science, Information Science and Archive Studies*.

Table 1 Classification of Keywords of LIS PhD dissertations in China (1994-2018)

Classification	Sample Keywords
Innovation of Library Service	Public library, Digital music library, Digital library, Local university library, Library automation system, Private library
Information Policy and Copyright	Network information policy, Electronic information policy, National information policy, Intellectual property management, Intellectual property information, Transfer of patent rights
Literature Research	Electronic literature research, Document communication, Ancient literature, Characteristic literature, Archival literature
Information Research	Information science, Intelligence analysis, Effectiveness evaluation of intelligence research, Information signal, Library and information agency
Knowledge Management	National knowledge innovation, Knowledge sharing, Knowledge supply chain, Knowledge collaboration, Remote electronic document cataloging, Thesaurus, Classification and massification, Interoperability, SOA, Social annotation, Semantic mining, Semantic analysis, Mass classification, Tag library, Associated data, Ontology learning, Domain ontology
Knowledge Aid and Guarantee	Social security, Information security, Information demand, User requirement, Digital rights management, Information service
Archive and Publication	Archival knowledge, Archival database, Archive management, Archival publishing, Archival documentary heritage, Archival historical material, Social memory, Electronic publishing, Digital publishing, Open publishing
Informetrics and Research Evaluation	Academic evaluation, Resource evaluation, Evaluation criteria, Citation network, Peer review, Scientific measurement, Social network analysis, Bibliometrics, Electronic literature, Reference, Patent measurement
Resource Construction	Human resource management, Information resource matching, Digital document resource aggregation, Information resource construction, Digital resource sharing
Corporation and Government Service	Enterprise management, SMEs, Software company, Networked enterprise, Enterprise alliance service, Government information resource development, Electronic document management, E-government
User Behavior	User information needs, User generated behavior, User behavior characteristic, User need, User context, Metric formula, Sustainable behavior
Network and Community	Network public opinion analysis, Internet, Online community, Virtual community, Academic community, Network environment, Innovation team
Law and Policy	Archival policy, Library policy, Industrial policy, Science and technology policy, Library law, Archival law
Big Data	Industrial competition, Information recycling, Data mining, Crisis

	warning, Optimization analysis
Theoretical Research	Situational theory, Information flow theory, Contingency theory, Game theory, Academic thought
Technology and Standard	Technical standard, Standard system, Standard specification, Associated data, Digital technology, Push technology
Competitive Intelligence	Dynamic competition, International competitiveness, Competitive intelligence mechanism, Competitive advantage
Information Organization and Retrieval	Network information retrieval, User-oriented information retrieval, Information retrieval system
Information Industry and Security	Information security system, Information security strategy, Information security risk assessment, Information industry structure, Information industry trade
Non-LIS Topics	Interdisciplinary, XML, Financial organization, Graduate education

Finally, every research topic (classification) pair assigned to dissertations with two or more research topics was labeled as a co-assigned pair of research topics. Each research topic co-assignment was imported into the Gephi (2015) graph drawing application in order to generate a visual map of the LIS PhD research topics where research topics are nodes drawn as colored circles and topic co-occurrences form edges (i.e. lines) between them. Modularity was used to produce the clusters when its resolution was set to 1. Clusters were colored differently and randomly but the nodes and edges within the same cluster were assigned to the same color. These co-occurrence maps can explain the evolution of LIS dissertation research topics in China.

Results

As Table 2 shows, from 1994 to 2018, 1,018 PhDs graduated from 13 institutions with Wuhan University as the largest source with 308 PhD graduates. More than half of the LIS PhDs (598 out of 1,018) are in *Information Science* programs while 292 and 128 LIS PhDs graduated from *Library Science* and *Archival Studies* programs respectively. Indeed, only 4 universities offer a PhD program in *Archival Studies*, and Renming University of China contributed 82.03% (105/128) of the PhD graduates in *Archival Studies*.

Table 2 Distribution of LIS dissertation in China (1994-2018)

University	LIS Dissertation	Library Science	Information Science	Archival Studies
Wuhan University	308	97	198	13
Chinese Academy of Sciences	175	90	85	0
Renmin University of China	128	2	21	105
Nanjing University	112	11	101	0
Peking University	109	43	65	1
Jilin University	82	15	67	0
Nankai University	35	27	8	0

Central China Normal University	33	1	32	0
PLA Information Engineering University	15	0	15	0
Yunnan University	9	0	0	9
Sun Yat-Sen University	6	6	0	0
Beijing Normal University	4	0	4	0
PLA University of International Relations	2	0	2	0
Total	**1,018**	**292**	**598**	**128**

The number of LIS PhDs increased from 4 in 1994 to a peak of 100 in 2011 as shown in Figure 1; then this number decreased radically. One possible reason is that some LIS dissertations have not been released yet due to the confidentiality agreement[1]; in addition, some universities may not authorize Wangfang to index their theses and dissertations (Lin and Fu, 2019). The restriction of data availability is a limitation of this study. In addition, a trade-off between major *Library Science* and *Information Science* is found that two third of LIS PhDs were in major *Library Science* before 2000 while the same ratio of LIS PhDs was in major *Information Science* after 2010.
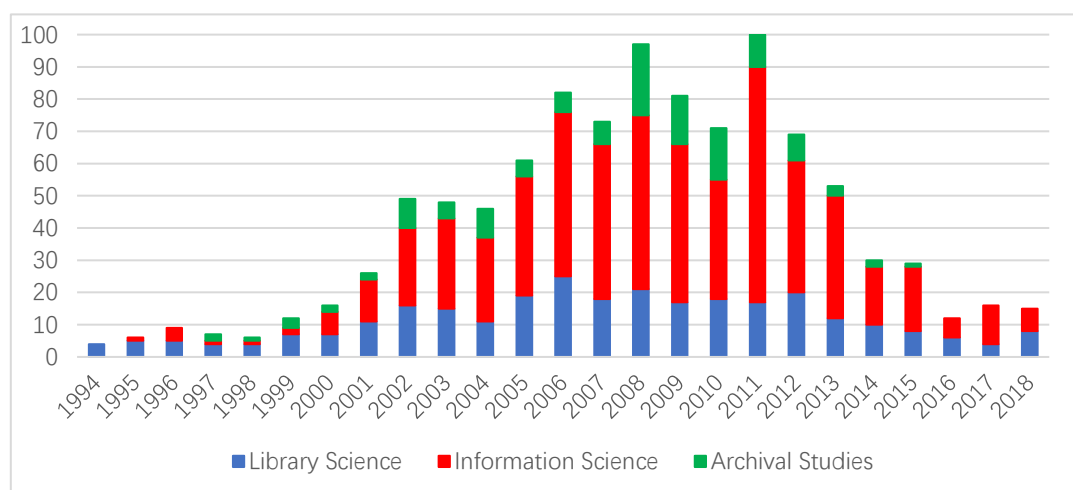

Figure 1 Distribution of LIS PhDs in China (1994-2018)

Evolution of Dissertation Topics

In this study, 373 out of 1,018 LIS dissertations were assigned only one research topic (hereinafter referred to as single research topic dissertation or SRT dissertation) while 645 were assigned two to four research topics (hereinafter referred to as multiple research topics dissertation or MRT dissertation). The average number of research topics per dissertation is 1.79 during the 24 years (1994-2018). As Figure 2 shows, the mean number of research topics

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[1] In China, PhD students could optionally sign a confidentiality agreement (1 to 5 years) when submitting their dissertations. The purpose of this confidentiality agreement is to keep their research results confidential for a period so that PhD graduates could publish their dissertation research in journals or monographs.

assigned to LIS dissertations increased from 1.00 in 1994 to 2.03 in 2008 and declined afterwards to 1.4 in 2018; meanwhile, the proportion of MRT dissertations also increased from 0% in 1994 to 78.69% in 2005 and decreased to 40.00% in 2018. As investigating these two indicators by major, PhDs in *Information Science* have more chances conduct an MRT dissertation research (1.85, 65.72%), followed by *Archival Studies* (1.77, 64.84%) and *Library Science* (1.69, 57.88%), but there is no huge difference among these three majors.
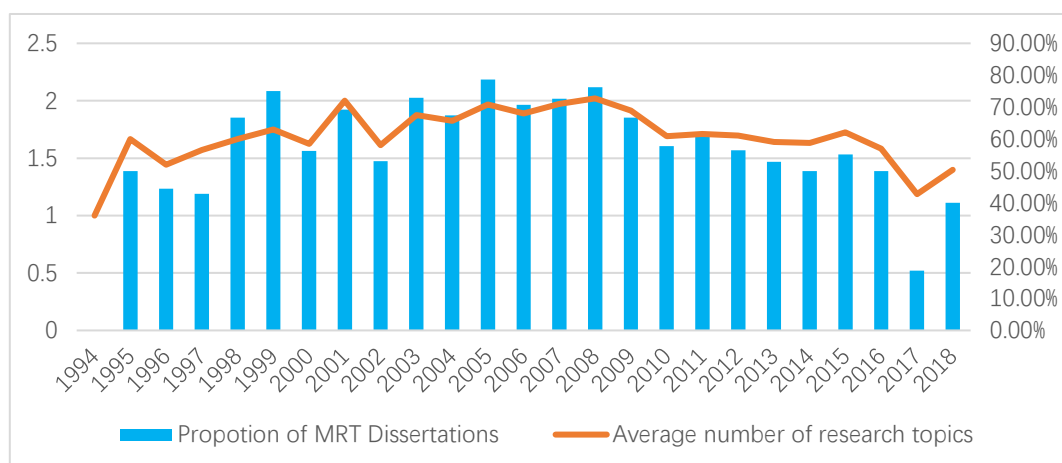

Figure 2 The trend of the number of LIS dissertation research topics in China (1994-2018)

Among the 20 LIS research topics, *Knowledge Management* is the most popular one appearing in 217 dissertations (21.3%), followed by *Informetrics and Research Evaluation* (151, 14.8%) and *Corporation and Government Service* (145, 14.2%), as shown in Table 3. Since more than half of LIS PhDs in China graduated with the major of *Information Science*, the bias exists in the results against the other two majors (i.e., *Library Science* and *Archival Studies*). The most popular research topics in *Library Science* and *Archival Studies* are *Innovation of Library Service* (77, 26.4%) and *Archive and Publication* (63, 49.2%) respectively.

Table 1 Distribution of LIS dissertation research topics in China (1995-2018)

Topic	Number	Library Science	Information Science	Archival Studies
Knowledge Management	217	51	157	9
Informetrics and Research Evaluation	151	14	136	1
Corporation and Government Service	145	21	90	34
Resource Construction	141	45	72	24
Network and Community	128	26	94	8
Non-LIS Topics	126	52	49	25
Innovation of Library Service	106	77	28	1
Archive and Publication	93	22	8	63
Technology and Standard	86	21	55	10
Literature Research	83	51	14	18
Information Industry and Security	79	0	74	5

User Behavior	68	17	46	5
Information Organization and Retrieval	63	12	51	0
Competitive Intelligence	60	8	52	0
Information Policy and Copyright	55	28	16	10
Theoretical Research	54	15	34	6
Big Data	53	6	46	1
Information Research	51	6	45	0
Knowledge Aid and Guarantee	38	7	27	4
Law and Policy	22	11	9	2

Figure 3 shows the evolution of major LIS dissertation research topics in China between 1994 and 2018 as we divide the 24 years into four periods (before 2000, 2000-2005, 2006-2010 and after 2010). *Literature Research* was the dominant research topic before 2000, but the LIS dissertation research topics became diverse afterwards. *Knowledge Management* was the most popular research topic in the new century while an obvious increase in terms of the number of LIS dissertations on *Informetrics and Research Evaluation* was shown in the past 10 years. Indeed, the change in the distribution of LIS dissertation research topics is also attributed to the increase of the number of LIS PhDs with major *Information Science*. There is no obvious change of research topics in all three majors. *Innovation of Library Service*, *Literature Research* and *Knowledge Management* are the top three dissertation research topics in major *Library Science* at all periods while *Knowledge Management*, *Network and Community, Informetrics Research Evaluation* and *Archive and Publication*, *Corporation and Government Service*, *Resource Construction* are the top three research topics in major *Information Science* and *Archive Studies* respectively. As a whole, in the past 20 years, less and less dissertations focused on *Literature Research* or *Information Research* decreases while more and more dissertations were about *Informetrics and Research Evaluation*.
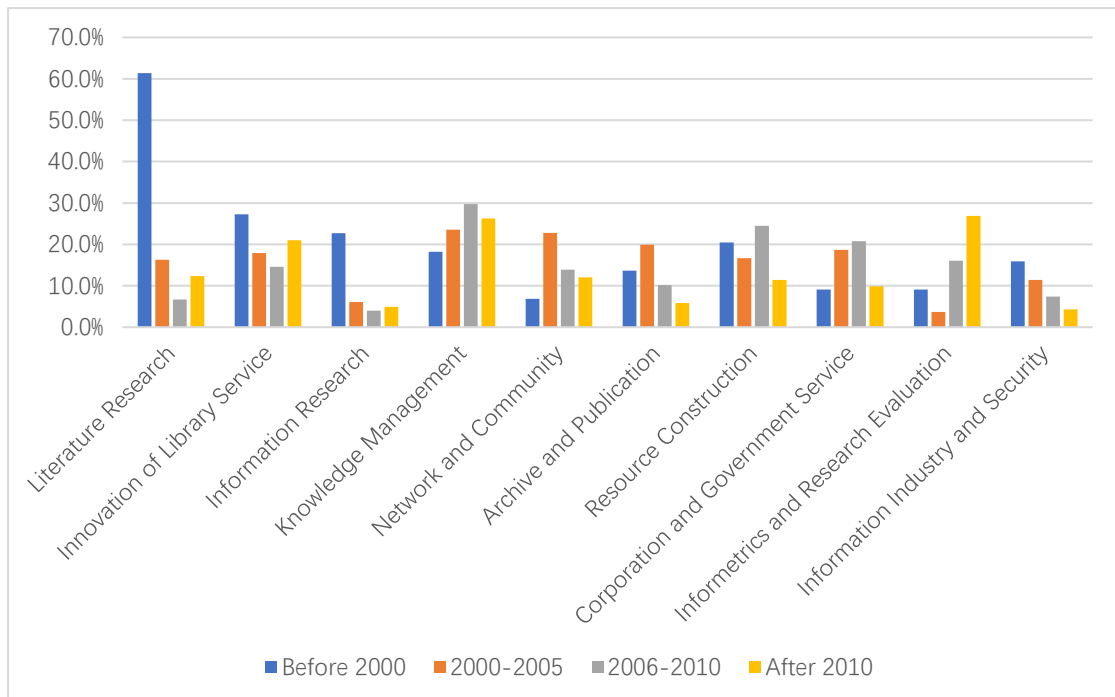
Figure 3 The evolution of major LIS dissertation research topics in China (1994-2018)

Dissertation Topic Co-assignment

In order to investigate the relationship among different LIS research topics in LIS dissertation research, the visual mapping considered 165 co-assignment dissertation research topic pairs and their 807 appearances in 645 MRT dissertations (presented in Figure 4). Both *Knowledge Management - Network and Community* and *Knowledge Management - Corporation and Government Service* account for 26 assigned topic pairs, followed by *Resource Construction - Network and Community* (21), and *Resource Construction - Corporation and Government Service* (20). It is noted that *Resource Construction* is the most popular co-assigned research topic and is co-assigned with all other 19 research topics; on the other hand, *Knowledge Management* is co-assigned with 15 other research topics although it is assigned in 186 MRT dissertations.

As the modularity resolution was set as 1.0, three clusters were also indicated in Figure 4 that could partly represent Library Science (in orange), Information Science (in blue), and Archive Studies (in green) respectively. Indeed, there is a strong triangle relationship among *Knowledge Management, Resource Construction* and *Innovation of Library Services* in *Library Science* dissertations while *Archive Studies* dissertations focus on *Archive and Publication* and *Other;* on the other hand, dissertation research in *Information Science* covers various LIS research topics.

Figure 4 Research topic co-assignment of LIS dissertation in China

Impact of Advisors

The role of LIS supervisors' research background on their students' research topics was also investigated in this study. Among the 135 LIS doctoral supervisors, the research background of 72 supervisors with a doctoral degree was identified by their dissertations; the research background of the remaining 63 LIS supervisors without a doctoral degree[2] was investigated by their 1,978 publications. Eventually, we found that 66 supervisors (48.9%) originated from LIS while 69 supervisors (51.1%) were from other fields, which is attributed to the systematic recruitment of multidisciplinary faculty members who are from computer science, or other ICT fields in the last decades.

From 1994 to 2018, 135 supervisors supervised 1,018 doctoral students; each of these supervisors supervised 1 to 40 doctoral graduates. As shown in Figure 5, the proportion of non-LIS supervisors increased and surpassed the proportion of LIS supervisors in 2016. With the increase of the number of Non-LIS supervisors, more and more LIS doctoral students were supervised by non-LIS supervisors compared with LIS supervision. This trend is partly attributed to the diversity of faculty recruitment as LIS schools would like to hire more faculty members with interdisciplinary background or from other fields.

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[2] Prior to 2000s, the minimum requirement for a faculty position is a master's degree in China. Thus, there are a lot of Chinese professors (most are full professors) without a doctoral degree, not only in LIS but also in other disciplines.
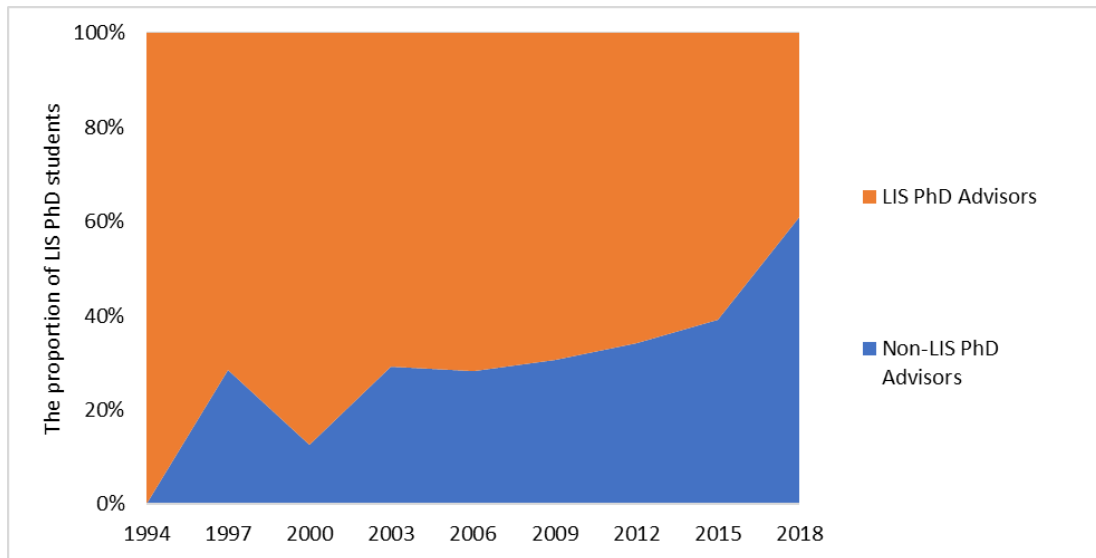
Figure 5 Proportion of LIS advisors and non-LIS advisors (1994-2018)

However, the impact of LIS doctoral advisors' research background on their students' dissertations is not significant. As Figure 6 shows, 63.1% (422/1018) of LIS PhDs under LIS supervision conducted an MRT dissertation; and the proportion of LIS PhDs under non-LIS supervision completing an MRT dissertation is 63.9% (223/349). The 0.8% difference between LIS and non-LIS supervision is marginal.
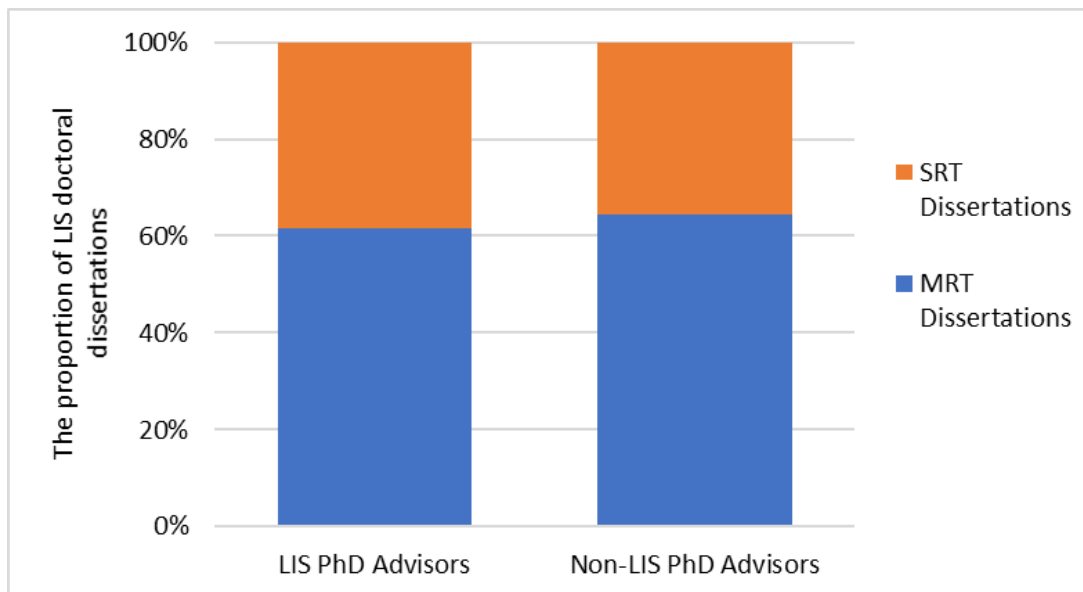

Figure 6 Diversity of research topics in LIS Doctoral Dissertation by the background of LIS PhD advisors

Discussion and Conclusion

Based on the analysis and mapping of the evolution of the dissertation research topics found in China's LIS doctoral dissertations, we find that there is no obvious change in LIS dissertation search topics in China as the investigation was conducted on all three LIS majors: *Library*

Science, *Information Science* and *Archival Studies*. In the past 20 years, since more and more LIS doctoral students were admitted with the major *Information Science* than the other two majors, research topics related to *Information Science* such as *Knowledge Management* and *Informetrics and Research Evaluation* replaced research topics related to *Library Science* and became popular LIS research topics but no obvious change is observed at the major level. In addition, we find that LIS doctoral students in major *Information Science* completed more MRT dissertations covering almost all LIS research topics while LIS doctoral students in other two majors prefer to conduct SRT dissertations or dissertations focusing on some traditional research topics.

This study does not confirm the findings of previous studies showing a radical change that *Information Science* has replaced *Library Science* as the most prevalent dissertation topic and the shift towards interdisciplinary dissertation research in North America. The variance may be attributed to the different education system between China and North America. LIS PhDs in North America are admitted to the same LIS program with different research directions while their counterparts in China are admitted to three different majors under the LIS program. As a result, the data analysis in this study is conducted at the level of major while previous studies were conducted at the level of program, contributing to different results between this study and previous studies. Indeed, this study reveals the change of LIS PhD program enrolment in China that more and more students were admitted to major *Information Science* than the other two majors, leading to the perception that more and more LIS dissertations focused on *Information Science* than *Library Science*.

In addition, this study does not find that LIS doctoral advisors' research background has an impact on their students' dissertation research topics in China, which was reported by previous studies in North America. The difference as well as its reasons should be explored by future studies.

There are still some limitations to this study. The data set is not complete because some dissertations are missing due to the confidentiality agreement and some LIS doctoral advisors cannot be identified; the research background of LIS doctoral advisors without a doctoral degree had to be identified by their publications; LIS dissertation research topics were categorized based on the National Social Science Fund Project, and the effect of the classification scheme needs to be considered. Future research should retrieve a full data set and apply the same classification scheme as other previous studies to make further investigations.

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