On the Evolution of Library and Information Science Doctoral Dissertation Topics in North America (1960–2013)

Fei Shu
School of Information Studies, McGill University. Email: fei.shu@mail.mcgill.ca

Vincent Larivière
École de bibliothéconomie et des sciences de l'information, Université de Montréal. Email: vincent.lariviere@umontreal.ca

Philippe Mongeon
École de bibliothéconomie et des sciences de l'information, Université de Montréal. Email: philippe.mongeon@umontreal.ca

Charles-Antoine Julien
School of Information Studies, McGill University. Email: charles.julien@mcgill.ca

Andrew Piper
Department of Language, Literatures, and Cultures, McGill University. Email: andrew.piper@mail.mcgill.ca

Since the 1960s, many scholars have questioned the relationship between library science and information science. This paper investigates LIS doctoral dissertations in terms of their topics and interdisciplinarity in the period 1960–2013. Results show that LIS is an interdisciplinary field in which library science and information science are intimately related. The study shows that Information Science has surpassed Library Science to become the dominant research topic in LIS. It also shows that the academic background of doctoral advisors affects the interdisciplinarity of their student's doctoral dissertations.

Keywords: library and information science education, dissertation topics, bibliometrics, academic advisors, doctoral education

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 library science and information science are two different fields that have strong interdisciplinary relations (Holmes, 2002; Saracevic, 1999) rather than being part of the interdisciplinary field of LIS (Tang, 2004). As an original contribution to the advancement of knowledge (Johnson, 2009; D. O'Connor & Park, 2001), the doctoral dissertation and its topical field classification can shed light on the transformations of LIS research. For example, this approach has been used to investigate the interdisciplinary relations between graduates and their advisors (Sugimoto, Li, Russell, Finlay, & Ding, 2011). Studies have reported a decreasing use of the word *library* in LIS doctoral dissertations (Finlay, Sugimoto, Li, & Russell, 2012; Sugimoto, Li, *et al.*, 2011), and that *information science* has surpassed *library science* to become the most prevalent research topic in LIS (Finlay *et al.*, 2012; Larivière, Sugimo-

ISSN: 0748-5786
doi:10.12783/issn.2328-2967/57/2/5

to, & Cronin, 2012; Sugimoto, Li, *et al.*, 2011). However, no study has investigated the evolution of the interdisciplinary relations in LIS doctoral dissertations topics. The purpose of this study is to establish the prevalence of LIS doctoral dissertation topics. It also investigates how dissertation topics have evolved since the 1960s' and demonstrates the interdisciplinary relationship between dissertation topics in this period.

Literature Review

Studies that investigate LIS doctoral dissertations have shown that *Library Science* is no longer the dominant research topic in LIS. Scholars began to investigate LIS doctoral dissertations at the end of 1970s (Anselmo, 1982; Lane, 1975; M. O'Connor, 1978). Houser (1982) defines the discipline of LIS by analyzing the research interests of all LIS doctoral dissertations, which are used in the current research. After examining their titles and abstracts between 1930 and 2009, Sugimoto, Li, *et al.* (2011) report that the main topics in LIS doctoral dissertations have changed substantially during the past 80 years. Specifically, *Library Science* is no longer the most prevalent research topic in this field. Studies report a diminishing use of the term *Library Science* and library-related words such as cataloging, reference, and collection. This trend has been reported in the context of LIS doctoral dissertations (Finlay *et al.*, 2012; Sugimoto, Li, *et al.*, 2011) and in scientific papers (Larivière *et al.*, 2012).

An increase in the interdisciplinarity in LIS dissertations is well documented. Tang (2004) uses citation analysis to show 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 journal articles from 1978 to 2007. They also report an increase in collaborations between LIS PhDs and researchers affiliated with non-LIS institutes. LIS PhDs benefit from collaborations with more experienced and established researchers since it improves their productivity in terms of publications (Lariviere, 2012).

Previous research suggests that LIS doctoral advisors' disciplinary background influence the interdisciplinarity of their student's doctoral dissertations. Sugimoto, Russell, and Grant (2009) reveal a radical change in the interdisciplinarity of LIS doctoral advisors: it generally shifts from history and education to computer science and information technology. Sugimoto, Ni, Russell, and Bychowski (2011) indicate that the disciplinary background of LIS advisors has an effect on the interdisciplinarity of the LIS doctoral dissertation. They examined the references from 60 LIS dissertations completed between 2000 and 2009, of which 40 were supervised by advisors with an LIS background and 20 were supervised by advisors with a non-LIS background. Results show that dissertations written under the supervision of advisors with an LIS background cite more LIS resources while those written under advisors with non-LIS backgrounds cite more interdisciplinary resources.

Although previous studies report the evolution of research topics and interdisciplinarity of LIS doctoral dissertations by investigating their titles, abstracts, references and citations, no research explores this evolution by analyzing the controlled topical terms from the ProQuest Subject Categories used by the ProQuest Thesis and Dissertation Database. All submitting authors are required to select one or more subject categories that best describe the field(s) of the dissertation's research (ProQuest). The chosen controlled topical terms represent the dissertation research's topic(s) from the authors' point of view. Sugimoto, Ni, *et al.* (2011) is the only study concerning the effects of LIS doctoral advisors' disciplinary background on the interdisciplinarity of their student's doctoral dissertations; however,

it is based on a small data set consisting of 60 LIS dissertations. Their results should be validated using a larger sample of LIS dissertations and additional interdisciplinarity variables that describe the advisors' academic background. In order to address these gaps this study investigates the controlled topical terms found in the ProQuest Thesis and Dissertation Database to reveal the evolution in LIS doctoral dissertation topics and whether the LIS doctoral supervision interdisciplinarity correlates with the change in LIS dissertation topics. Specifically:

1. How have LIS doctoral dissertation topics evolved since the 1960s?
2. How interdisciplinary are LIS theses and how has this evolved since the 1960s?
3. How are these evolutions affected by the doctoral advisors' academic background?

Methodology

Dissertations produced between 1960 and 2013 by 44 ALA schools were collected. These schools are found in the database of ALA accredited programs(ALA), which indicates that 36 ALA schools are currently offering a PhD program; there are five discontinued ALA schools, and three current ALA schools that once offered a PhD program.

Collecting a list of LIS PhD dissertations involved three steps. First, a manually validated list of graduated PhD students between 1960 and 2013 and their advisor(s) was compiled using the MPACT database (MPACT, 2010), which records all LIS PhDs from 1930 to 2009. Second, LIS PhDs who graduated after 2009 were identified and added to the list by searching the ProQuest Thesis and Dissertation Database and corresponding university websites. Finally, all LIS doctoral dissertations corresponding to this list of LIS PhD graduates were retrieved from the ProQuest Thesis and Disserta-

Table 1. Numbers of LIS PhDs and Dissertations Retrieved by University (1960–2013).

University	PhD	Dissertation
Pittsburgh	406	407*
Rutgers	275	275
Florida State	255	254
Illinois	217	216
North Texas	199	199
Indiana	187	187
Michigan	175	175
Columbia**	160	159
Case Western Reserve**	134	134
North Carolina	114	114
Syracuse	108	108
Wisconsin, Madison	105	105
Berkeley**	101	100
Drexel	93	93
Simmons	82	36
Texas Woman's	78	78
Albany, SUNY	77	77
Texas, Austin	77	67
UCLA	75	75
Toronto	74	74
Western	64	57
Chicago**	60	60
Southern California**	50	50
Hawaii	41	41
Missouri	41	41
McGill	33	24
Washington	29	29
Emporia State	27	27
Alabama	25	25
Arizona	17	17
Minnesota***	17	17
Buffalo, SUNY***	16	16
Tennessee	13	4
Long Island	12	12
Montreal	12	12
British Columbia	11	0
Dominican	9	0
Wisconsin, Milwaukee	9	8
San Jose State	5	0
Alberta	5	5
Oklahoma***	4	4
South Carolina	4	4
Kentucky	1	1

*One PhD graduate from Pittsburgh obtained double doctoral degree.

**Discontinued ALA Schools.

***ALA Schools offering a PhD Program in history.

tion Database based on their availability. This process produced a list of 3,450 LIS doctoral dissertations from a total of 3,561 graduated LIS PhD students, meaning that 96.9% of doctoral dissertations were collected as shown in Table 1.

In addition, 754 LIS PhD advisors' doctoral dissertations (86.4% of all advisors) were collected of which 258 dissertations are also part of the 3,450 LIS dissertations. These dissertations establish 3,171 doctoral student/advisor relation pairs (including 211 co-supervision).

For each dissertation, their controlled topical terms (hereinafter referred to topics) were retrieved from the *Subject Classifications* field found in the ProQuest Thesis and Dissertation Database. Dissertations with 2 and more topics were coded as interdisciplinary; this produced a list of 1,797 interdisciplinary dissertations that contained 10,182 topic pairs of which 2,356 were unique co-assigned topic pairs.

A co-occurrence map illustrates the trends in LIS dissertation topic co-assignments; the technique is established (Leydesdorff & Rafols, 2009; Yan, Ding, & Zhu, 2010; Zhao, 2009) and appropriate when the objective is to highlight how objects are related. Topic co-assignments were imported into the Gephi (2015) graph drawing application in order to generate a visual map of the LIS PhD topics where topics are nodes drawn as colored circles and topic co-occurrences form edges (i.e. lines) between them. These maps can reveal clusters that express the prevalence of topic co-assignments; the nodes and edges within the same cluster were assigned to the same color. To reveal the evolution of topic prevalence the data was analyzed by the number of co-assignments in groups based on the decade of graduation.

Results

Evolution of Dissertation Topics

The number of yearly LIS PhD graduates increases from 18 in 1960 to 114 in 2013 and reaches its highest number of graduates (116) in 2010. Among the 3,450 LIS doctoral dissertations, 1,797 are interdisciplinary dissertations with 2 to 7 topics, and the mean number of topics per dissertation is 1.902. Figure 1 shows that this number has increased from 1.006 in the 1960s to 2.701 in the 2010s while the percentage of interdisciplinary dissertations has increased from 0.6% to 88.5% over this time. Note that in both cases Figure 1 shows an abrupt increase in the late 1980s.

Figure 2 presents the prevalence of dissertation topics from 1960 to 2013. *Library Science*, the most prevalent topic, appears in 2,326 dissertations (67.4%), but it is assigned to 96.5% of dissertations in the 1960s down to 45.0% in the 2010s. *Information Science* appears in 1,541 dissertations (44.6%) and becomes the most prevalent topic after the 2000s: its ratio increases from 0% in the 1960s to 81.1% in the 2010s. 562 dissertations (16.3%) contain both *Library Science* and *Information Science* while 46 (4.2%) have neither. *Computer Science, Educational Technology*, and *Higher Education* were ranked 3rd to 5th, but their shares are less than 10% of the total topic assignments.

Dissertation Topic Co-Assignments

From 1960 to 2013, *Library Science* and *Information Science* account for 12.5% (1,272/10,182) of assigned topic pairs, followed by *Information Science* and *Computer Science* (350), and *Information Science* and *Educational Technology* (200). The evolution over time shows that there was one interdisciplinary dissertation in 1960s containing one topic pair: *Library Science* and *Modern Literature*. The interdisciplinary topic maps for each decade from the 1970s to the 2010s are presented in Figure 3. In the 1970s a marked increase in the number of interdisciplinary LIS dissertations produces three separate clusters but *Library Science* and *Information Science* are not yet significantly connected. A single cluster forms during the

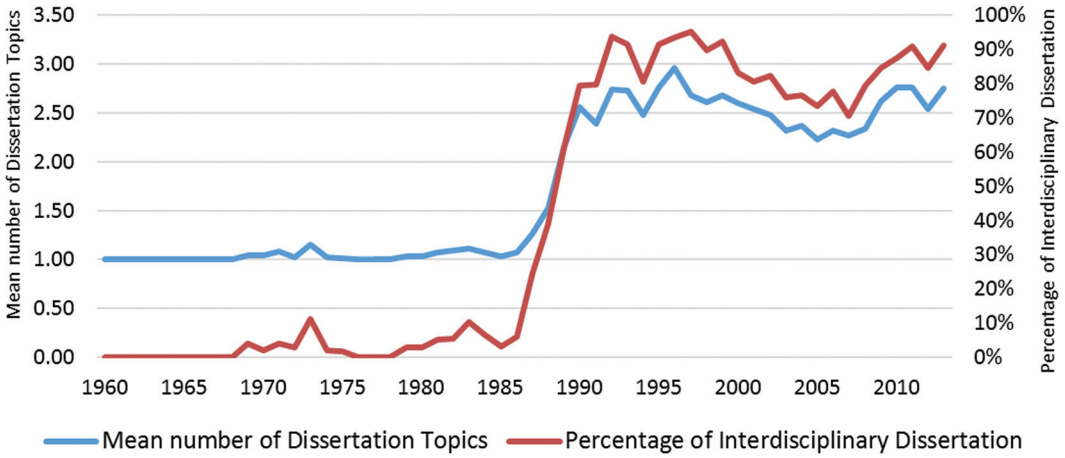

Figure 1. Degree of interdisciplinarity in LIS doctoral dissertations (1960–2013).

1980s and 1990s, representing the field of LIS with *Library Science* and *Information Science* as its two main topics. Since the 1990s, *Information Science* has replaced *Library Science* as the dominant LIS topic as shown by the size of the node circles in the 2000s and 2010s.

LIS Doctoral Advisor

The radical growth in the number of multidisciplinary dissertation may in part be explained by the systematic recruitment of multidisciplinary faculty members that in turn attract and supervise multidisciplinary PhD students. To verify this possibility 754 dissertations written by LIS advisors were analyzed as a group. Figure 4 shows that 371 advisors (49.2%) obtained a doctoral degree in LIS and the remaining 383 (50.8%) were from other fields, and 30.2% (228/754) of LIS advisors' dissertations are interdisciplinary.

From 1960 to 2013, these 754 advisors collectively supervised 2,999 PhD students, each supervising between 1 and 53 graduating PhDs. Figure 5 shows that the ratio of LIS PhDs supervised by advisors with LIS/non-LIS degree increases since the late 1970s. Figure 6 shows that

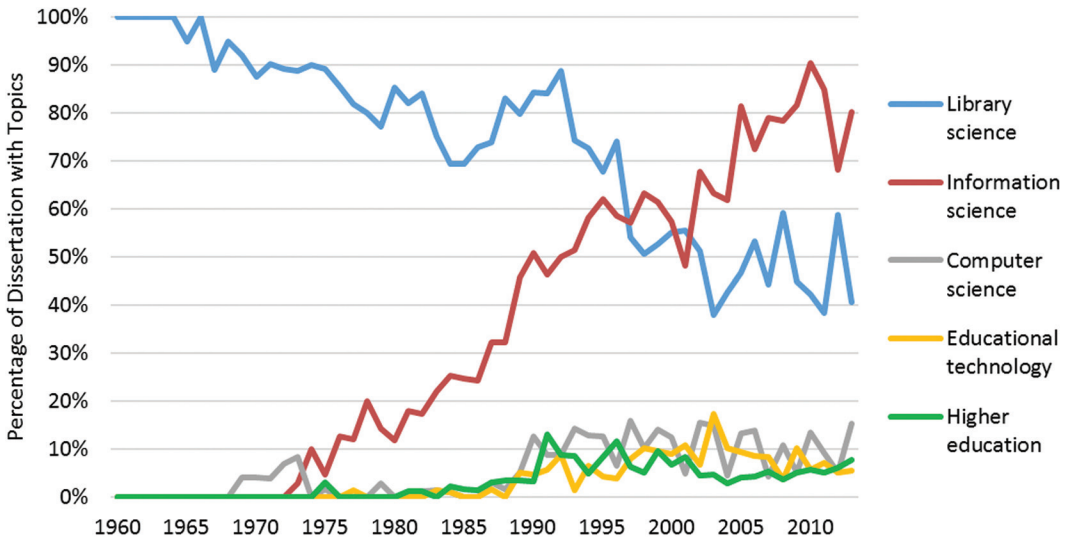

Figure 2. Top 5 topical terms of LIS doctoral dissertations (1960–2013).

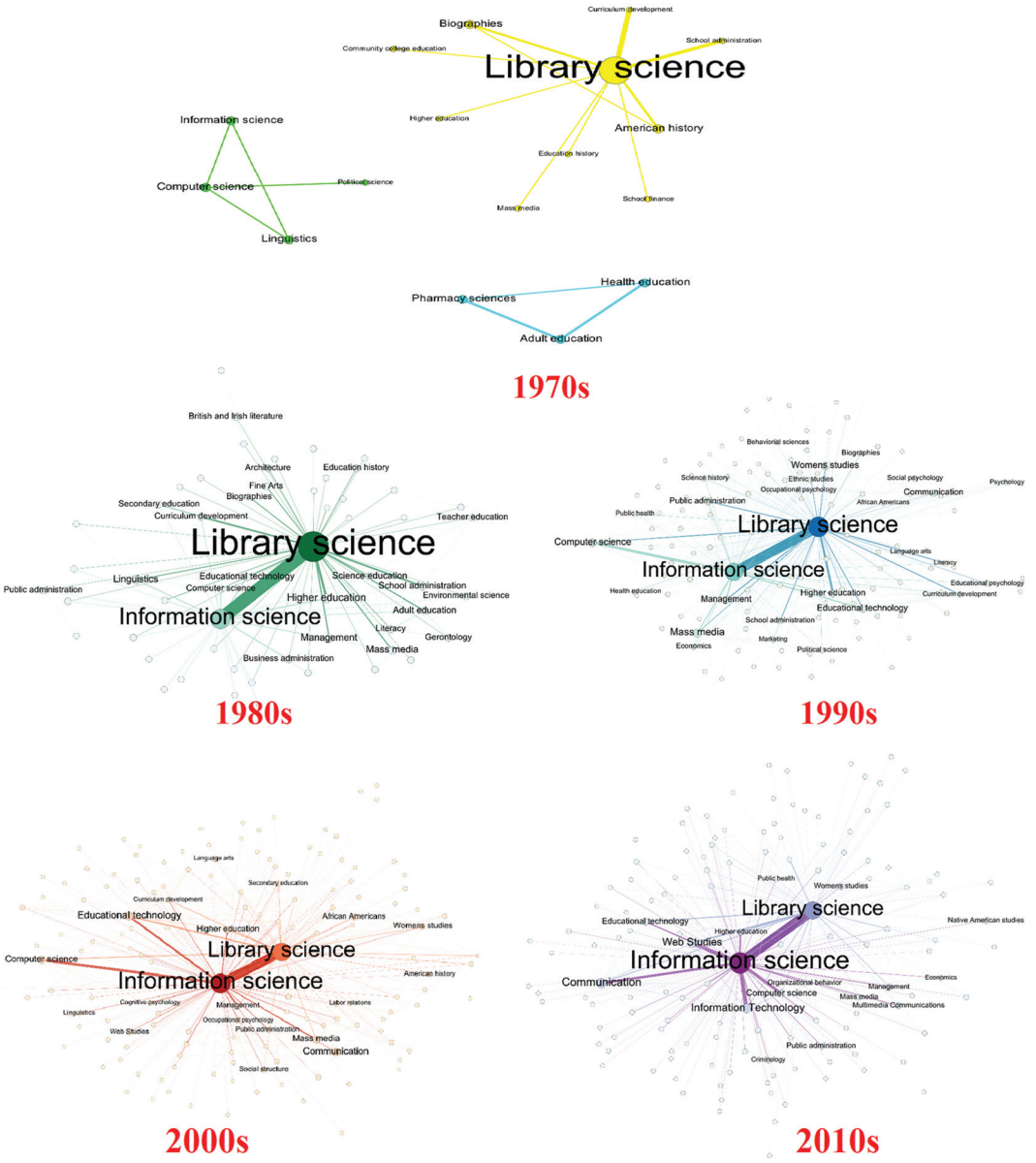

Figure 3. Topical term co-assignment in LIS doctoral dissertations by decade.

the ratio of LIS PhDs supervised by advisors with an interdisciplinary dissertation increases since 1990s. Figure 7 shows that the LIS advisors' seniority, as measured by the difference in the number of years between the student's and the advisor's graduation year, also increases since the late 1960s. These changes in LIS advisors' academic background correspond to the abrupt increase shown in Figure 1.

Discussion

Our findings confirm earlier research stating that *Information Science* has surpassed *Library Science* to become the dominant research interest in LIS (Finlay *et al.*, 2012; Sugimoto, Li, *et al.*, 2011), and corroborates previous studies reporting the increase of interdisciplinarity in LIS (Chang & Huang, 2012; Tang, 2004).

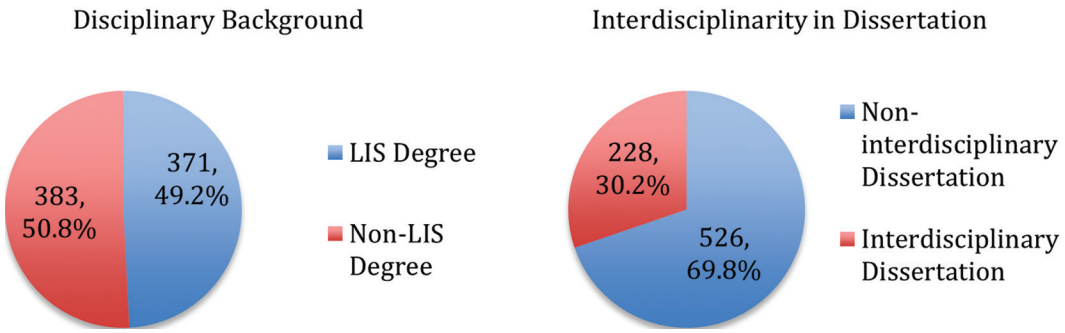

Figure 4. Academic background of LIS doctoral advisors (1960–2013).

However, this study indicates a sudden increase in the late 1980s in terms of the average number of LIS dissertation topics and the ratio of interdisciplinary dissertations as compared to the gradual increase of interdisciplinarity in previous eras observed by Chang and Huang (2012).

The late 1980s increase of interdisciplinarity in LIS dissertations may be partly attributed to the iSchool movement initiated in 1988, which stems from traditional library science while promoting an interdisciplinary approach to the advancement of information science (Bruce, 2011; King, 2006). Perhaps as the interdisciplinary field consisting of *Library Science* and *Information Science* was formed in the 1980s (Tang, 2004), the number of dissertations indexed using both *Library Science* and *Information Science* increased from 43 in the 1980s to 241 in the 1990s. In addition, closures of traditional library schools in the 1980s (Wiggins & Sawyer, 2010) may also have reduced the number of purely *Library Science* dissertations. Table 2 lists the top 10 non-interdisciplinary LIS schools in terms of the mean number of topics per doctoral dissertations. Among these 10 universities, Case Western Reserve, Chicago, Southern California, Columbia, and Berkeley, which as a group contributed 30.4% (410/1,348) of single-topic LIS dissertations over three decades (1960–1989), closed their traditional library schools during the 1980s. This partly explains both the decrease in the number of non-interdisciplinary LIS dissertation and the increase in the number of interdisciplinary LIS dissertation.

Sugimoto, Ni, *et al.* (2011) suggests that the advisors' disciplinary background has an impact on the interdisciplinarity

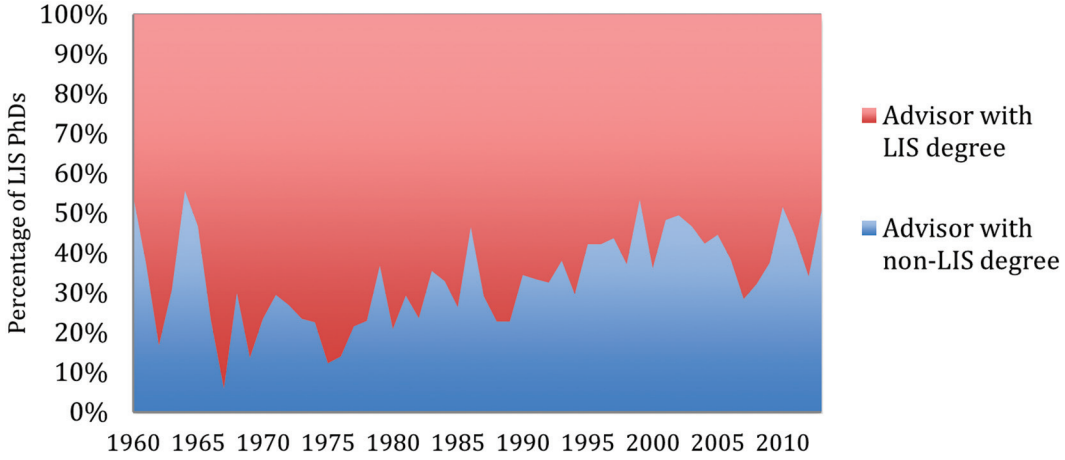

Figure 5. Ratio of LIS PhDs by advisors' disciplinary background (1960–2013).

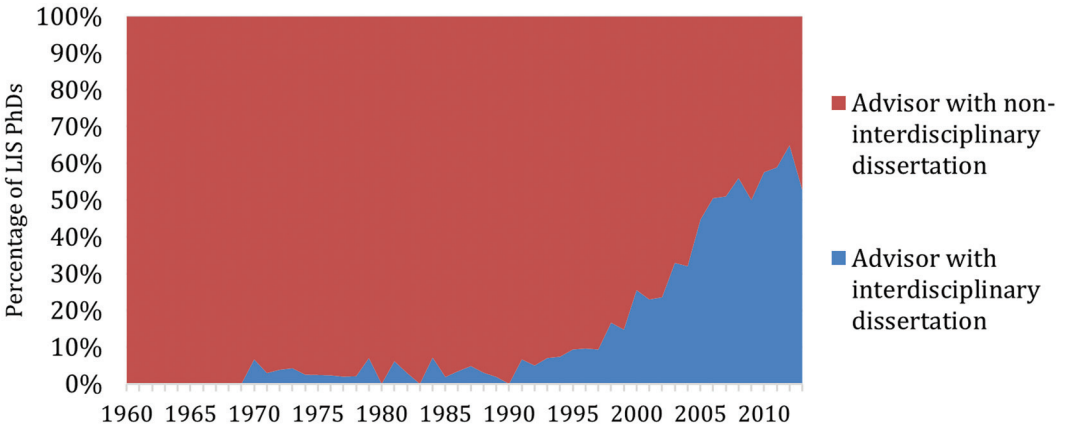

Figure 6 Ratio of LIS PhDs advisors' interdisciplinarity in their dissertation (1960–2013).

of the LIS doctoral dissertation; this is confirmed by this study based on a much larger dataset that spans over a longer period of time. In addition, this study investigates the advisors' disciplinary background (i.e., whether they graduated from an LIS school), the interdisciplinarity of their dissertations (i.e., the number of topics assigned to their dissertation), and their seniority (i.e., the number of years since their graduation).

Figure 8's left chart shows that 52.2% (1066/2041) of LIS PhDs supervised by advisors with a doctoral degree in LIS conducted an interdisciplinary dissertation while 64.7% (731/1129) of LIS PhDs whose advisor graduated from another field conducted an interdisciplinary research. Figure 8's right chart corroborates this trend based on the distinction between LIS and non-LIS dissertation topics. It shows that 42.9% of PhDs whose advisors had a LIS doctoral degree (876/2041) chose topics other than *Library Science* and *Information Science* (hereinafter referred to non-LIS topics) in their dissertations while 55.4% of PhDs supervised by advisors having a non-LIS doctoral degree (625/1129) assigned at least one non-LIS topic to their dissertation.

These results show that students of interdisciplinary advisors are more likely to produce an interdisciplinary dissertation; indeed, as shown in Figure 9, 79.0% (537/680) of PhD students supervised by an interdisciplinary advisor also chose

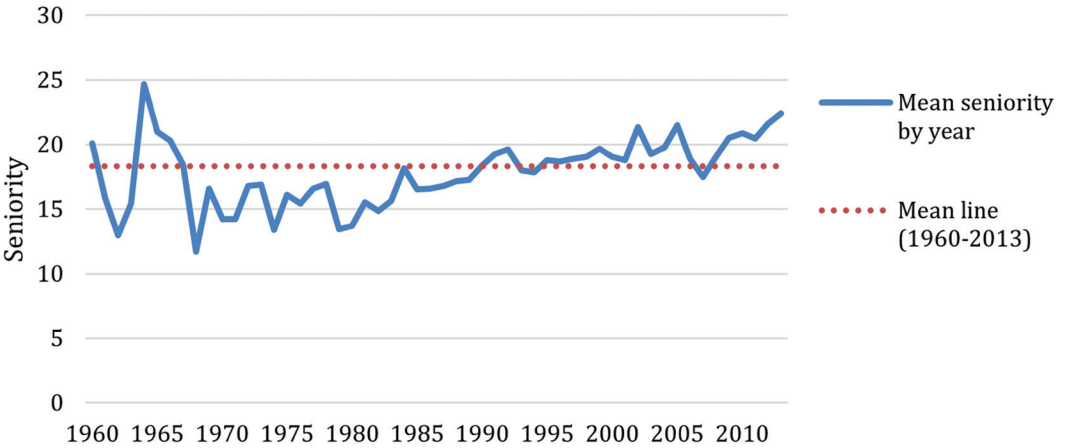

Figure 7. LIS advisors' seniority (1960–2013).

Table 1. Top 10 Non-interdisciplinary LIS Schools based on Dissertations (1960–2013).

University	Mean Number of Research Topics	Number of Single-topic Dissertations	Number of Graduated PhDs
Oklahoma	1.000	4	4
Minnesota	1.000	17	17
Case Western Reserve	1.030	131	134
Chicago	1.183	56	60
Southern California	1.260	41	50
Columbia University	1.321	127	159
Montreal	1.333	8	12
South Carolina	1.500	3	4
Michigan	1.657	118	175
Berkeley	1.670	63	100

interdisciplinary topics for their dissertations, while this ratio is 50.6% (1260/2490) for PhDs whose advisor submitted a single topic dissertation. This is a novel finding of this study.

The analysis of advisor dissertations also reveals that PhDs supervised by more experienced advisors, as measured by the difference in the number of years between the student's and the advisor's graduation year, are more likely to conduct an interdisciplinary dissertation and to choose non-LIS topics; this is also a novel finding of this study. Figure 10 shows that both the percentage of interdisciplinary dissertations and dissertations having non-LIS topics follow the increase in advisors' seniority: more than half of LIS PhDs (56.6%) supervised by advisors having more than 10 years experience conducted an interdisciplinary dissertation while this ratio is 38.9% for PhDs supervised by advisors having 10 years or fewer years of experience. This trend is also reflected by the percentage of dissertations having non-LIS topics that are 47.6% and 39.4% respectively.

Limitations

The analyzed data is not fully comprehensive: not all dissertations are indexed by ProQuest and 111 LIS PhDs' advisors could not be identified. Additionally, dis-

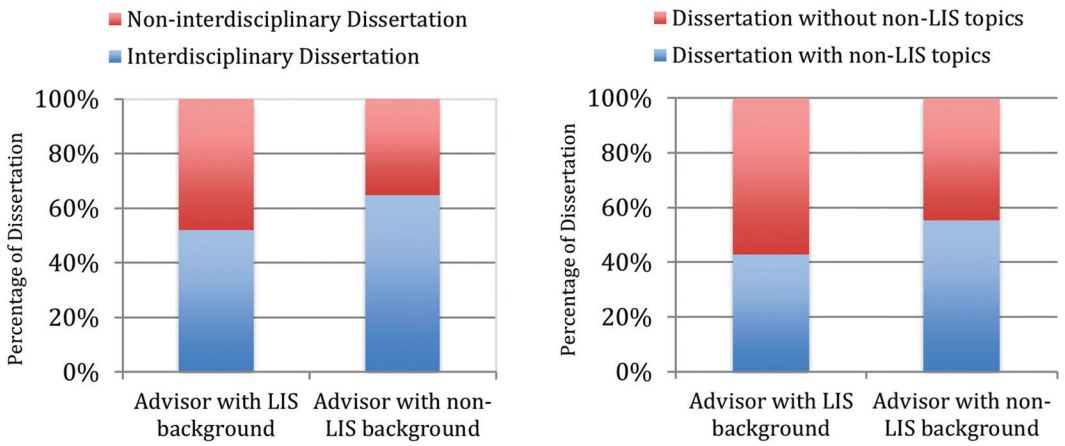

Figure 8. Interdisciplinarity in LIS Doctoral Dissertations by advisor background.

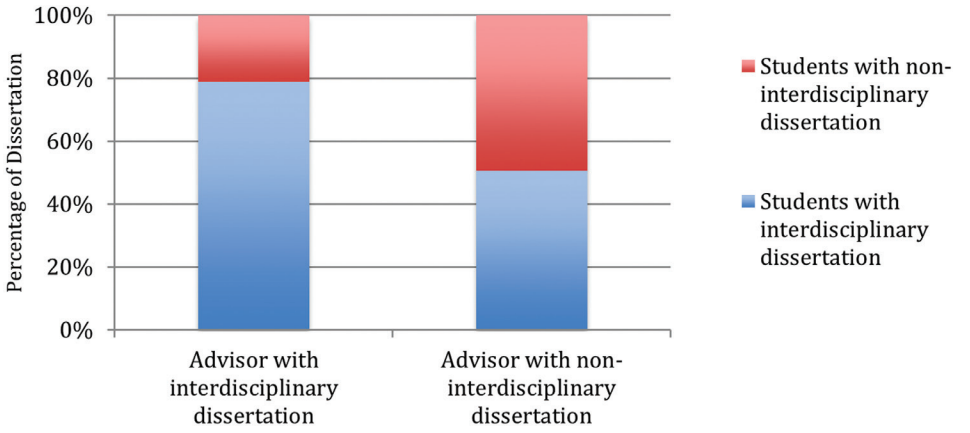

Figure 9 Interdisciplinarity in LIS Doctoral Dissertations between students and advisors.

sertation topics are chosen by their author and may be inconsistently indexed across dissertations. Finally, overtime, the additions and updates to ProQuest's topical classification scheme may affect the evolution in the number of dissertation per topic, and changes in indexing practice may affect the number of topics per dissertation.

Conclusion

This study performed an analysis of the evolution of research topics and interdisciplinarity in LIS doctoral dissertations showing a radical change in LIS since the late 1980s: *Information Science* has replaced *Library Science* as the most prevalent dissertation topic, and this coincides with a shift towards interdisciplinary dissertation research. The mapping of LIS doctoral dissertation topic co-assignments revealed a strong relationship between *Library science* and *Information science* still exists; this shows that LIS is still an interdisciplinary field. These findings confirm those from previous studies, which lend credence to the choice of data set and methodology.

Novel findings of this study concern the effects of the doctoral advisors' disciplinary background and the interdisciplinarity of their dissertation on the interdisciplinarity of their students' dissertation, and the

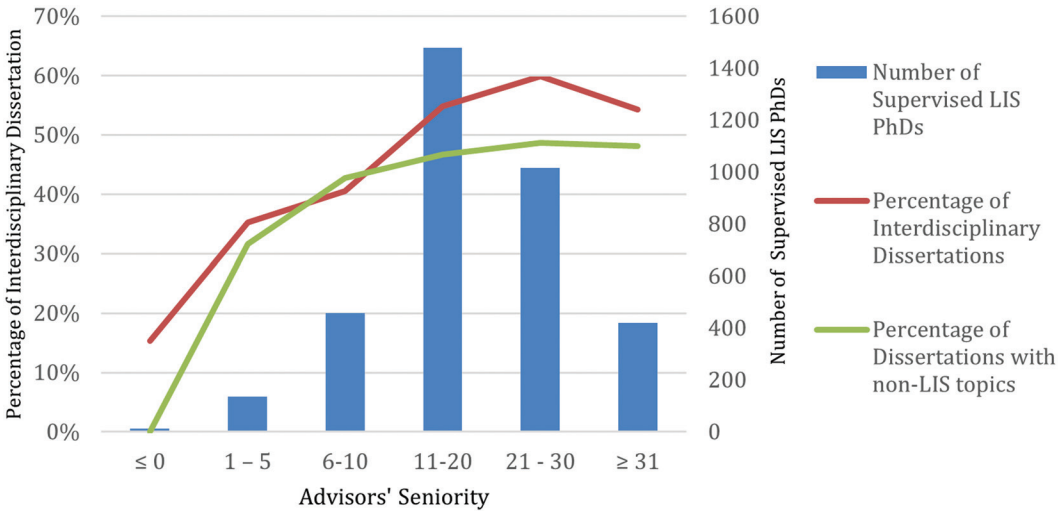

Figure 10. Interdisciplinarity in LIS Doctoral Dissertations by Advisors' Seniority.

effect of the advisors' seniority. This last finding is perhaps the most striking: as LIS faculty gain experience they increase the interdisciplinarity of their PhD research advising. Future research should compare this effect of seniority with non-LIS domains and further investigate results by analyzing the bibliographic coupling, co-citation, and co-authorship between LIS PhDs and their advisors. It would also be of value to examine in more detail why LIS PhDs improve their productivity in terms of publications when they engage in interdisciplinary collaborations.

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