Postprint of Theoretical Application Analysis of Library Science Doctoral Dissertations in China

Authors: Liu Jing, Wang Yanan, Yang Zhigang

Date: 2023-04-01T16:02:45+00:00

Abstract

[Purpose/Significance] As the foundation of scientific research, theory plays an irreplaceable role in research outcomes. Statistical analysis of theory application in Chinese library science doctoral dissertations holds significant theoretical and practical importance for illuminating the general landscape of theory application in contemporary library science research and for constructing the disciplinary theoretical system of library science.

[Method/Process] This study employs Chinese library science doctoral dissertations as a sample for theory extraction, utilizing content analysis, informetrics, and visualization analysis methods to conduct multi-dimensional statistical analysis on the frequency of theory application, the relationships between theories and research topics, and the source disciplines of theories.

[Results/Conclusion] The theories introduced in doctoral dissertations exhibit considerable diversity with strong interdisciplinary characteristics; theory naming is non-standardized, with identical theories being referred to by multiple names; the level of theory application in doctoral dissertations is relatively low. Library science research should emphasize basic theoretical research; theory application demonstrates strong temporal characteristics; information science-related disciplines will assume a leading role in library science research.

Full Text

Preamble

Volume 65, Issue 3, February 2021

Analysis of Theoretical Application in Doctoral Dissertations of Library Science in China

Liu Jing[1],[2], **Wang Yanan**[1], **Yang Zhigang**[1],[2]
[1]Institute of Science and Technology Information, Jiangsu University, Zhenjiang 212013
[2]Library of Jiangsu University, Zhenjiang 212013

Abstract:
[**Purpose/Significance**] As the foundation of scientific research, theory plays an irreplaceable role in research outcomes. Statistical analysis of theoretical application in Chinese library science doctoral dissertations holds important theoretical and practical significance for revealing the current landscape of theoretical application in library science research and for constructing the theoretical system of library science as a discipline. [**Method/Process**] Taking Chinese library science doctoral dissertations as samples, this study extracts applied theories and employs content analysis, informetrics, and visualization methods to conduct multi-angle statistical analysis on the frequency of theoretical application, the correlation between theories and research topics, and the source disciplines of theories. [**Results/Conclusions**] Doctoral dissertations introduce a wide variety of theories with strong interdisciplinary characteristics; theoretical terminology is used non-standardly, with the same theory being referred to by multiple names; and the application level of introduced theories in doctoral dissertations is not high. Library science research needs to focus on basic theoretical research; theoretical application has strong temporal characteristics; and information science-related disciplines will play a leading role in library science research.

Keywords: library science; theoretical application; doctoral dissertation; content analysis; Sankey diagram
Classification Number: G250
DOI: 10.13266/j.issn.0252-3116.2021.03.005

Since China approved the establishment of its first library science doctoral program in 1990, doctoral education in library science has been continuously developing. As a microcosm of the research process and research level, library science doctoral dissertations can reflect the overall status of doctoral education in library science in China during a certain period, while also to some extent reflecting the research level of library science in China and revealing the status, characteristics, and changes of library science research in the corresponding period [1]. Therefore, mining and analyzing library science doctoral dissertations from different perspectives is an important approach for exploring disciplinary development trajectories, discovering disciplinary growth points, and perfecting the disciplinary theoretical system.

Looking at current research outcomes, scholars have conducted analytical studies on domestic and foreign library science doctoral dissertations from multiple perspectives. For example: Li Yu et al. [2] used CiteSpace, Ucinet and other

tools to conduct keyword co-occurrence analysis on library science doctoral dissertations, 梳理 ing the research history, current status, and development trends of dissertation topics from the perspective of research themes; Cao Shujin et al. [3] took American library and information science doctoral dissertations as research objects and analyzed their research topics and methods; Cao Fuyong et al. [4] used ProQuest to conduct keyword co-word clustering on foreign library science doctoral dissertations, revealing research hotspots in foreign library science doctoral dissertations. Through literature review, it is found that current research on Chinese library science doctoral dissertations mainly focuses on research topics, research methods, and research hotspots.

Theory is the foundation of scientific research, defined as "a system of concepts and principles that explain observed phenomena or processes" [5]. In the research process, theory, with its powerful explanatory capacity, elucidates how and why specific phenomena occur [6], serving the function of "explaining and predicting phenomena" [7]. Therefore, the application of theory can reflect the scientific rigor of research work. For a discipline or field, possessing a relatively scientific and systematic theoretical system is a sign of academic maturity [8]. Doctoral students need to learn and expand theories in their discipline during their studies and research, and apply them to their own research to provide theoretical support [9].

Based on the above reasons, this paper intends to extract theories from Chinese library science doctoral dissertations and conduct statistical analysis on the frequency of extracted theories, the correlation between theories and research topics, and the source disciplines of theories from multiple perspectives, using quantitative data to understand the general landscape of theoretical application in Chinese library science, identify high-frequency theories, summarize commonly used theories in various research fields of library science, and explore the cross-fertilization between Chinese library science and related disciplines from the perspective of theoretical source disciplines, with a view to providing references for the construction of theoretical systems and research paradigms in Chinese library science.

This research is supported by the National Social Science Fund Project "Research on Library Science Principles from the Perspective of Information Science" (Project No.: 19BTQ018).

Author Introductions:
Liu Jing (ORCID: 0000-0002-8402-2359), Director, Associate Professor, Ph.D., E-mail: liujing@ujs.edu.cn; Wang Yanan (ORCID: 0000-0002-7836-9540), Master's student; Yang Zhigang (ORCID: 0000-0003-4431-1735), Lecturer, Ph.D.

Received Date: July 6, 2020
Revised Date: November 20, 2020
Page Range: 34-42
Responsible Editor: Yi Fei

Liu Jing, Wang Yanan, Yang Zhigang. Analysis of theoretical application in

doctoral dissertations of library science in China [J]. Library and Information Service, 2021, 65(3): 34-42.

2 Research Design

2.2 Data Collection and Processing

Content analysis, as a classic social science research method, can uncover the intrinsic nature of literature information through quantitative analysis [10] and is widely applied in the field of library and information science. This study adopts content analysis to code theories applied in doctoral dissertations through reading and analysis, constructing three coding tables for theories, research topics, and source disciplines. The theoretical coding table is used to present the general landscape and characteristics of theoretical application, while the research topic coding and source discipline coding are used to reflect the attribute characteristics of library science theoretical development.

This study primarily takes eight universities with first-level doctoral authorization in Library, Information and Archives Management (Peking University, Wuhan University, Renmin University of China, Nanjing University, Chinese Academy of Sciences, Nankai University, Jilin University, and Sun Yat-sen University) as the main survey samples. Wanfang Knowledge Service Platform is used as the data collection tool, focusing on theories applied in doctoral dissertations in the library science specialty direction included in the platform. Excel is used as the data statistical analysis tool to directly reveal the status of theoretical application in doctoral dissertations.

Foreign scholars K.D. Kumasi et al. [11] consider theory as "models, frameworks"; K. Pettigrew and L. McKechni [12] believe that "if authors describe the 'theory' (applicable to established or developmental theories) in their articles, or use terms such as 'conceptual' (including its variants, such as conceptualization), 'framework', 'foundation' to describe such ideas, viewpoints, or methods, then such ideas, viewpoints, or methods can be called theories"; J. Meyer and R. Land [13] define theory as "a framework for the characteristics of learning portals in disciplinary fields or disciplines"; S.J. Kim and D.Y. Jeong [14] in their research only regard anything described by one of the following keywords as theory: theory, conceptual framework, foundational theory, paradigm, grand theory, and formal theory. Chinese Professor Wang Fang from Nankai University [8, 15] believes that "there is no clear distinction between theory and concepts such as facts, doctrines, viewpoints, and models," with concepts similar to theory including laws, principles, theorems, and frameworks.

Based on the above domestic and foreign scholars' definitions of theoretical scope, this paper follows the following principles in the process of theoretical extraction:

(1) The title, abstract, keywords, and chapters related to theories in doctoral

dissertations are taken as the main information sources for theory extraction, with manual browsing and reading conducted for each dissertation.

(2) In the title and other parts of dissertations, whenever words such as "theory, basic theory, model, concept, paradigm, framework, theoretical framework, foundation, based on, law, algorithm, principle, theorem" appear, they are prioritized for identification as theories, but whether they are theories needs to be confirmed and screened after extraction.

(3) Theories without obvious theoretical identification words, such as "systems theory" and "element theory," also need to be extracted and recorded simultaneously.

(4) Algorithm models, technical frameworks, or other nouns close to methods or tools, such as grounded theory and OAIS reference model, do not belong to the scope of theoretical extraction [16].

The data collection and processing procedure is as follows: The bibliographic information of 252 doctoral dissertations retrieved from the dissertation subdatabase of Wanfang Knowledge Service Platform is imported into Excel tables. Based on the principles summarized in Section 2.1, theories involved in the literature are extracted and organized. Theories belonging to the same type but with different names are merged, and their frequency, research topics, and source disciplines are statistically categorized to form relevant charts for analysis.

2.3 Coding Reliability

The theoretical extraction work in this study was conducted independently by two researchers simultaneously, and the extracted results were compared with each other. For inconsistent extraction results, discussions were held to obtain unified results. If disagreements remained, a third person was involved to determine the final result. After theoretical extraction was completed, SPSS software was used for consistency testing based on the Kappa coefficient. The Kappa coefficient, as an indicator for measuring inter-rater consistency, can effectively judge the consistency of theoretical extraction results. Table 1 lists the results of two coding schemes: theoretical extraction and research topic coding. The Kappa values are all higher than 0.85, indicating strong consistency between the two extractors' results [17].

Table 1 Coding Reliability Test Results Kappa Coefficient: 0.871 (Theoretical Extraction), 0.947 (Research Topic Coding)

3 Statistical Analysis and Analysis of Theoretical Application

3.1 Frequency Analysis of Theoretical Application

In this study, original names from the texts were used for theoretical coding. After cleaning the theoretical codes (including removal, deduplication, and merging), 158 types of theoretical codes were obtained, which were applied 239 times in the 252 literature samples, with an average application frequency of 0.96 times per dissertation. Among them, 128 types of theoretical codes were applied only once, accounting for 81.01% of all theory types and 53.56% of the total theoretical application frequency. The distribution of theoretical code application frequency from high to low is shown in Table 2 (where theoretical codes with an application frequency of 1 are only partially exemplified). Among the 158 theoretical codes, those with an application frequency of 2 or more in Table 2 can be regarded as high-frequency core theoretical codes. Overall, the theories applied in doctoral dissertations show strong dispersion.

Table 2 Frequency Distribution of Theoretical Codes in Chinese Library Science Doctoral Dissertations

Frequency (times)	Theoretical Codes (Partial)
15	Resource Construction Theory
7	Knowledge Management Theory
4	Ontology Theory, Media Theory
3	Game Theory, Service Theory, Incentive Mechanism, Competition Theory, Cybernetics, Total Quality Management Model, Five Laws of Library Science, Systems Theory, Strategic Management Theory
2	Value Theory, Social Network Theory, Digital Library Theory, Network Theory, Crisis Theory, Information Ecology Theory
1	Public Management Theory, Public Choice Theory, Hegel's Property Personality Theory, Transaction Cost Theory, Structural Holes Theory, Competitive Intelligence System Theory, Practice Community Framework, Information Lifecycle Theory, Information Systems Success Model, Intellectual Property Theory, Organizational Reengineering Theory, etc.

Resource Construction Theory is the theoretical code with the highest application frequency. As early as 1994, some Chinese library science scholars, in order to break through the limitations of document resource construction, conceived theoretical viewpoints on information resource construction. A research climax on this new theoretical viewpoint emerged in 1999-2000, with Dong Yan, Gao Bo and others studying this theoretical system, whose research results provided good theoretical guidance for library information resource construction. As a product of the network and information age, Resource Construction Theory represents the inevitable development trend of library collection construction theory and has been widely applied in library collection evaluation, playing an important supporting, guiding, and reference role in the construction of information resource co-construction and sharing theory [18-19].

Knowledge Management Theory is the theoretical code with the second highest application frequency, referring to the collection, organization, and integration of existing knowledge resources, with new resources generated during the integration process, thereby enabling knowledge information resources to be better and faster utilized by people. Applying Knowledge Management Theory to the development of library science will produce a "qualitative leap" in knowledge information services and promote a major development in library undertakings [20].

Media Theory is the third most frequently used theoretical code. In this study, Media Dependency Theory, Uses and Gratifications Theory, Agenda-Setting Theory, and the "Spiral of Silence" hypothesis are all categorized under Media Theory. These theories all originate from the field of communication studies. Shera was the first to introduce communication theory into library science [21]. Media Dependency Theory emphasizes media functions, Uses and Gratifications Theory shifts focus to the audience, Agenda-Setting Theory emphasizes effects and influences, and the "Spiral of Silence" hypothesis focuses on the social control function of public opinion. The application of these theories in library science, on the one hand, enables libraries to utilize advanced information means or media to perform their functions of transmitting knowledge information, and on the other hand, prompts libraries to pay more attention to user needs, as the realization of libraries' social functions depends on communication [22].

Although Ontology Theory and other theories do not have as high application frequencies as the above theories, they play an irreplaceable role in enhancing library services and optimizing library resource construction, promoting the development of library science.

3.2 Correlation Analysis Between Theory and Research Topics

Analyzing the correlation between theories and literature research topics can help us understand commonly used theories in various library science research fields. There is no unified standard for research topic classification, and different scholars have already classified library science research topics [23-27]. This study

comprehensively analyzed various research topic distribution tables, and based on considerations of comprehensiveness and authority, primarily used references [23] and [25] as the basis, combined with keyword frequency and literature classification numbers of the collected samples for comprehensive consideration, ultimately constructing a research topic table for library science doctoral dissertations. By labeling the research topic corresponding to each dissertation through its keywords and classification numbers, and then statistically analyzing the theories and their quantities corresponding to each research topic, the frequency distribution of theoretical codes under each research topic was obtained after data cleaning (see Table 3).

Table 3 Frequency Distribution of Research Topics and Corresponding Theoretical Codes in Chinese Library Science Doctoral Dissertations

Research Topic	Number of Dissertations	Percentage of Total Sample	Theoretical Application Frequency	Percentage of Total Frequency	Average Application Frequency per Dissertation
Information Resource Construction and Knowledge Management	70	27.8%	60	25.79%	0.86
Library Management	36	14.3%	43	18.65%	1.19
Library Service	33	13.1%	27	11.51%	0.82
Library Science Theory	26	10.3%	24	10.32%	0.92
Library Automation and Networking	47	18.7%	45	19.44%	0.96
World Libraries (excluding China)	5	2.0%	5	2.15%	1.00
Bibliography	4	1.6%	4	1.72%	1.00

Research Topic	Number of Dissertations	Percentage of Total Sample	Theoretical Application Frequency	Percentage of Total Frequency	Average Application Frequency per Dissertation
Others	31	12.3%	31	13.39%	1.00

From Table 3, we can see that: (1) Research topics in Chinese library science doctoral dissertations are relatively concentrated, with Information Resource Construction and Knowledge Management, Library Service, Library Management, and Library Automation and Networking all exceeding 30 dissertations, accounting for 27.8%, 13.1%, 14.3%, and 18.7% of the total sample respectively, while dissertations on Bibliography and World Libraries themes do not exceed 5; (2) From the perspective of theoretical application frequency, Information Resource Construction and Knowledge Management, Library Service, Library Management, and Library Automation and Networking have relatively high total theoretical application frequencies, all exceeding 20 times; (3) From the perspective of average theoretical application frequency per dissertation, Information Resource Construction and Knowledge Management, Library Service, Bibliography, and World Libraries have relatively high average theoretical application frequencies, all exceeding 1, indicating that these four research topics pay more attention to theoretical guidance for research or practical work than other topics.

By conducting co-occurrence analysis between Chinese library science doctoral dissertation research topics and high-frequency theoretical codes in Table 2, the correspondence between research topics and high-frequency theoretical codes was obtained (see Table 4). Table 4 allows us to understand the relevant theoretical situation of each research topic.

Table 4 Correspondence Between Research Topics and High-Frequency Theoretical Codes in Chinese Library Science Doctoral Dissertations

Research Topic	High-Frequency Theories (Frequency)
Information Resource Construction and Knowledge Management	Resource Construction Theory (11), Knowledge Management Theory (7), Ontology Theory (4), Cybernetics (4), Social Network Theory (3), Five Laws of Library Science (3), Competition Theory (2), Practice Community Framework (2), Incentive Mechanism (1), Systems Theory (1), Media Theory (1), Network Theory (1), Strategic Management Theory (1), Hegel's Property Personality Theory (1)
Library Automation and Networking	Digital Library Theory (2), Game Theory (1)
Library Management	Game Theory (3), Public Management Theory (2), Transaction Cost Theory (2), Strategic Management Theory (2), Resource Construction Theory (2), Incentive Mechanism (1), Systems Theory (1), Media Theory (1), Knowledge Management Theory (1), Information Lifecycle Theory (1), Intellectual Property Theory (1)
Library Service	Media Theory (4), Information Ecology Theory (3), Competition Theory (2), Incentive Mechanism (1), Systems Theory (1), Resource Construction Theory (1), Network Theory (1), Strategic Management Theory (1), Uses and Gratifications Theory (1), Value Theory (1), Structural Holes Theory (1), Competitive Intelligence System Theory (1), Total Quality Management Model (1), Organizational Reengineering Theory (1)
Library Science Theory	Service Theory (3), Information Systems Success Model (2), Knowledge Management Theory (1), Hegel's Property Personality Theory (1), Intellectual Property Theory (1)

Research Topic	High-Frequency Theories (Frequency)
World Libraries	Incentive Mechanism (1), Systems Theory (1), Resource Construction Theory (1), Public Choice Theory (1), Information Lifecycle Theory (1)
Bibliography	Media Theory (1), Network Theory (1), Knowledge Management Theory (1), Information Lifecycle Theory (1), Intellectual Property Theory (1)

The high-frequency theories under the "Information Resource Construction and Knowledge Management" theme are distributed across 3 different research topics, indicating that these theories have strong universality for different research topics in library science and are part of the core theories of Chinese library science research, exerting significant influence on library science research.

The basic work of libraries is the collection, processing, preservation, and utilization of document information. Theories under this theme, such as Resource Construction Theory and Knowledge Management Theory, help select, collect, organize, and develop disordered information into an ordered and usable information resource system, thereby improving the utilization efficiency of library resources. Other theories under this theme, such as Social Network Theory, have good guiding significance for creating network community academic resource association models [28]; Cybernetics, Five Laws of Library Science, and Value Theory all play important roles in knowledge organization, management, and sharing.

Looking at the high-frequency theories corresponding to each research topic, Resource Construction Theory, Knowledge Management Theory, and Media Theory are mainly distributed across 3 different research topics, indicating that these theories have strong universality for different research topics in library science and are part of the core theories of Chinese library science research, exerting significant influence on library science research.

3.3 Analysis of Theoretical Source Disciplines

Possessing a complete disciplinary theoretical framework is a sign of a mature discipline. However, with the enhancement of interdisciplinary integration, theories applied in library science research increasingly originate from other disciplines. Sorting out the sources of these theories helps understand the mutual reference and absorption between disciplines, thereby helping us more accurately clarify the nature of the discipline.

This study primarily classifies the source disciplines of extracted theories according to the first-level discipline classification standards in the "National Standard

Discipline Classification and Code Table." Meanwhile, according to research needs, discipline names were appropriately adjusted: since this study focuses on theories applied in library science research, "Library, Information and Documentation Science" was split into two different disciplines—"Library Science" and "Information and Documentation Science." On this basis, the frequency distribution of theoretical source disciplines was statistically analyzed to examine the cross-fertilization between library science and related disciplines. Table 5 shows the source disciplines of theories applied in the sample literature and corresponding representative theoretical codes, while Figure 1 [Figure 1: see original paper] displays classic disciplinary theories and library science theories in doctoral dissertations.

Table 5 Frequency Distribution of Theoretical Source Disciplines

Source Discipline	Percentage of Total Frequency	Percentage of Total Theories	Representative Theories (Partial)
Management Science	24.69%	12.03%	Total Quality Management Model, Strategic Management Theory, Process Management Theory, 4P Theory, Knowledge Management Theory
Information Science and Systems Science	21.52%	15.90%	Information Systems Success Model, Systems Theory, Cybernetics, Grid Theory, Information Ecology Theory
Computer Science and Technology	15.90%	10.76%	Ontology Theory, Software Engineering Theory, Process Maturity Model (CMM), CNNs Model, N-gram Model

Source Discipline	Percentage of Total Frequency	Percentage of Total Theories	Representative Theories (Partial)
Library Science	11.39%	10.76%	Scientific Communication Theory, Sense-Making Theory, Citation Analysis Theory, Information Architecture Theory, Competitive Intelligence Theory
Information and Documentation Science	10.76%	11.39%	Element Theory, Five Laws of Library Science, Knowledge Organization Theory, Knowledge Management Theory, Knowledge Resource Theory
Journalism and Communication Studies	5.44%	6.33%	Media Theory, Network Audience Theory, Communication Gap Theory
Philosophy	4.60%	3.80%	Dialectical Materialism, Value Theory, Doctrine of Contradiction

Source Discipline	Percentage of Total Frequency	Percentage of Total Theories	Representative Theories (Partial)
Economics	4.18%	3.80%	Transaction Cost Theory, Transition Economics Theory, Capital Theory, Latecomer Advantage Theory, Principal-Agent Theory
Psychology	3.35%	2.53%	Expectation-Confirmation Theory, Hierarchy of Needs Theory, Difference Theory, Dreyfus Skill Acquisition Model, Crisis Theory
Sociology	2.93%	2.53%	Social Network Theory, Community Practice Framework, Social Planning Theory
Political Science	2.09%	1.90%	Civil Society Theory, Elite Theory, Public Governance Theory
Pedagogy	1.67%	1.27%	Child-centered Concept, Child Priority Theory, Child Interest Maximization Theory

Source Discipline	Percentage of Total Frequency	Percentage of Total Theories	Representative Theories (Partial)
Law	1.26%	1.27%	Intellectual Property Theory, Inheritance Management Mechanism, Rights Management Mechanism

Note: Discipline classification in the table is primarily based on first-level disciplines specified in the "National Standard Discipline Classification and Code Table." Based on research needs, "Library, Information and Documentation Science" was split into "Library Science" and "Information and Documentation Science."

From Table 5, we can see that: (1) The sample literature involves theories from 15 different disciplines, showing that the theoretical source disciplines of Chinese library science present diversified characteristics; (2) The number and application frequency of theories from library science itself are not the highest, with the theory quantity percentage being only 11.39%, lower than Management Science and Computer Science and Technology, and above Economics; (3) From the perspective of disciplinary theoretical frequency percentage, apart from Library Science, theories applied in Chinese library science research more frequently come from Management Science, Information Science and Systems Science, Computer Science and Technology, Economics, and Information and Documentation Science, with each disciplinary theoretical frequency percentage exceeding 5% of total theoretical frequency. From the perspective of theoretical source disciplines, these five disciplines have high closeness with library science. (4) The 10 disciplines with theoretical frequency percentages below 5% have a combined theoretical frequency of 27.60%, and related theories have also been applied in Chinese library science research, playing certain theoretical guiding roles, which can be regarded as extended areas of library science-related disciplines.

As the source discipline of doctoral dissertations in this study, although library science does not have the highest frequency and quantity of theoretical application in the literature collection, Figure 1 [Figure 1: see original paper] reveals that library science theories have relatively high usage frequency and relatively even temporal distribution, indicating that library science theories run through the development and changes of library science and witness its reconstruction and transformation [29]. Table 6 lists some newly developed library science theories to better grasp the inheritance and innovation of library science theories

in doctoral dissertations. Additionally, this paper uses a Sankey diagram to show the intersection of the top 5 disciplines with high theoretical application frequency with theoretical names and usage time (see Figure 2 [Figure 2: see original paper]), thereby revealing the role of different disciplines in the temporal development of library science.

Table 6 Examples of Newly Developed Library Science Theories

Newly Developed Library Science Theories (Partial) - Theoretical Framework for Digital Library Evaluation Research - "Structure-Conduct-Performance" Theoretical Framework - Theory of Library Personalized Information Services - Double-Layer Interaction Model of Ontology Learning Information Flow and Knowledge Flow - New Model of Literature Information Resource Co-construction and Sharing - Library Total Quality Management Model - Library Website Service Theory - Differentiated User Model for Network Information Behavior - Information Resource Co-construction and Sharing System for Public Library Service System - Researcher Scientific Quality Update Model

From Figure 1 [Figure 1: see original paper] and Table 6 , we can see that some traditional library science basic theories such as social epistemology, communication theory, law theory, relationship theory, level theory, and various "knowledge"-named theories have gradually faded out, replaced by theories focusing on changes in the information environment, expansion of information resource definitions, and application of information science and technology, moving from "knowledge" to "information," from "social cognition" to "network analysis," and from purely humanities-oriented macro-theoretical discussions on "relationship, level, element" to concrete theoretical applications combining humanities with information science and technology methods such as "sharing, models, evaluation." Library science's dependence on information science theories and methods is becoming more obvious, and digital humanities is playing a huge role in the theoretical development of library science, which undoubtedly provides strong support for the proposition of the National Social Science Fund project "Research on Library Science Principles from the Perspective of Information Science" (Project No.: 19BTQ018) that the author is currently researching.

From Figure 2 [Figure 2: see original paper], we can clearly see that the application of management science-related theories is mainly concentrated before 2010, with theoretical application frequency slightly decreasing over time. This is opposite to the temporal distribution of theories under information science and computer science disciplines. Before 2008, theories in the information science field were less applied, but with the development of information technology, the application frequency of theories from Information Science and Systems Science and Computer Science and Technology has shown an upward trend in recent years. Professor Wu Dan et al. from Wuhan University [16] also found in their research that among high-frequency theories applied in library science research in the past decade, the types and frequencies of theories under information science and computer science disciplines are the highest, far exceeding those under man-

agement science. This indicates to some extent that information science-related disciplines will play a leading role in library science research.

Management science, as an independent discipline, has rapidly applied its theories and methods to library management research, and library management has become an independent branch of library science. Therefore, the disciplinary relevance between management science and library science is extremely close [36].

The connection between economics and library science is mainly manifested in the cross-fertilization of information economics and library science. With the arrival of the information age, library science, as an indispensable part of knowledge-intensive industries, has an inherent close connection with information economics, and the two disciplines influence and permeate each other. The influence of information economics on library science is reflected in deepening research on paid services and supplementing basic principles of library work, while library science provides society with abundant knowledge information resources, cultivates numerous information brokers for information economics, and promotes the development of information economics [37].

Information science and other disciplines rank fifth as cognate disciplines of library science. The possible reason is that as cognate disciplines with "blood relations," information science, documentation science, and library science have the same or similar research objects and methods. More and more researchers do not make detailed distinctions between the research content of these disciplines in their studies, and library science, information science, documentation science and other disciplines are increasingly tending toward integration. Especially under the background of "information management" as a larger discipline, the boundaries between these disciplines will become increasingly blurred.

The extended areas of library science-related disciplines involve many disciplines, reflecting that Chinese library science is gradually broadening its research fields and scope, actively absorbing research theories from other disciplines to further promote the improvement and maturation of the library science disciplinary system. Among these related disciplines, humanities and social science disciplines such as political science, sociology, journalism and communication studies, pedagogy, and law still occupy a relatively large proportion compared to natural sciences and engineering and technical sciences. They provide theoretical and methodological support for various branch research fields of library science such as information communication, intellectual property, and social education. Meanwhile, knowledge from natural sciences such as mathematics and statistics, physics, information science and systems science, as well as computer science and management science from engineering and technical sciences, has also been extensively applied to library science, providing important assistance for library information resource organization and technical support.

---

4 Conclusions and Discussion

This paper conducts statistical analysis on the frequency of theoretical application, the correlation between theories and research topics, and source disciplines in publicly available doctoral dissertations from eight universities with library science doctoral authorization points in China. It finds that Resource Construction Theory, Knowledge Management Theory, Media Theory, Ontology Theory, etc., are high-frequency core theories in Chinese library science research; Information Resource Construction and Knowledge Management, Library Service, Library Management, Library Automation and Networking are research topics with relatively high total theoretical application frequencies; and apart from Library Science, Management Science, Economics, Information and Documentation Science, Information Science and Systems Science, and Computer Science are important source disciplines for theories in library science research fields.

Based on this, this paper identifies certain characteristics and problems in Chinese library science research for discussion with library science researchers:

(1) **A wide variety of theories are introduced in doctoral dissertations, with strong interdisciplinary characteristics.** This study extracted 158 types of theories from 252 doctoral dissertations, among which 128 theories came from outside library science, showing obvious interdisciplinary characteristics. This is closely related to the interdisciplinary nature of library science itself, as library science involves research issues in humanities, technology, management, and other aspects. When studying corresponding issues, it inevitably borrows theories from relevant disciplines. Extensive theoretical borrowing provides a broader perspective for library science research and reflects the good inclusiveness and openness of the library science discipline. Through absorption and borrowing, it continuously promotes its own development. This characteristic, on the one hand, conforms to the current trend of interdisciplinary integration across the entire scientific system, and on the other hand, shows that library science, like libraries, is a growing organism with theoretical qualities that keep pace with the times.

(2) **Non-standardized use of theoretical terminology, with the same theory using multiple theoretical names.** In the process of counting theoretical names, this study found that the same content theory extracted would appear under multiple names. For example: Scientific Research Lifecycle Model, Information Lifecycle Management Theory, Information Lifecycle Theory, Scientific Data Lifecycle Theory, etc. Although these theories are expressed differently, they ultimately point to Lifecycle Theory. This phenomenon, on the one hand, indicates that the theory has strong applicability, and researchers can generate new theoretical connotations or theoretical representations by combining research questions with corresponding theories from different research objects and perspectives; on the other hand, it also shows that researchers in this discipline are

still in the developmental stage regarding the application of some theories and have not formed standardized and unified cognition. Therefore, on the basis of deeply applying other theories, we should interpret and apply them as much as possible from the perspective of our own discipline, achieve the "localization" and integration of introduced theories, establish the discourse power and characteristic theoretical connotations of our own discipline, and gradually form unified cognition and standardized theoretical names.

(3) **The application level of introduced theories in doctoral dissertations is not high.** Although this study extracted as many as 158 types of theories, the application frequency of each theory is not high, with the highest frequency being only 15 times, and as many as 128 types of theories were applied only once, showing obvious dispersion characteristics. This phenomenon may be because many introduced theories are only used to solve individual problems, with limited explanatory power and applicability that cannot be effectively extended to related research. Another reason may be that in the survey sample, a considerable proportion of theories are only briefly mentioned as simple arguments or explanatory statements without specific application and detailed discussion to provide guiding ideology for the dissertation. This indicates that library science is still in a relatively young stage, with strong inclusiveness and openness but insufficient integration capability. We need to improve the depth and level of theoretical application in future research.

(4) **Library science research needs to focus on basic theoretical research.** Among the 158 theories extracted, basic library science theories account for a relatively small proportion, only 11.39%. Other applied theories, except those developed based on library science's own theories, are all borrowed from other disciplines to provide guidance for library science-related research. Although this phenomenon can enrich library science research, the more theories introduced and borrowed from other disciplines, the more library science may lose its disciplinary characteristics. Therefore, in subsequent research, we need to strengthen the application and research of basic library science theories, absorb and borrow the "essence" of other disciplines on the basis of ensuring the mature development of our own disciplinary theoretical system, thereby promoting common development and progress among various disciplines.

(5) **Information science-related disciplines will play a leading role in library science research.** This study finds that the source disciplines of theories are mainly concentrated in Management Science, Library Science, Information and Documentation Science, Information Science and Systems Science, Computer Science, and Economics. From the temporal distribution of theories, theories under Information Science and Systems Science and Computer Science show a growth trend, while the theoretical frequency of Management Science is relatively stable but also shows

a downward trend. Combined with other expert research, information science-related disciplines will play a leading role in the future development of library science.

This study has made some explorations into revealing the landscape and development of theoretical application in Chinese library science research, but the research still has certain limitations. Although the eight universities selected in this paper are representative, not all their doctoral dissertations can be retrieved from database platforms, so there will be omissions in data collection. Moreover, this study only roughly divided disciplines and topics, lacking further refinement, stratification, and analysis of theoretical codes. The focus of this paper is on the frequency of theories applied in Chinese doctoral dissertations, the correlation between theories and research topics, and the source disciplines of theories, with insufficient analysis of theoretical application levels, such as the correlation analysis between theories and research methods—what theories are applied as the basis for certain research methods and what problems they are used to solve. The author will further explore these issues in subsequent research.

Acknowledgments: Thanks to Research Librarian Wang Zhengxing from Jiangsu Ocean University Library for providing revision suggestions for this paper; thanks to graduate students Tang Jianghao, Zheng Xiqing, Zhang Tianyi, and Wang Meng from the Institute of Science and Technology Information, Jiangsu University, for their work in data collection and processing.

References: [1] Yang Guoli, Liu Jing, Wang Manrong, et al. Mapping analysis of research topics in European and American library science doctoral dissertations [J]. Chinese Journal of Library Science, 2015, 41(4): 96-111. [2] Li Yu, Liu Hong, Sun Jianjun. Mapping analysis of research topics in Chinese library science doctoral dissertations [J]. Library Journal, 2018, 37(6): 22-30. [3] Cao Shujin, Chen Yijin. Analysis of research topics and methods in American library science doctoral dissertations [J]. Library and Information Knowledge, 2011(5): 28-33. [4] Cao Fuyong, Zhan Jiajia. Analysis of research hotspots in foreign library science doctoral dissertations based on co-word clustering [J]. Library and Information Service Online Journal, 2010(10): 12-17. [5] Huang Zongzhong. Re-discussion on the basic theory of library science [J]. Library Tribune, 2006(6): 3-10. [6] Corley KG, Gioia DA. Building theory about theory building: what constitutes a theoretical contribution [J]. Academy of Management Review, 2011, 36(1): 12-32. [7] Kerlinger FN. Foundations of behavioral research: educational, psychological and sociological inquiry [M]. New York: Thomson Learning, 1973. [8] Wang Fang, Shi Haiyan, Ji Xuemei. Application of theories in Chinese information science research: content analysis based on Journal of the China Society for Scientific and Technical Information [J]. Journal of the China Society for Scientific and Technical Information, 2015, 34(6): 581-592. [9] Xu Zhongqin, He Ruimin, Qiang Wenxin. Effectively strengthen doctoral course construction and strive to improve doctoral training quality [J].

Academic Degrees & Graduate Education, 1992(5): 17-18. [10] Lu Taihong. Information Analysis [M]. Guangzhou: Sun Yat-sen University Press, 1998. [11] Kumasi KD, Charbonneau DH, Walster D. Theory talk in the library science scholarly literature: an exploratory analysis [J]. Library & Information Science Research, 2013, 35: 175-180. [12] Pettigrew KE, McKechnie L. The use of theory in information science research [J]. Journal of the American Society for Information Science and Technology, 2001, 52(1): 62-73. [13] Meyer J, Land R. Threshold concepts and troublesome knowledge: linkages to ways of thinking and practising within the disciplines [J]. Improving Student Learning: Ten Years On, 2003, 4(1): 1-16. [14] Kim SJ, Jeong DY. Knowledge structure of library and information science in South Korea [J]. Library & Information Science Research, 2005, 27: 51-72. [15] Wang Fang, Chen Feng, Zhu Na, et al. Research on the sources, application, and disciplinary exclusivity of information science theories in China [J]. Journal of the China Society for Scientific and Technical Information, 2016, 35(11): 1148-1164. [16] Wu Dan, Xu Shuang, Li Xiuyuan, et al. Analysis of theory use in Chinese library science research in the past decade [J]. Library and Information, 2019(6): 41-51, 2. [17] Guo Yibin, Guo Wei, Qin Yuchen, et al. Consistency test based on Kappa coefficient and its software implementation [J]. Chinese Journal of Health Statistics, 2016, 33(1): 169-170, 174. [18] Jin Shengyong. Research on the goal-oriented theoretical system of library information resource co-construction and sharing [D]. Tianjin: Nankai University, 2010. [19] Qi Wenjun, Jin Shengyong. Research on the theoretical system of information resource construction [J]. Hebei Sci-Tech Library Journal, 2016, 29(3): 16-20. [20] Zhao Haili. Discussion on the application of knowledge management theory in libraries [J]. Library Theory and Practice, 2012(11): 41-42, 53. [21] Wang Chuanqing, Lian Hongjiang. Review of theoretical cross-research between library and information science and communication studies [J]. Library and Information Service, 2004(8): 94-97, 106. [22] Yan Zhe. Application of communication studies in contemporary library work [J]. Library Work and Study, 2007(5): 18-19. [23] Gu Qiangfen. Evolution of information resource construction theory [J]. Sci-Tech Information Development & Economy, 2006(16): 106-107. [24] Li Yu, Liu Hong, Sun Jianjun. Mapping analysis of research topics in Chinese library science doctoral dissertations [J]. Library Journal, 2018, 37(6): 22-30. [25] Zhang Xuemei. Construction of a thematic classification table for Chinese library science research and analysis of thematic distribution patterns [D]. Changchun: Jilin University, 2018. [26] Zhang Lina. Analysis of thematic distribution of basic theory research in Chinese library science in the past decade [D]. Harbin: Heilongjiang University, 2014. [27] Zhang Xuemei. Statistical analysis of thematic distribution of Chinese library science research in the new period [D]. Harbin: Heilongjiang University, 2014. [28] Zhang Sufang. Research on academic resource association in network communities [D]. Tianjin: Nankai University, 2012. [29] Wu Dan, Lu Liuxing, Dong Jing, et al. Fundamental issues in library science theoretical research in the past decade [J]. Chinese Journal of Library Science, 2020, 46(4): 20-38. [30] Yi Ling, Gong Jiaoteng. Review of basic theoretical research in Chinese library science [J]. Library Tribune, 2018, 38(5): 19-30, 50. [31] Wu Weici. Review

of basic theoretical research in library science (1995-2004) [J]. Chinese Journal of Library Science, 2005(2): 15-19. [32] Ye Ying. Analytical representation and logical structure of basic library science theory [J]. Journal of Academic Libraries, 2005(3): 6-10, 26. [33] Fan Bingsi. Four periods of basic library science theory [J]. Journal of the National Library of China, 2008(1): 24-27, 34. [34] Luo Liqin, Ma Hengtong. Basic theoretical research in library science since the founding of New China [J]. Library, 2012(2): 22-27. [35] Wu Weici. Trends in basic theoretical research of library science [J]. Library and Information Service, 2017, 61(16): 6-7. [36] Wu Weici, Dong Yan. Introduction to Library Science [M]. Beijing: Beijing Library Press, 2002: 36. [37] Li Zhongliang. Analysis of the relationship between information economics and library science [J]. Information and Documentation Services, 2007(2): 10-13.

Author Contributions:
Liu Jing: Research topic selection and design, paper writing guidance, revision suggestions;
Wang Yanan: Data acquisition and processing, paper writing and revision;
Yang Zhigang: Revision of paper framework and content.

Analysis of Theoretical Application in Doctoral Dissertations of Library Science in China

Liu Jing[1],[2], Wang Yanan[1], Yang Zhigang[1],[2]

[1]Institute of Science and Technology Information, Jiangsu University, Zhenjiang 212013
[2]Library of Jiangsu University, Zhenjiang 212013

Abstract:
[**Purpose/Significance**] As the foundation of scientific research, theory plays an irreplaceable role in research outcomes. Statistical analysis of theoretical application in Chinese library science doctoral dissertations holds important theoretical and practical significance for revealing the current landscape of theoretical application in library science research and for constructing the theoretical system of library science as a discipline. [**Method/Process**] Taking Chinese library science doctoral dissertations as samples, this study extracts applied theories and employs content analysis, informetrics, and visualization methods to conduct multi-angle statistical analysis on the frequency of theoretical application, the correlation between theories and research topics, and the source disciplines of theories. [**Results/Conclusions**] Doctoral dissertations introduce a wide variety of theories with strong interdisciplinary characteristics; theoretical terminology is used non-standardly, with the same theory being referred to by multiple names; and the application level of introduced theories in doctoral dissertations is not high. Library science research needs to focus on basic theoretical research; theoretical application has strong temporal characteristics; and information science-related disciplines will play a leading role in library science research.

Keywords: library science; theoretical application; doctoral dissertation; content analysis; Sankey diagram

Note: Figure translations are in progress. See original paper for figures.