

# A Panoramic Analysis and Reflection on Research of the Five Laws of Library Science in China

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## Abstract

**Purpose:** In the era of artificial intelligence, the Five Laws of Library Science still play a guiding role in deepening library science theory and promoting practical innovation.

**Method:** This article takes CNKI-related literature as the data source, employs bibliometric methods, and utilizes CiteSpace and large language models to analyze the research dynamics, research forces, and research hotspots and trends of the Five Laws of Library Science in China.

**Conclusion:** Research on the Five Laws of Library Science in China has experienced three stages: initial development, practical application, and comprehensive development. Collaboration among authors and between institutions remains relatively weak. Its research hotspots encompass three aspects: theoretical analysis, practical application, and service innovation. The deep integration of user-centeredness and humanistic spirit with emerging technologies represents the research trend in this field.

## Full Text

### Preamble

#### A Panoramic Analysis and Reflection on the Five Laws of Library Science Research in China

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**Abstract:** [Objective] In the artificial intelligence era, the Five Laws of Library Science continue to serve as a guiding framework for deepening theoretical understanding and fostering practical innovation in library science. [Methods]

This study employs bibliometric methods, utilizing CNKI documents as the data source and combining CiteSpace with large language models to analyze research dynamics, intellectual forces, hotspots, and trends in domestic research on the Five Laws of Library Science. [Conclusions] Research on the Five Laws in China has evolved through three stages: initial development, practical application, and comprehensive advancement. Collaboration among authors and institutions remains relatively weak. Research hotspots encompass theoretical analysis, practical application, and service innovation. The integration of user-centered principles and humanistic values with emerging technologies represents the dominant research trend.

**Keywords:** Five Laws of Library Science; mapping knowledge domains; CiteSpace; large language models

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In 1931, Indian scholar S. R. Ranganathan proposed the Five Laws of Library Science, which have since become a cornerstone of library science theory. These laws not only embody the fundamental principles of library service but also provide guidance for the theoretical and practical development of libraries.

Domestic research on the Five Laws began in the 1980s, with scholars such as Yu Mingdi and Zhan Shu introducing the concept and discussing translations [?, ?]. The publication of the Chinese translation of *The Five Laws of Library Science* by Xia Yun et al. in 1988 sparked a surge of scholarly interest. Researchers have reinterpreted the laws from various perspectives: Wang Suqin correlated the laws with the “three elements” of library systems using a three-dimensional coordinate framework [?]; Liu Jingyu analyzed and evaluated the laws in terms of applicability, significance, impact, and development trends [?]; and Xu Zhengxing reexamined their meaning in the context of smart services from postmodernism and Library 2.0 perspectives [?]. Other scholars have conducted innovative research and applications tailored to China’s library development context, extending the domain beyond foundational theory to encompass digital libraries, Library 2.0, and reading promotion initiatives.

For instance, Xu Yuequan and Yu Ning classified and analyzed laws in library and information science, positioning the Five Laws as normative propositions [?]. Zhao Shuquan elaborated on the laws from the perspective of modern information service systems, arguing that traditional theories require new interpretations to guide contemporary library services [?]. Scholars including Zhang Xiumin, Ji Hongjun, Zhou Jinliang, and Luan Fangfang reinterpreted the laws in the digital library era [?], while Wu Xiaojun articulated the integration of user-centered philosophy in Library 2.0 with the service principles of the Five Laws [?]. Liu Yuexue applied correlation analysis to examine the relationship between reading promotion and each of the Five Laws, revealing how the laws reflect the essence of reading promotion activities [?]. Ren Beibei and Liang Fang respectively presented case studies of reading promotion programs at Nan-

ing Audit University and Hunan Agricultural University, demonstrating the practical value of the Five Laws in campus reading promotion and cultural construction [?, ?].

Previous research has primarily relied on traditional qualitative analysis, with bibliometric studies and systematic reviews of existing literature remaining scarce. To address this gap, this study selects relevant domestic publications on the Five Laws from 1982 to 2023, employing bibliometric methods and utilizing CiteSpace [?] and ChatGPT-4 to analyze research forces, hotspots, and future trends, thereby providing support for subsequent development in this field.

### 1.1 Research Methods and Tools

CiteSpace (Citation Space) is a scientific literature visualization tool developed by Professor Chen Chaomei of the College of Computing and Informatics at Drexel University in 2003. Through co-citation and co-occurrence analysis, it enables multi-perspective and time-divided visual analysis of scientific literature data, revealing historical development and structural changes in knowledge domains. ChatGPT is a conversational AI built on large-scale language models, with the ChatGPT-4 version offering particularly precise, high-quality, and diverse text analysis capabilities. This study employs CiteSpace (6.3.R1) to conduct co-occurrence and clustering analyses of the literature dataset, generating scientific knowledge maps for authors, institutions, and keywords, and utilizes ChatGPT-4 combined with expert judgment to summarize research hotspots and trends in China's Five Laws research.

### 1.2 Data Sources

This study retrieved documents from the China National Knowledge Infrastructure (CNKI) database using the subject terms: “图书馆学五定律” (Five Laws of Library Science), “阮氏五定律” (Ranganathan's Five Laws), “阮纳纳赞,” and “阮网纳赞” (Ranganathan). The search scope included all academic journals published through 2023. The initial retrieval yielded 481 documents, which after data cleaning and deduplication, resulted in a final dataset of 267 publications.

## 2.1 Annual Publication Volume Analysis

Analysis of annual publication trends (Figure 1 [Figure 1: see original paper]) reveals three distinct stages in Chinese research on the Five Laws:

1. **Initial Development Stage (1982–1999):** Characterized by low but gradually increasing publication volume, this period focused primarily on introducing and interpreting the Five Laws, establishing a foundation for subsequent research growth.
2. **Practical Application Stage (2000–2011):** This phase witnessed a steady upward trend with an average of 12–17 publications annually. Research perspectives shifted from theoretical introduction to deeper theo-

retical exploration and practical application, covering themes such as theoretical extension and innovation [?, ?], digital libraries [?, ?] and Library 2.0 [?], and applications in library service and management [?]. These contributions enriched library science theory and provided practical guidance for library development.

3. **Comprehensive Development Stage (2012–Present):** Although total publications have shown a declining trend, research depth and breadth have increased significantly. Themes now encompass user-centered service innovation [?], digitalization and technology integration [?], social responsibility [?, ?], and theoretical deepening [?, ?]. While direct attention to the Five Laws has diminished, emerging trends show their integration with new technologies.

## 2.2 Author Analysis

Author collaboration network analysis (co-authorship analysis) is a common CiteSpace method for examining collaborative relationships within a research field. In this analysis, nodes represent individual authors and edges represent collaborative relationships.

Setting the node type to “author” yielded a network with 180 nodes, 33 edges, and a network density of 0.002 (Figure 2 [Figure 2: see original paper]). Overall, collaborative relationships among researchers in this field are relatively loose, with most collaborations occurring within internal teams and weak connections between different research groups.

Table 1 presents the top 10 authors by publication volume. Xu Zhengxing ranks first, followed by Yu Mingdi and Huang Shunrong. Xu’s research focuses on profound reinterpretation and theoretical extension of the Five Laws from perspectives integrating postmodernism and traditional Chinese culture, highlighting their new significance in smart service contexts [?]. Yu Mingdi examined modern applications and development of the laws, particularly addressing the “reader first” principle and the contradiction between collection development and user needs, offering both historical reflection and suggestions for theoretical refinement [?]. Huang Shunrong investigated the applicability of the Five Laws in modern libraries, especially in collection development at university libraries [?].

## 2.3 Institution Analysis

CiteSpace’s institutional co-occurrence analysis function visualizes collaborative relationships among institutions, revealing cooperation patterns, intensity, and trends. Analyzing the 1982–2023 data in five-year intervals with “institution” as the node type identified 154 institutions and 19 collaborative relationships, with a network density of 0.0014 (Figure 4 [Figure 4: see original paper]). The visualization reveals weak inter-institutional collaboration networks, with no apparent central research institutions.

As shown in Table 2, Nanjing Communications Institute of Technology Library ranks first in publication volume, followed by the Department of Information Resource Management at Nankai University and Tianjin University of Science and Technology Library. Notably, only six institutions have published three or more articles, indicating high concentration of research activity and relative limitations in institutional engagement.

Figure 3 [Figure 3: see original paper] shows the institutional collaboration network map for Five Laws research.

## 2.4 Research Hotspots and Trends Analysis

### (1) Keyword Co-occurrence Analysis

Keyword co-occurrence analysis effectively reveals relationships among keywords in academic literature, illuminating core concepts, thematic development, and knowledge structures. This study selected literature from 1982 to 2023, using “keyword” as the node type with a g-index filter ( $k=100$ ). The resulting network contains 302 nodes, 713 edges, and a density of 0.0155 (Figure 4 [Figure 4: see original paper]). Nodes with purple edges indicate high betweenness centrality. As shown in Table 3, keywords such as “Five Laws of Library Science,” “Ranganathan,” “university library,” and “library science” play crucial connecting and bridging roles in the field, revealing core themes, key figures, and theoretical foundations.

Table 4 shows that the most frequent keywords include “Five Laws of Library Science,” “Ranganathan,” “library,” “library science,” “university library,” “reader service,” “digital library,” “reading promotion,” “reader,” and “long tail theory,” indicating research focuses on theoretical application, service management, user experience, and digital practice.

### (2) Keyword Clustering Analysis

Keyword clustering effectively reflects research hotspots, interdisciplinary integration, knowledge evolution paths, and structural characteristics. Building upon Figure 4, we generated a keyword co-occurrence clustering map (Figure 5 [Figure 5: see original paper]). The clustering modularity ( $Q=0.5913>0.3$ ) indicates significant cluster structure, while the average silhouette coefficient ( $S=0.893>0.7$ ) validates high cluster homogeneity and reliability. The analysis yielded 12 clusters (Table 5): Five Laws of Library Science, reading promotion, library, library science, Ranganathan, reader service, public library, librarian, smart service, open-shelf lending, library network, and living library.

While CiteSpace’s clustering function objectively represents research content, results tend to describe concrete features rather than directly mapping actual hotspots, potentially limiting direct insight into themes and trends. Therefore, following principles of role, task, rule, and output in prompt engineering, and considering multi-dimensional information including keyword frequency,

strength, Sigma values, and clustering results, this study employs ChatGPT-4 and expert judgment to further analyze semantic relationships and comprehensively identify research hotspots in China's Five Laws research.

**(i) Theoretical Analysis of the Five Laws** As a foundational theory in library science, the Five Laws provide crucial guidance for modern library development. Chinese scholars have conducted extensive theoretical explorations adapted to national conditions. Yu Mingdi proposed the “library work resonance law” based on the Five Laws and contemporary practice [?]. Jing Haiyan revealed the enduring vitality and applicability of the laws through comparative studies [?]. Huang Jungui proposed five principles of library science derived from both the original and new Five Laws [?]. Han Songtao interpreted the laws through a “resource-integration-service” abstract model, arguing that different service modes for different media remain within Ranganathan’s descriptive framework [?]. Lin Qing offered profound humanistic interpretations of Ranganathan’s three core elements: “collection,” “reader,” and “librarian” [?]. Xu Zhengxing explored connections between Library 2.0 and postmodernism, offering deep reflection on the Five Laws [?]. Xu Yuequan and Yu Ning classified the laws as normative propositions [?]. Zhao Shuquan analyzed the laws’ impact on automated and intelligent library development, noting they provide both core service principles and theoretical support for transformation amid the information technology revolution [?].

**(ii) Application Exploration of the Five Laws** Since China’s reform and opening-up, numerous scholars have conducted extensive applied research based on the Five Laws, primarily focusing on management and services in traditional libraries. Shen Xiaoying documented how Hangzhou Library applied the “reader-centered” principle to improve circulation desk efficiency and service quality [?]. Wang Xinrong and Zhang Yahong discussed practical applications in campus library management [?, ?]. Research has also explored the laws’ validity in digital environments. Feng Lian and Li Qin Hai argued that the core concepts remain relevant for guiding modern library services [?, ?]. Wang Xiaodan and Li Jingjing demonstrated the value of the Five Laws in technology integration through RFID applications [?, ?]. Li Yanchun proposed university library reading promotion strategies guided by the laws [?].

**(iii) Five Laws and Service Innovation** The Five Laws provide core principles and direction for modern library service innovation, driving continuous progress. Chinese scholars have conducted in-depth research on “information service,” “service innovation,” and “precision service.” Cai Qin emphasized the importance of knowledge dissemination methods and technological applications in service innovation [?]. Li Xin explored innovative approaches to library service content and methods based on the Five Laws [?]. Ye Ying interpreted service innovation practices from the perspectives of the Five Laws and “book theory,” proposing a dual strategy of print and digital services [?]. Mu Xiaoyan

examined user-centered service innovation pathways for university libraries in the information age [?]. Xu Zhengxing reflected on service concepts under the Five Laws in smart service contexts [?]. These studies reveal that modern library service innovation hinges on user-centered design, efficient resource utilization, personalized services for diverse needs, optimized processes for improved efficiency, and continuous exploration of new strategies for sustainable development.

### (3) Keyword Burst Analysis

Burst detection identifies sudden increases in concepts, themes, keywords, or research activities within specific time periods, revealing emerging trends and rapidly growing research foci. This study identified 25 major keyword bursts (Figure 6 [Figure 6: see original paper]). “Year” indicates when a keyword first appeared, “Begin” marks when its usage started increasing significantly, “End” shows when the trend concluded, and “Strength” represents burst intensity—higher values indicate faster growth and greater research attention.

Note that burst analysis begins in 1997, as keyword records were systematically included in bibliographic information from that year. Through manual review of 1982–1996 literature and combined analysis of Figure 1 and Figure 6, we identify three evolutionary stages:

1. **Initial Exploration and Foundational Theory (1982–1999):** Burst keywords including “law,” “library science,” “open-shelf system,” and “librarian” highlight theoretical exploration and preliminary practical application of the Five Laws.
2. **Digital Transformation and Service Model Innovation (2000–2014):** Burst keywords such as “digital library,” “humanism,” “reader service,” “information service,” and “network environment” indicate research focused on digital library development, information technology applications, humanistic values, and evolving librarian roles. Keywords like “reader service,” “long tail theory,” and “network environment” also reflect trends toward personalized services and diversified theoretical research under emerging technologies.
3. **Smart Libraries and User-Centered Services (2015–2023):** High-intensity bursts including “reading promotion,” “smart service,” and “post-modernism” reveal dual research foci: theoretical construction of the Five Laws in smart library contexts, and studies on libraries’ social and cultural responsibilities in user services.

Figure 6 also shows that direct research on the Five Laws has gradually decreased, replaced by the internalization and integration of core concepts such as “user-centered” principles and “humanistic spirit” into new research themes like “smart library,” “digital library,” “reader needs,” and “reading promotion.” This shift demonstrates that future research will move beyond direct focus on

the laws themselves toward deep integration of their principles with emerging technologies, user behavior, and service innovation.

### 3.1 Conclusions

Using CiteSpace and ChatGPT-4, this study comprehensively analyzed research trends, core issues, and future directions of China's Five Laws research, yielding the following conclusions:

1. **Publication Volume:** Research development has progressed through three stages: initial development (1982–1999), deepening exploration and practical application (2000–2011), and comprehensive development (2012–present). The annual publication trend shows a “growth-stability-fluctuation” pattern.
2. **Research Forces:** Xu Zhengxing, Yu Mingdi, and Huang Shunrong are core authors, but have not formed closely connected collaborative groups. Overall, author collaboration is loose, mostly limited to internal teams. Major institutions include Nanjing Communications Institute of Technology Library, Nankai University, and Tianjin University of Science and Technology. While institutional distribution shows high concentration, no core research groups have formed around these institutions.
3. **Research Hotspots:** Three main thematic areas emerge: theoretical analysis and extension of the Five Laws, application exploration and practice, and service innovation. Evolutionary stages include initial exploration (1982–1999), digital transformation (2000–2011), and smart libraries with user-centered services (2012–2023). The research focus has shifted from the theory itself to deep integration of its core principles with emerging technologies, user behavior, and service innovation.

### 3.2 Outlook

Based on the visualization analysis, the Five Laws will continue to transform and expand in future research, emphasizing integration of humanistic values and user-centered concepts into broader library science themes. In the artificial intelligence era, important future directions include: how libraries can achieve user-centered service design, how to maintain and promote the core principles of the Five Laws in globalized and multicultural contexts, and how interdisciplinary collaboration can extend these principles to broader domains. Future research should also consider multi-source data, diverse analytical tools, and international perspectives. This bidirectional dynamic exploration will advance both theoretical development of the Five Laws and innovation in library practice, enabling libraries to better serve users and society.

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**Author Contribution Statement:**

Niu Weidong: Designed the research framework and revised the manuscript;  
Shen Dongchao: Drafted and revised the manuscript.

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