Thought Expression, Application, and Evolution of Post-prints in Library Development and Transformation

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Abstract

[Purpose/Significance] The discourse on thinking expressions that has emerged in library science research furnishes a novel perspective for interpreting library transformation, supplementing conventional emphases on technology and institutions. By systematically examining typical thinking expressions alongside their application contexts and evolutionary patterns, this study seeks to better comprehend the developmental transformation process of libraries. [Method/Process] This research systematically reviews studies on thinking in professional library science literature, analytically constructs quantifiable indexing of thinking expressions, and employs an integrated approach of bibliometric and content analysis methods to investigate their temporal distribution, contextual distribution, expression intensity, and patterns of change. [Results/Conclusion] The volume of thinking expressions in library science research has experienced rapid growth since 2011, with primary applications in domains including library services, resource development, and leadership management. Current thinking expressions persistently manifest deconstructive and reconstructive characteristics, while tendencies toward localization and specialization have become increasingly pronounced.

Full Text

Preamble

Thinking, as a mental activity, requires certain forms of expression to be manifested [3]. This study selects professional literature in library science as the carrier of thinking expression, systematically collecting and reviewing research literature on thinking in the domestic library field over the past 40 years. Using bibliometric methods and content analysis, it presents the content characteristics and changes of these expressions, while combining relevant cases to illustrate

how these thinking patterns are applied in library development and reform. In summary, this paper addresses three main questions: 1) What thinking expressions have emerged in the process of library development and reform, and what connotations and characteristics do they exhibit? 2) How are these thinking expressions reflected in or applied to the context of library development and reform? 3) How have these thinking expressions changed over time at the literature indicator level, and what evolutionary patterns do they demonstrate at the practical level?

2 Theoretical Foundations and Conceptual Clarifications

The theoretical foundation section responds to the limitations of "superficiality," "isolation," and "staticness" in previous library thinking research by theoretically interpreting the following issues:

2.1 Deepening Research: Uncovering Conceptual Changes Reflected in Thinking Expressions

Deepening thinking research in the library field requires uncovering the conceptual changes reflected in thinking expressions. In 2018, Chen Chao, Director of Shanghai Library and Shanghai Institute of Science and Technology Information, pointed out that facing the new era, the most important thing is to "change the way of thinking." Changes in thinking mode are the prerequisite and foundation for all reforms—only by truly changing our thinking can we address new problems and challenges [4]. Thinking is the mental and intellectual process active in people's minds [5], representing the brain's indirect and general reflection of objective things. Broadly speaking, thinking refers to consciousness and spirit, in contrast to objective "existence" [6]. Thinking and concepts interact with and influence each other [7]. Thinking modes affect people's subjective understanding of objective things (i.e., concepts). Concepts are the products of thinking processes, and the heterogeneity of thinking leads to the divergence of concepts [6]; meanwhile, existing concepts can serve as the foundation, groundwork, and prelude for thinking [8-9], with thinking activities in a given period based on and dominated by existing concepts [5]; and the process of conceptual transformation can generate more new thinking modes [7]. Therefore, the current proliferation of various thinking expressions in the library field precisely reflects potential transformations in library concepts. Conceptual change in the conceptual domain is often accompanied by hesitation, confusion, conflict, and even risk within the profession. When facing various new thinking modes, we need a calm attitude and careful assessment of their deep-level impacts.

2.2 Three-Dimensional Research: Uncovering the Linkages Between Technology, Institutions, and Concepts

To avoid viewing thinking elements in isolation and one-sidedly, we must examine them in connection with other reform elements in library development. Tech-

nological innovation may bring disruptive impacts in the short term, particularly affecting the information exchange and communication field where libraries operate; however, the adoption and promotion of new technologies must be accompanied by the improvement and optimization of management strategies and governance mechanisms, thereby driving innovation at the library management and organizational institution level—a process that may involve long-term coordination, adaptation, and game-playing. In contrast, conceptual change may be a more subtle yet profound process, touching upon the philosophical foundation and mental models of libraries as a profession, the cultural attributes of libraries as institutions, the atmosphere and style of libraries as spaces/places, and the value judgments of libraries as services/functions. People's understanding of technology, institutions, and concepts develops progressively and deepens over time. North argued that the determinant of economic growth is institutions rather than technology. Although North's theory is narrated within the socio-economic domain, he himself pointed out its potential broader applicability [12]. In the later stage of his institutional thought, North paid greater attention to the influence of human mind, cognitive processes, and belief structures on institutional generation and change [13], viewing concepts, doctrines, and fashions as sources of institutional change. Cognitive theories of institutional change emphasize that individual cognition determines behavior, and cognitive factors, as important forms of informal institutions, affect the implementation results of formal institutions [14], playing a significant role in institutional evolution. Thinking is precisely such an important cognitive factor.

In the process of institutional evolution, institutions often face path dependence and lock-in problems—once embedded in a certain path or structure, existing institutions may follow their inherent inertia and self-reinforce within a certain period, largely stemming from the "mental set" of actor groups within the institution [15]. This fixed thinking mode not only has inertial tendencies but also exhibits group characteristics [15], varying across different levels and domains (such as nation or ethnicity, groups, disciplines, and individuals) [16]. As a specific profession, since practitioners' thinking is cultivated within shared core concepts, external environments, and specific groups, it is prone to forming a unique thinking mode during a certain period. Libraries are institutions where professional mental sets are particularly evident. For instance, in discussing the transformation of research library service models, Zhang Xiaolin argued that compared with many technical challenges, establishing a "thinking mode" that supports users' open knowledge service innovation is more important [17]. Thus, the significance of focusing on the library thinking domain lies not merely in improving thinking itself, but in promoting the optimization of institutional environments through changing thinking. Only in a sound governance environment can various technological methods be better accepted and integrated, thereby forming a virtuous cycle of library development and reform driven by the three elements of concepts, institutions, and technology.

2.3 Dynamic Research: Uncovering Evolutionary Patterns of Thinking in Library Development

In library development and reform, the aforementioned elements of concepts, institutions, and technology are not only interconnected but also dynamically changing. In recent years, some studies have begun to examine the evolutionary trajectories of different elements in library transformation. For example, regarding the technological element, some scholars believe that library development patterns previously overlooked can be found in the history of technology [18]; regarding the institutional element, some scholars have analyzed the development histories of various types of libraries at home and abroad from an institutional evolution perspective, focusing on the historical origins, era backgrounds, and social environments of library institution formation to seek a reference framework for comparative analysis of library development models [19-21]. In contrast, diachronic studies on the conceptual element in library development still have much unexplored territory. Existing intellectual history research related to libraries mostly focuses on disciplinary, academic, and scholarly thoughts from ancient to modern times, lacking attention to thinking in contemporary indigenous library institutional practice and research on modern-adjacent history [22-23].

Moreover, similar to "Moore's Law" in the technology field, the emergence of new thinking and the surge of new intellectual trends have become increasingly frequent in recent years, with some traditional concepts reaching a critical point of change. Various new terms often appear in forms that subvert traditional cognition, overwhelming practitioners. In this context, we should further explore the evolutionary patterns of thinking in library development, leveraging the descriptive, explanatory, critical, and predictive functions of theory. As Barabási, the founder of "scale-free networks" in complex network theory, pointed out, social development is not entirely random, accidental, or unpredictable, but follows an orderly pattern called "burst"—sudden intensive occurrence after a long period of silence. Whether in nature or human society, as long as power-law distributions are followed, burst points will emerge. In the current environment, through the "convergence" of data, science, and technology, social development processes have been unprecedentedly digitized, formalized, and modeled, making this "burst" pattern easier to understand, predict, and even control, granting us "new thinking" for foreseeing the future [24]. This "convergence" described by Barabási is even more evident in the information exchange and communication field where libraries operate, suggesting that we may be in a new burst period involving not only new technologies but also new thinking modes. We need to grasp this temporal node from a historical and developmental perspective.

3 Research Methods

As previously discussed, thinking itself is a mental activity that requires carriers for expression and dissemination. When analyzing the evolution of thinking in the library field, we must identify observable sample objects. Among

thinking carriers, language is the most important tool for realizing, consolidating, and communicating thinking outcomes; thinking achievements are recorded and fixed through language, expressed and disseminated via language, enabling their intergenerational transmission and accumulation, and allowing thinking to develop based on inherited achievements [25]. Academic literature, written in academic language following professional discourse norms, inherently carries the characteristics of professional thinking in a given period. Academic journals, as the main platforms for scholarly exchange, facilitate understanding of disciplinary development trends and promote knowledge dissemination to advance library development [26].

In library science academic journals, a series of papers with "thinking" in their titles have emerged in recent decades (typical recent examples include discussions on the application of "Internet thinking" in libraries), representing specialized discussions and high-level generalizations of thinking in the library field. This study used "library" and "thinking" as title search terms, selecting the CNKI full-text journal database as the data source, and retrieved 445 documents in the library and information science field. The earliest paper was published in 1985, with the search cutoff date being May 2020, spanning over 30 years. Given the large time span, moderate sample size, and concentrated content themes, this literature sample is suitable for analysis.

For the collected literature, we employed a combination of content analysis and bibliometrics. The content coding scheme used in the analysis is shown in Table 1 . By statistically analyzing the publication time fields of papers, we reflected the diachronic changes in thinking expressions. We extracted the "thinking expression" from each paper—that is, the summary of a certain thinking mode or type in the literature—to form measurable indices, such as scenario thinking, design thinking, and data thinking. Sometimes one paper might yield multiple indices; for instance, literature discussing Internet thinking might address platform thinking, cross-boundary thinking, user thinking, etc. In such cases, each thinking expression was parsed from the text and indexed independently, allowing the analysis granularity to shift from the paper level to the content theme level. Most papers defined their proposed thinking expressions, but some descriptions were relatively general (e.g., using "new thinking" as the title). For these cases, we further indexed the specific application domain of the thinking expression to facilitate subsequent statistics.

Table 1 Content Analysis Coding for Library Thinking Research Literature

Thinking Expression Name in Text	Definition of Thinking Expression	Application Domain of Thinking Expression

4 Findings and Discussion

4.1 Temporal Distribution of Library Thinking Research Literature

Using individual papers as the statistical unit, we analyzed the literature by publication time, with results shown in Figure 1 [Figure 1: see original paper]. Using five-year intervals starting from 1985, the results identify 2011 as a watershed. From the 1990s through the first decade of the 21st century, relevant literature showed a gradual upward trend; after 2011, the volume began to rise rapidly. The number of papers on thinking published since 2016 alone exceeds the total of the previous 20 years. The main reason is that since 2011, the big data and "Internet Plus" environment has gradually formed, affecting all aspects of library development and bringing a burst period for various thinking expressions, particularly the massive emergence of discussions on Internet thinking, creating a new "thinking" craze.

4.2 Application Scenarios of Library Thinking Research Literature

Excluding some literature with broad discussions of thinking, most papers connect with specific application scenarios. After parsing and statistically analyzing the application domains of thinking expressions in the literature, the results are shown in Figure 2 [Figure 2: see original paper].

4.2.1 Typical Scenario 1: Library Services Fifty-six percent of thinking expressions relate to library services. In early literature before 2011, most service-related expressions reflected the influence of "human-centered" concepts, approaching library service implementation from humanistic and people-oriented perspectives. For example, when discussing "new thinking and strategies for library services," some literature summarized it as "reader-centered," understanding, meeting, exceeding, and deepening services to fulfill reader needs while also caring for staff needs [27]. In the first decade of the 21st century, an important thinking shift in library services moved from a "library-centered geocentric model" to a "user-centered heliocentric model" [28]. After 2011, literature on library service thinking was mostly strongly influenced by new technologies and their applications, especially after 2015, when thinking expressions basically could not escape prefixes like "Internet" or "data." This perhaps reflects the ebb and flow of influence between humanistic and technological factors on library thinking.

4.2.2 Typical Scenario 2: Library Resources Library resource construction is another domain where thinking expressions frequently appear. Over recent decades, library resource forms and processing methods have undergone profound changes, which can be summarized as "digitization" (emergence of born-digital resources and digitization of traditional documents), "openization" (open access), and "datafication" (big data and its applications). These changes have impacted not only specific content processing technologies and work organization methods but also triggered thinking changes, as reflected in relevant

literature. For instance, in the late 1990s, when discussing "new thinking in collection development," literature was still limited to allocating physical print materials, such as adjusting funding ratios between books and periodicals or increasing social science holdings [29]. By around 2000, similar discussions began addressing the balance between online and physical resources, establishing special collections, and adjusting traditional print-centered concepts to meet resource diversification challenges [30]. In the big data era, resource construction has shifted toward knowledge organization and resource discovery, using data for user profiling, behavior prediction, and management decision-making [31], while Internet thinking has permeated all aspects of resource acquisition, circulation, and disposal, manifested in reader participation in acquisition, creating procurement platforms, broadening document sources, and enabling cross-boundary circulation [32].

4.2.3 Typical Scenario 3: Library Leadership and Management Thinking expressions also frequently appear in library management and leadership literature, but mainly before 2011. From the 1990s to the early 21st century, changing library leaders' thinking became a focal point for solving library development challenges, producing numerous discussions on improving leaders' thinking modes and levels. Afterward, attention to library leaders cooled, possibly because library work in the new technological environment became increasingly complex and specialized, with significant differences between business areas [33], making thinking expressions in library management more professional and specific to particular groups. Additionally, library governance structures and internal business frameworks have continuously improved and perfected in recent years. These developments actually place higher demands on library leaders' thinking, requiring elevation from specific business levels to strategic levels, highlighting the need to form strategic thinking [34] with holistic and global perspectives, observing and handling issues from historical, value-based, and worldwide heights.

4.3 Theme Intensity and Variation of Thinking Expressions in Library Field

Through word frequency statistics of parsed thinking expressions, we created the visual word cloud shown in Figure 3 [Figure 3: see original paper], where word frequency reflects the expression intensity of thinking themes and macroscopically shows the usage of relevant thinking expressions in library science journals over the past 40 years. The findings indicate: 1) Rich variety and diverse expressions of thinking modes; 2) High expression intensity for Internet thinking, data thinking, innovative and creative thinking, design thinking, and convergent/divergent thinking, with relatively numerous and concentrated research literature; 3) Thinking expressions mainly involve borrowing, migration, and transplantation, with few directly related or "native" professional thinking modes for the library field. Notably, data thinking has risen rapidly in recent five years, showing a "burst" trend in the new technological environment

and reflecting enhanced relevance and professionalism in library field thinking expressions.

Meanwhile, the emergence, growth, and decline of these thinking expressions show distinct temporal characteristics and significant differences. Since Figure 3 can only statically present quantitative comparisons, we introduced a temporal dimension to generate the diachronic evolution shown in Figure 4 [Figure 4: see original paper]. It should be noted that due to large frequency differences before and after 2011 (e.g., "Internet thinking" after 2011 reached 77 occurrences, while "creative thinking" before 2011 only reached 23, and 62% of thinking expressions had frequencies below 4), the vertical axis in Figure 4 does not directly use occurrence frequencies. Instead, it applies logarithmic function standardization to normalized frequencies of thinking expressions with 4+ occurrences, converting them into standard values representing data trends to more completely and clearly reflect comparative evolutionary trends.

Figure 4 presents the evolutionary trends of major thinking expressions in library science literature over nearly 40 years. The findings show: First, overall, thinking expression research has entered an active period since 2011, with current discussion frequencies reaching historical highs; second, high-frequency expressions like Internet thinking, data thinking, and design thinking have all emerged in the past 10 years as new expressions; third, creative thinking, open thinking, and convergent/divergent thinking that were at relatively high points before 2011 emerged intensively within fixed periods then quickly declined; additionally, only innovative thinking shows relatively persistent and stable vitality in literature, though this expression itself sometimes lacks specificity.

To better present changes before and after 2011, we created Figure 5 [Figure 5: see original paper] based on occurrence frequencies and year ranges of major thinking expressions, with numerical values showing expression frequencies. The figure reveals that except for innovative thinking (which lacks specificity), relevant high-frequency thinking expressions have basically been completely replaced, reflecting the characteristics of thinking trends analyzed in the theoretical foundation section and the significance of thinking expressions as indicators for observing library development changes.

4.4 Typical Thinking Expressions and Development Patterns in Library Field

4.4.1 Development Stages of Library Thinking Expressions From a content perspective, thinking expressions before and after 2011 reflect different orientations and intellectual trends. Before 2011, research themes can be summarized as thinking "construction" and "structuring"—beginning to treat thinking as an independent research level, using thinking elements as important variables to explain library development while introducing general thinking methods like creative thinking, divergent thinking, and reverse thinking into library construction and development considerations. After 2011, research

themes can be summarized as thinking "deconstruction" and "reconstruction"—reflecting on established thinking and its impacts under postmodern influences and new technology shocks, with proposed new thinking having subversive qualities toward original thinking, most typically represented by Internet thinking and data thinking.

4.4.2 Analysis of Typical Thinking Expressions in the Construction/Structuring Stage Typical thinking expressions in the library field's construction/structuring stage include creative thinking, convergent/divergent thinking, open thinking, and divergent thinking. These expressions are general and universal. Under the continued influence of the global library science "methodology" research boom from the 1960s-70s [35], China's library field in the 1980s, while re-establishing its theoretical foundation after reopening to the world, extensively absorbed various new concepts and expressions being introduced. For example, creative thinking, as a complex thinking activity supporting scientific research, emphasizes novelty in thinking processes and outcomes [36]. The introduction and widespread discussion of creative thinking at that time helped break the previously closed, rigid, and dogmatic library work and research situation, reflecting the pursuit of scientization in library activities.

For China's library field in the 1980s, which was reconnecting with and embracing the world, the information environment was already undergoing rapid change, with the first wave of digitization hitting. The library field needed open thinking to absorb vast external information while facing new "ancient vs. modern" and "indigenous vs. foreign" debates. Based on actively transplanting foreign ideas, theories, and methods, it attempted to 赋予 new connotations to libraries' existing theoretical foundations, system structures, and research content [37], while constructing concepts in newly opened territories. Library work and research proceeded simultaneously with modernization, internationalization, and localization, generating a series of expressions about convergent and divergent thinking.

Overall, from the late 20th century to the early 21st century, typical thinking expressions in China's library field came mainly from borrowing, absorption, rediscovery, and integration, showing a process and effect of construction/structuring. However, this stage's thinking evolution, while enriching the library field's conceptual domain, also had some long-lasting limitations. For instance, some literature pointed out that thinking during this stage was overly divergent [38], with divergent thinking even dominating [39], lacking necessary focusing and sustained in-depth construction, which to some extent led to later problems of disciplinary and theoretical system expansion, conceptual complexity, 浮躁 mentality, blurred focus, and lost ground in library science.

4.4.3 Analysis of Typical Thinking Expressions in the Deconstruction/Reconstruction Stage Typical thinking expressions in the library

field's deconstruction/reconstruction stage include Internet thinking, data thinking, and design thinking. Unlike the construction/structuring stage, typical expressions in this stage update rapidly, presenting a completely new landscape: First, they clearly reflect the application of new technologies, models, and methods, better representing the combined effects of technological change, institutional innovation, and conceptual transformation; second, these expressions are no longer vague but have relatively clear objects and application scenarios.

Taking Internet thinking as an example, it is a way of re-examining markets, users, products, value chains, and even entire business ecosystems under the combined effects of mobile Internet, big data, cloud computing, and other technologies [40], and is a 思想 for re-examining all activities based on the Internet in a ubiquitous connectivity environment [41]. These definitions show that Internet thinking itself represents the subversion and reconstruction of various scenes in the industrial civilization tradition by new "digital civilization" and "Internet civilization." As a "container," Internet thinking involves subdivisions like user thinking, platform thinking, cross-boundary thinking, and ecological thinking. These expressions refer not to specific information technologies or concrete management methods, but to new ideas for understanding and transforming old ways—making thinking expressions aptly serve as deconstruction/reconstruction tools in library development.

Table 2 illustrates the deconstruction/reconstruction role of relevant thinking expressions in the library field through examples. Despite involving borrowing and migration, unlike the metaphysical deduction of thinking expressions in the early construction/structuring stage, thinking expressions in the deconstruction/reconstruction stage have clearer problem awareness and emerge more from bottom-up induction in library practice. Since Internet thinking, data thinking, and cross-boundary thinking themselves originate from the open Internet environment, information technology becomes the common bond between emerging thinking expressions and library practice. From library information resource construction to library services and management, libraries as important social knowledge institutions provide fertile ground for the application and growth of new thinking.

Table 2 Example Analysis of Typical Thinking Expressions in the Deconstruction/Reconstruction Stage

Typical Thinking Expression	Application Scenario Example	Deconstruction/Reconstruction
Library Information Resource Construction	Traditional channel-based procurement	Reader participation in procurement

Typical Thinking Expression	Application Scenario Example	Deconstruction/Reconstruction
Publishing-Library Relationship	Upstream-downstream relationship	Competitive-cooperative relationship between different ecological niches
Library Positioning	Library as place and portal	Library as open knowledge community
Library Management Decision-making	Experience-based decision-making	Data-driven decision-making
Library Activity Organization	Based on existing documents and resources	Based on problem-solving and idea stimulation
Library Reading Promotion	Library as single organizational entity	Library cooperating with diverse social entities

4.4.4 Development Trends of Library Thinking Expressions Examining the changing patterns of library thinking research content over time reveals two tendencies: localization and specialization. Localization manifests as research increasingly aligning with indigenous contexts and scenarios. In the 1980s, when China's library field recovered from its dormant period, it had strong intentions for reconstruction, revival, and reconnection with the world. Alongside society-wide "culture fever" and "Western learning fever," various foreign new concepts and thinking expressions were introduced in library professional journals as conceptual weapons to promote library development. Subsequently, research shifted from simply introducing thinking concepts to seeking thinking tools based on indigenous actual conditions and specific problems. Over the past decade, as China's comprehensive national strength has grown, especially in Internet information technology, new technologies and business forms have spawned new thinking and concepts, forming highly condensed and characteristic expressions like Internet thinking. Specialization manifests as research increasingly aligning with specific library practices, returning to libraries' own activity domains [42], shifting from blindly importing conceptual expressions to endogenously summarizing and refining thinking changes from professional practice. Thinking expressions in recent library professional journals have become increasingly targeted and directed toward specific library business scenarios.

Drawing on Harvard psychologist H. Gardner's classification [43], we can view new changes as emerging from three domains: "wetware" (i.e., mind, cognition, and thinking), "dryware" (i.e., technology and hardware), and "goodware" (i.e., values and ethics). With research coverage of libraries' "dryware" and "goodware" domains, this study attempts to focus on changes in the library field's thinking.

Thinking reflects the logic of how people understand things and consider problems, being the product of practical activities [37], gradually formed through the progressive sedimentation of knowledge, concepts, and habits. Therefore, thinking also has epochal and social characteristics; different historical stages incorporate knowledge achievements and ideological concepts that represent the trends of their times into thinking [44], forming historically characteristic thinking modes and their expressions and applications.

In libraries' continuous development and reform, thinking provides an underlying logic, while thinking expressions provide a representation for observing library change processes. Changes in thinking expressions in library research over the past 40 years reflect the combined reform of internal concepts and external environments. Thinking expressions with vitality and promotional effect in library development and reform originate from the effective linkage of new technologies and new methods. We are currently in a new thinking burst period and need to grasp the new opportunities of "convergence" in data, science, and technology, thoroughly elaborating and applying valuable new thinking to contribute professional thinking with librarian professional characteristics to future knowledge society.

References

[1] Zhang Yanbin. Internet thinking should not be vulgarized [J]. IT Time Weekly, 2015(9): 62-63. [2] Wang Zongyi. Professional thinking and professional methods—Reflections on basic research in contemporary Chinese library science [J]. Library and Information Service, 2009, 53(21): 21-24, 133. [3] Tian Li. Expression and evolution of design thinking—Review of *Sketch · Scheme · Architecture: How World-Class Architects Show How to Design* [J]. Huazhong Architecture, 2006, 24(7): 15-20. [4] Chen Chao. New era urgently needs new thinking—Strategic thinking on library development in the new era [J]. Shanghai University Library and Information Work Research, 2018(2): 6-10. [5] Miao Qiming. On concept-based thinking mode: Belief thinking [J]. Journal of Ningxia University (Philosophy and Social Sciences Edition), 1998(4): 61-65. [6] Zhang Zhihong. On the consensus of thinking characteristics and cultural concepts [J]. Jianghan Tribune, 2017(12): 68-76. [7] Jin Danyuan. Reflections on the dual transformation of contemporary artistic concepts and artistic thinking [J]. Hundred Schools in Arts, 2018, 34(3): 39-43. [8] Zhang Hengshan. On the conceptual foundation of rule-of-law thinking [J]. Theory and Reform, 2013(4): 5. [9] Dewey. How We Think [M]. Translated by Wu Zhongyou. Beijing: Xinhua Publishing House, 2015. [10] Yu Liangzhi. Introduction to Library Science [M]. Beijing: Science Press, 2003. [11] Chen Chuanfu, Chen Yi. Library transformation and its risk prospects [J]. Journal of Library Science in China, 2017(7): 32-50. [12] North. Institutions, Institutional Change and Economic Performance [M]. Translated by Liu Shouying. Shanghai: Shanghai Sanlian Bookstore Press, 1994. [13] Zhang Haifeng. Back to Veblenian institutionalism: Is North's institutional theory evolutionary? [J]. Social Sciences, 2018(8): 45-

54. [14] Gao Mingzi, Chen Dongping. Supply-demand mismatch of rural land transfer from a contract perspective—Direct identification and empirical analysis [J]. Economic and Management Research, 2018(8): 72-81. [15] Xie Dongping. "Constant" and "change": An examination of China's higher education key construction system operation [J]. Heilongjiang Researches on Higher Education, 2018(5): 16-20. [16] Chen Zhongli, Yang Ying, Lin Zhenyi, et al. Thinking Mode and Social Development [M]. Beijing: Social Sciences Academic Press, 2001. [17] Zhang Xiaolin. Open access, open knowledge, open innovation promoting open knowledge service models—3O convergence and paradigm transformation of research libraries [J]. New Technology of Library and Information Service, 2013, 23(2): 1-10. [18] Li Guangjian. History of technology is a mirror for observing library development patterns [J]. Library Tribune, 2016(5): 1. [19] Wang Zheng. Examination of early American town library organizational governance systems [J]. Information and Documentation Services, 2016(5): 17-22. [20] Zhao Yimin. Research on the Business Management Mechanism of the National Library [M]. Beijing: China Social Sciences Press, 2018. [21] Wang Zheng. Interpretation of national samples of library reform from an institutional evolution perspective—Reading *Research on the Business Management Mechanism of the National Library* [J]. Journal of the National Library of China, 2019(1): 103-109. [22] Wang Lei. Summary of the first library history academic symposium [J]. Library Development, 2007(1): 115-117. [23] Chen Dingquan. Research on library technology history (1954-): Absence, framework, and value [J]. Library Tribune, 2016(5): 2-8. [24] Barabási. Bursts: The Hidden Pattern Behind Everything We Do [M]. Translated by Ma Hui. Beijing: Beijing United Publishing Co., Ltd., 2017. [25] Thinking and language [EB/OL]. [2020-06-01]. https://baike.baidu.com/item/思维和语言/2958702?fr=aladdin. [26] Wu Dan, Xu Shuang, Li Xiuyuan, et al. Analysis of theory usage in Chinese library science research in the past decade [J]. Library & Information, 2019(6): 41-51. [27] Wang Zongyi. Professional discourse: Practice description and thinking construction—Reflections on contemporary library activities [J]. Journal of Library Science in China, 2017, 43(7): 13-23. [28] Li Haiying. New thinking and strategies for library services [J]. Library Forum, 2010(10): 93-95. [29] Zhang Xiaolin. Major trends subverting digital libraries [J]. Journal of Library Science in China, 2011(5): 4-12. [30] Liu Xingquan. New thinking in university library collection development [J]. Journal of Intelligence, 1998(6): 96-97. [31] Shi Huixia, Xie Lin. New thinking in public library collection development [J]. Journal of Library Science in China, 2000(2): 31-33. [32] Gao Lin. Big data thinking and library knowledge resource discovery [J]. Library & Information, 2015(1): 128-130. [33] Li Hui, Lin Yongchun. Analysis of public library collection development based on Internet thinking [J]. Library Work and Study, 2019(7): 83-87. [34] Wang Zheng, Zhang Peng. Research on new types of librarian positions overseas [J]. Information and Documentation Services, 2015(2): 106-111. [35] Ke Ping. What kind of library directors do we need? [J]. Journal of the National Library of China, 2011(1): 6-11. [36] Xie Yuantai. Library science research and creative thinking [J]. Library and Information, 1985(Z1): 61-64. [37] Zhuang Shouqiang. General Creation Studies [M]. Xuzhou: China

University of Mining and Technology Press, 2001. [38] Shan Bo. Transformation of thinking modes in contemporary library science [J]. Document, Information & Knowledge, 1986(1): 11-14. [39] San Si. Maintaining necessary tension between divergent and convergent thinking—Review of the "Bernal phenomenon" in library science research [J]. Library Science Research, 1987(3): 1-5. [40] Liu Xun. Behind the "low ebb" appearance—Exploring disciplinary and thinking patterns in library science [J]. Journal of Library Science in China, 1993(1): 71-75. [41] Wang Shiwei. New model for future libraries—Smart libraries [J]. Library Development, 2011(12): 1-5. [42] Chen Yuan, Cai Jinkui, Xu Liang. Reflections on smart library development in the Internet thinking environment [J]. Journal of Modern Information, 2015, 35(11): 38-42. [43] Gardner. Changing Minds [M]. Translated by Ren Kai, Wu Zhen, Liu Pei. Beijing: China Renmin University Press, 2009. [44] Zhang Jian. Library structural patterns and thinking modes [J]. Journal of the Sichuan Society for Library Science, 1989, 50(4): 8-14.

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Abstract: [Purpose/significance] The thinking expressions emerging in library science research provide a new perspective for interpreting library reform in addition to technology and institution. By combing typical thinking expressions and their application scenarios and evolution, we can understand library development and reform. [Method/process] This paper systematically reviewed thinking expressions in professional library science literature, formed measurable thinking expression indices, and analyzed temporal distribution, scenario distribution, expression intensity, and variation rules using literature measurement and content analysis. [Result/conclusion] Since 2011, the number of thinking expressions in the library field has grown rapidly, mainly used in library services, resource construction, and leadership. Current thinking expressions reflect deconstruction and reconstruction, with tendencies toward localization and specialization.

Keywords: thinking; concept; library change; Internet thinking; data thinking

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