

Integration of New Quality Productive Forces into University Library Knowledge Services: Coupling Logic, Practical Challenges, and Practical Pathways

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Abstract

[Purpose/Significance] Developing new quality productive forces constitutes the intrinsic requirement and pivotal focus for promoting high-quality development. Knowledge organization and service innovation represent crucial support for advancing scientific and technological innovation, facilitating the cultivation and development of new quality productive forces, and achieving self-reliance and self-improvement in science and technology. University libraries, serving as key frontiers for knowledge services, possess potential value in their service innovation for nurturing new quality productive forces. [Method/Process] This study employs text content analysis to thoroughly examine the key elements and core characteristics of new quality productive forces and university library knowledge services, elucidate their coupling logic, analyze the practical challenges confronting the empowerment of library knowledge services by new quality productive forces, and ultimately propose practical pathways and feasible adjustment measures. [Results/Conclusion] In the digital intelligence era, university libraries should facilitate the deep development and sharing of diverse data elements, enhance the development of new quality librarians and service teams, actively promote the integration and penetration of emerging technologies, and establish a flat incentive system, thereby stimulating the vitality of production factors such as technology and data involved in knowledge services, and enabling new quality productive forces to become the endogenous driving force for advancing library knowledge services.

Full Text

Integrating New Quality Productive Forces into University Library Knowledge Services: Coupling Logic, Realistic Challenges, and Practical Paths

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Abstract

[Purpose/Significance] Developing new quality productive forces represents an inherent requirement and critical focal point for advancing high-quality development. Knowledge organization and service innovation serve as essential supports for promoting scientific and technological innovation, fostering the cultivation and development of new quality productive forces, and achieving technological self-reliance and self-strengthening. As pivotal hubs of knowledge services, university libraries hold substantial potential value in nurturing new quality productive forces through service innovation. **[Method/Process]** Employing textual content analysis methodology, this study deeply examines the key elements and core characteristics of new quality productive forces and university library knowledge services, elucidates their coupling logic, analyzes the realistic challenges faced in empowering library knowledge services with new quality productive forces, and finally proposes practical pathways and feasible adjustment measures. **[Result/Conclusion]** In the era of digital intelligence, university libraries should focus on the deep development and sharing of various data elements, improve the construction of new quality librarian teams, actively promote the integration and penetration of emerging technologies, and establish flat, incentivizing institutional mechanisms. By stimulating the vitality of production factors such as technology and data involved in knowledge services, new quality productive forces can become the endogenous driving force for advancing library knowledge services.

Keywords: New Quality Productive Forces; Library; Knowledge Services; High Quality Development

Introduction

Universities constitute a vital component of national strategic scientific and technological capabilities, while libraries serve as frontier positions for excavating knowledge resources, transmitting scientific intelligence, and supporting

university research and teaching. In January 2022, the “Several Opinions on Deepening the Construction of World-Class Universities and First-Class Disciplines” stipulated that universities must ground themselves in the new development stage, serve the new development pattern, and comprehensively promote high-quality “Double First-Class” development [1]. In September 2023, General Secretary Xi Jinping creatively proposed the important concept of “new quality productive forces” [2], providing theoretical guidance and practical direction for university libraries on how to construct new knowledge service models and promote the development of world-class universities with Chinese characteristics against the backdrop of technology-led development. The 2024 Government Work Report explicitly called for “vigorously advancing the construction of a modern industrial system and accelerating the development of new quality productive forces,” indicating that new quality productive forces will bring transformation to industrial development [3]. This theory has further injected new momentum into the construction of university library knowledge service models, continuously expanding their connotation and extension.

Currently, academic research on knowledge services has primarily focused on exploring foundational platform construction [4], librarian professional competence development [5], service content expansion [6], and functional space renovation [7], with relatively few studies examining the construction of library knowledge service systems from the perspective of the interaction between productive forces and production relations. Against this backdrop, this paper endeavors to deeply excavate the basic connotations, logical associations, and contemporary characteristics of new quality productive forces and library knowledge services, with particular emphasis on investigating how to employ new quality productive force theory to expand library knowledge service pathways, thereby providing scientifically sound programmatic support for implementation.

1. Coupling Logic of New Quality Productive Forces and Library Knowledge Services

1.1 Basic Connotation of New Quality Productive Forces

Marxist productivity theory reveals the essence and laws of social production development. Productivity refers to the capacity of laborers to influence and transform nature by employing various production factors in production practice. Its development status serves as the fundamental criterion for measuring social development and constitutes the original and long-term force driving social progress. Faced with a new round of scientific and technological revolution and industrial transformation, new quality productive forces have emerged to promote productivity transformation, reshape production relations, and enable new configurations of production factors. Compared with traditional productive forces, new quality productive forces exhibit significant differences in driving forces, production methods and tools, production scale and efficiency, social im-

pact, and development strategies and priorities. Therefore, new quality productive forces represent an inevitable trend of scientific and technological progress and social development.

As the core driving force for achieving high-quality development in the new era, the “new” in new quality productive forces manifests in higher-quality laborers, higher-technology means of production, and broader-ranging objects of labor. The core lies in innovation-led development characterized by high technology, high efficiency, and high quality, providing scientific guidance for shaping new drivers and advantages for development [8].

The other anchor point, “quality,” is embodied in “high quality,” “multiple qualities,” and “dual quality-efficiency” [9]. High quality means that new quality productive forces prioritize qualitative improvement while ensuring quantitative growth, with both advancing in parallel to achieve a leap in high-quality development. Multiple qualities refer to the important characteristics of new quality productive forces, including innovativeness, coordination, greenness, openness, and sharing. Dual quality-efficiency emphasizes that development should focus on both economic and social benefits, with technology-driven development always aiming to benefit human society.

The key elements of new quality productive forces are threefold: (1) Higher-quality laborers constitute the primary element of new quality productive forces [10]. New quality productive forces emphasize that humans are the most active and critical factor in the production chain. Therefore, laborers need to possess comprehensive knowledge and skills, specifically technological, strategic, and applied talents who master new quality means of production, possess rich production experience, and maintain multi-dimensional knowledge structures. (2) Higher-technology means of production serve as the source of power for new quality productive forces. New quality productive forces emphasize the technological attributes of production tools. Emerging technologies such as the Internet of Things, cloud computing, blockchain, big data, and large models have promoted the widespread application of non-physical tools, enabling production processes to leap toward scale, customization, and personalization. (3) Broader-ranging objects of labor constitute the material foundation of new quality productive forces. In April 2020, the Central Committee of the Communist Party of China and the State Council issued the “Opinions on Building a More Perfect Market-oriented Allocation System and Mechanism for Factors,” which included data as a new type of production factor in the document, clarifying the reform direction for the five factors of land, labor, capital, technology, and data [11]. As a new type of production factor, data has become an important object of labor. Research on large models, supercomputing, and simulation based on data collection, processing, storage, and reuse has unleashed even more powerful productive forces.

1.2 Basic Connotation of Library Knowledge Services

Libraries serve as vital centers for knowledge storage, knowledge acquisition, knowledge exchange, and knowledge inheritance. As early as 1950, the University of Nebraska Library in the United States established “subject librarians” to provide knowledge services for faculty and students [12]. The continuous development of emerging technologies such as big data, cloud computing, model construction, and AIGC has broadened the boundaries of knowledge acquisition, accelerated the speed of knowledge iteration, expanded the domains covered by knowledge, and improved the efficiency of knowledge transformation. Amidst multiple opportunities and challenges including emerging technological transformations, upgraded reader demands, and resource reuse constraints, university libraries have begun to leverage policy support from various institutions to actively explore new models of knowledge services. By fully utilizing the underlying support advantages of libraries as knowledge storage centers, knowledge acquisition centers, knowledge exchange centers, and cultural inheritance centers, libraries have expanded their business content from knowledge supply and knowledge mining to ubiquitous knowledge services, enhancing the efficiency of knowledge acquisition, analysis, organization, mining, storage, and reorganization to provide readers with creative and personalized knowledge value-added services [13]. This precisely represents a new growth point for library work.

Library knowledge service constitutes a comprehensive system supported by multiple interdependent elements. Figure 1 [Figure 1: see original paper] illustrates the logical framework of university library knowledge service construction. Professional librarians, emerging technologies, and data resources form the supporting system of knowledge services and serve as the solid cornerstone for their development: (1) Professional librarians guarantee the quality of knowledge services. Knowledge services highly depend on knowledge-based labor provided by librarians with professional disciplinary backgrounds [14], excavating the potential value of various explicit and implicit knowledge, achieving knowledge reorganization and reuse, and presenting it through innovative forms such as visualization and integration, thereby facilitating the evolution from knowledge to wisdom. (2) Technology-driven approaches constitute the conditional foundation of knowledge services. We have currently entered the fourth paradigm of data-intensive scientific research, where a vast amount of rich knowledge content is encoded and stored in data form. As data accumulation reaches unprecedented depth and breadth [15], technologies such as semantic web, blockchain, knowledge mining, and human-computer interaction are reshaping every aspect of knowledge services, including knowledge acquisition, organization, and storage. (3) Data resources represent the key element for conducting knowledge services. Data serves as the underlying foundational element of the DIKW (Data-Information-Knowledge-Wisdom) model. Data is the source of information, and information is the cornerstone of knowledge [16]. In other words, data constitutes the fundamental source of information, knowledge, intelligence, and wisdom, making it the core resource for knowledge services. With the full ar-

rival of the digital era, value-added services based on deep data mining and utilization of library resource data, reader behavior data, and library business data have become increasingly important.

1.3 Logical Association Between New Quality Productive Forces and Library Knowledge Services

Through in-depth analysis of the basic connotations and core elements of new quality productive forces and library knowledge services, the two exhibit close associations in terms of construction foundation, internal logic, and development objectives. As shown in Figure 2 [Figure 2: see original paper], the deep integration and penetration of new quality productive forces into library knowledge services essentially constitute a systematic reshaping process of existing knowledge service models. In turn, the knowledge services that achieve development through this process feed back results in the form of new quality laborers, new quality service content, and new quality data value. This process not only identifies a practical domain for new quality productive forces within the knowledge service field but also endows library knowledge services with solid theoretical support and practical orientation, jointly promoting the efficiency, intelligence, and innovation of knowledge services.

The construction logic demonstrates symbiotic characteristics. (1) From the perspective of new quality laborers: First, new quality productive forces rely on high-quality, high-caliber laborers as core elements to drive production upgrading and iteration, making new quality laborers the primary factor in new quality productive force development. Second, library knowledge services provide abundant educational and learning opportunities for readers, representing a process of deep participation in cultivating high-quality laborers. This cultivates more high-quality laborers for production development and contributes to the advancement of new quality productive forces. Furthermore, these new quality laborers participate in scientific research and production activities, creating more knowledge and wisdom that further enriches the content system of library knowledge services. (2) From the perspective of new quality means of production: Higher-technology means of production constitute the power source of new quality productive forces, and this dynamic mechanism is particularly prominent in the field of library knowledge services. Advanced technological innovations such as big data analytics and artificial intelligence algorithms have fundamentally transformed knowledge service models. Simultaneously, the continuous deepening of new quality knowledge service content in libraries provides clear demand orientation and feedback mechanisms for technological innovation. Users' diversified and high-quality demands for knowledge services become the driving force for continuous technological innovation, enabling a positive, mutually reinforcing relationship between technological progress and service innovation. (3) From the perspective of new quality objects of labor: In the iterative development of productive forces, data, as a new type of production factor, has become an important object of labor. Its multiplier effect can achieve exponential value

creation across multiple production scenarios [17]. The value-added process of data elements essentially represents the deep development and value recreation of information resources. Through data analysis technologies, libraries excavate, organize, and utilize business data, behavioral data, and literature data to provide personalized and precise knowledge services for users, promoting the renewal and upgrading of knowledge service formats to better adapt to the requirements of the data-intensive era. Conversely, the continuous expansion and deepening of library knowledge service content further excavates the potential value of data. The increasing granularity of services requires libraries to assume the responsibilities of data centers, break down data silos, collect more data information for multi-dimensional analysis, and utilize data elements multiple times to enhance data value.

The core elements demonstrate consistency. Both emphasize the decisive role of humans in the production process, technology-driven approaches as the core engine of innovation, and the importance of data resources as key production factors. Professional librarians, as representatives of higher-quality laborers, not only possess general professional knowledge and advanced technical capabilities but can also fully leverage intelligent technologies to efficiently integrate and optimize the allocation of innovative elements such as data and knowledge. This activates their potential and enables them to play a positive role, becoming an indispensable force driving the high-quality development of library undertakings.

The development objectives exhibit homogeneity. Both represent new theories and new services proposed for high-quality development in the era of open science and digitalization. New quality productive forces achieve high-quality development in new fields and new tracks through laborer education, production tool upgrading, and optimized allocation of production factors. Meanwhile, library knowledge services focus on upgrading librarian teams, empowering through science and technology, and adding value to data elements to promote comprehensive iterative upgrading of service content, service capabilities, and service quality.

2. Realistic Challenges of Knowledge Services in University Libraries Empowered by New Quality Productive Forces

2.1 Insufficient Librarian Team Construction

According to the “Basic Statistical Data Analysis of Chinese University Libraries” reports from the past five years, university library staff in China are gradually experiencing aging and generational gap issues. In terms of educational qualifications, as of 2022, among 1,308 university libraries, 840 had no staff members with doctoral degrees, accounting for 64.2% of libraries that submitted data. Master’s degree staff accounted for 35.7% of total permanent staff

in university libraries, with an average of 10.5 master's degree staff employed per library [18]. Against the backdrop of modern university library knowledge transformation, librarians' data analysis and processing capabilities, knowledge mastery and output abilities constitute the most important soft power in library capability resources [19]. With the rapid penetration of new quality productive forces, the content and scope of discipline-related knowledge services continue to expand, placing higher demands on talent structure. There is an urgent need for compound talents who possess both library and information science backgrounds and interdisciplinary research expertise [20]. However, the current reality reveals a significant gap, which not only constrains the competitive advantages of university talent cultivation but also severely restricts the practical application and implementation of new quality productive forces in knowledge services, hindering the comprehensive enhancement of knowledge innovation and service effectiveness.

2.2 Limited Technological Innovation Application

The library community has consistently been at the forefront of embracing new technologies and adapting to new environments. Facing a new round of information technology revolution, numerous university libraries have courageously explored and dedicated themselves to introducing technologies such as artificial intelligence-generated content, big data, cloud computing, 5G, edge computing, digital twins, and blockchain into library knowledge service systems [21]. Against this backdrop, exploratory practices have emerged, including discipline service platform construction [22], teaching reference book service platform construction [23], and print-electronic integrated platform construction [24]. University libraries have also actively procured intelligent devices developed based on optical character recognition technology, visual tracking technology, and other innovations to provide readers with more convenient and efficient self-service knowledge services. However, in the process of technology-enabled knowledge services, problems inevitably arise where technology R&D teams focus solely on development while demand-side parties passively adapt their operations, causing poor alignment between technology and demand that prevents genuine organic integration [25]. This not only hinders the conduct of traditional knowledge service operations but also obstructs readers' acceptance of emerging knowledge service formats. Simultaneously, as these technological applications deepen, inevitable potential risks emerge, such as excessive dependence of librarians and readers on intelligent tools, knowledge content alienation, and data ethics risks. These issues affect the authority of knowledge and exacerbate information silo and information cocoon phenomena [26], impeding the free flow and deep integration of knowledge.

2.3 Insufficient Data Element Allocation

China has established university library alliances represented by the China Academic Library & Information System (CALIS), the China Academic Social Sci-

ences and Humanities Library (CASHL), and the National Science and Technology Library (NSTL), along with regional university library alliances and agriculture-related university library alliances, enabling joint construction and sharing of literature, data, and knowledge among member libraries. On one hand, as copyright and resource costs continue to rise, problems such as exclusive digital resource content and data system differences inevitably emerge during alliance development [27], making data silo phenomena increasingly prominent and preventing the full realization of the value of data resource co-construction and sharing mechanisms. On the other hand, university libraries exhibit significant disparities in data mining and application capabilities. While the volume and variety of library data resources grow increasingly large and diverse, much data remains underutilized, resulting in low effectiveness in transforming data resources into productive forces. The potential release of data as an important production factor is suppressed, and in more severe cases, unclear intellectual property delineation and data leakage risks further constrain the effective transformation and application of active data.

2.4 Imperfect Institutional Mechanisms

University libraries have actively integrated into university talent cultivation systems, research support, and decision-making assistance, gradually constructing a knowledge service system primarily focused on academic resource support and supplemented by scientific research intelligence analysis. However, in the specific implementation process, this service system remains constrained by inherent limitations such as multiple governance entities, with institutional and mechanical challenges remaining quite prominent. On one hand, there is a lack of systematic top-down incentive and constraint mechanisms. Currently, the organizational structure for implementing knowledge services in university libraries relies on information consultation departments as the main drivers, with other departments providing auxiliary support. Cross-departmental collaboration mechanisms are inadequate, and there is a lack of service effectiveness evaluation and service tracking assessment, resulting in incomplete incentive and constraint policies. On the other hand, libraries have not sufficiently tapped the collaborative potential of professional research teams and experts within the university, as well as social organizations and enterprises during the knowledge service process. While relevant researchers possess professional disciplinary literacy and social organizations and enterprises hold unique advantages in market interaction, unclear institutional frameworks and ambiguous cooperation mechanisms for university library knowledge services have prevented effective integration of these collaborative resources. The loss of this assistance and cooperation has become a major constraint on university libraries' knowledge service initiatives.

3. Practical Path of Knowledge Services in University Libraries Empowered by New Quality Productive Forces

3.1 Deep Development and Sharing of Data Elements

The deep excavation, efficient management, extensive sharing, and effective reuse of data resources are key to unleashing the core value of data as a new type of production factor. On one hand, university libraries need to build upon existing data, fully develop the value and utility of current data resources, and shift from resource location to data analysis and utilization [28]: (1) Effective integration and application of resource data. While continuously advancing the digitization of print special collection literature resources, libraries should also integrate and associate other electronic literature resources on related topics. For example, by leveraging pre-trained models and large language models, libraries can construct parallel corpora of classical texts, improve intra-lingual and inter-lingual machine translation of ancient books, and enhance the exposure and activity of collection resource data. (2) Precise analysis and service of reader data. Based on comprehensive collection of multi-dimensional data including book borrowing and returning, space utilization, and equipment usage, libraries can construct large models and reader profiles to accurately analyze reader behavior patterns and preferences. This enables the generation of personalized book borrowing analysis reports, space renovation plans, and equipment usage reports. After refinement and improvement, libraries can provide more personalized knowledge services to readers. For instance, establishing reader reading behavior logs based on eye-tracking technology allows for targeted adjustments to collection layout and resource procurement plans. (3) Detection and optimization of environmental data. Using wireless sensor technology and infrared recognition technology to collect real-time environmental data such as sound, light, and electricity within the library, libraries can intelligently adjust library environments and layouts based on data. For example, using WiFi positioning technology to obtain traffic flow and reader movement trajectories during different time periods enables the conduct of knowledge service-related promotional activities during specific periods and in specific areas, constructing a modern, minimalist, open, and green reading environment more suitable for knowledge services and comprehensively enhancing the library's functional positioning as a knowledge exchange and innovation center.

On the other hand, libraries need to expand data source channels and broaden knowledge service pathways: (1) Independent data collection. Libraries possess professional advantages in knowledge organization and can collect, organize, and store data resources for specific disciplines to build proprietary characteristic databases. For example, independently creating open access resource repositories or organizing oral histories to form characteristic resource databases provides strong data support for academic research and disciplinary education. (2) Data acquisition through library-university cooperation. As knowledge hubs and exchange platforms within universities, libraries should deepen cooperation with various campus departments. By integrating faculty and student data from per-

sonnel systems, scientific research achievement data from research offices, and experimental equipment and consumables data from laboratory management centers, libraries can achieve comprehensive aggregation of data resources, enrich library data resource reserves, and enable precise knowledge content recommendation based on big data models. (3) Data sharing through social cooperation. To further expand the scope and types of data resource acquisition, libraries should actively explore cooperation pathways with external institutions. For example, establishing data exchange mechanisms with other university libraries and public libraries to achieve data resource sharing and complementarity; participating in co-construction of digital projects with publishing institutions to obtain electronic data resources and promote the digitalization and widespread dissemination of knowledge; actively seeking participation in government-led data construction projects to obtain authoritative data support and assume important responsibilities for data storage and management; utilizing social media and online platforms to monitor hot topics and trends related to reading, knowledge sharing, and specific disciplinary fields on social media, collect reader evaluations and feedback, and monitor participation numbers, registration status, and interaction levels for library-hosted activities; and encouraging readers to donate valuable resources such as research results and datasets, while employing appropriate recognition and reward mechanisms to stimulate reader participation enthusiasm and contribution motivation, jointly promoting the prosperity and development of the knowledge ecosystem.

3.2 Improving New Quality Librarian Team Construction

The construction of new quality librarian teams represents a crucial talent cultivation initiative aligned with new quality productive force development. Within the new quality productive forces framework, new quality talents are defined as modern professionals possessing high adaptability, open-minded thinking, and cross-boundary innovation capabilities [29]. New quality librarians are innovative specialists equipped with multi-dimensional knowledge structures including information technology, proficient in various new quality production tools, and possessing strong information and digital literacy. The primary task in cultivating new quality librarians lies in deepening the training system for existing librarians to ensure they can meet the diverse knowledge service needs of internal faculty and students, external research institutions, social organizations, and government departments. New quality librarians require not only professional backgrounds in library and information science but also enhanced multi-dimensional capabilities in data storage and management, intelligence collection and organization, knowledge mining and dissemination, literature organization and writing, and content reporting and presentation. This enables them to provide readers with full-cycle, one-stop knowledge services spanning project initiation, implementation, completion, and evaluation. Based on this, librarian training can be integrated into the university's faculty training system to conduct high-standard librarian training programs. Simultaneously, establishing librarian learning teams, developing reasonable continuing education plans,

and periodically organizing exchange and discussion activities both within and outside the university and the profession can help librarians learn the latest library and information science knowledge and expand their knowledge service horizons. Furthermore, given the increasingly vertical and specialized nature of knowledge service content, new quality librarians can be further categorized according to service content into reproducibility librarians [30], data librarians [31], publishing librarians [32], digital humanities librarians [33], etc. This enables precise positioning of job functions, shaping of different professional identities, and provision of specialized, refined, and comprehensive knowledge service content, thereby providing stable support for improving libraries' total factor productivity.

Second, efforts must focus on building innovative service teams. Currently, many libraries have dedicated themselves to introducing doctoral-level talents, interdisciplinary and compound disciplinary background talents, and overseas high-end talents. Moving forward, greater emphasis should be placed on constructing high-level innovation teams with clear responsibilities, detailed division of labor, frequent communication, and skillful mutual support. Within the team, work tasks should be subdivided according to the data lifecycle, including data collection, data processing, data analysis, data storage, and data sharing, enabling multiple librarians to collaboratively advance multiple knowledge service tasks simultaneously. This promotes the efficient integration, refinement, organization, and dissemination of knowledge resources. Alternatively, based on current subject librarians and college liaisons, libraries can cooperate with faculty teams in corresponding colleges to establish discipline service teams. This approach fully leverages the advantages of college faculty's high professional literacy and subject librarians' high information literacy to explore higher-quality knowledge service content such as discipline development strategic planning consultation, patent layout consultation, specialized literature analysis, development forecasting analysis, and decision support reports, meeting the growing high-level knowledge service demands of researchers.

3.3 Actively Promoting Technology Integration and Penetration

In the process of promoting new quality productive force development, libraries should adhere to the principle of "relying on technology rather than depending on it [34], and skillfully using technology rather than merely being able to use it." Emerging technologies serve as important catalysts for new quality productive force development and play an irreplaceable role in promoting the transformation of new knowledge into high-quality productive forces.

First, libraries should actively introduce equipment systems suitable for library knowledge services. (1) Technology liberates human resources. By employing intelligent consultation robots and AI digital librarians for voice consultation and intelligent Q&A, libraries can meet readers' needs in knowledge acquisition, learning, and research. Through ChatGPT's advantages in semantic analysis and imitation learning, libraries can provide precise Q&A adapted to specific

scenarios, delivering more accurate, timely, and personalized services [35]. (2) Technology enhances efficiency. AI smart reading devices based on optical character recognition technology with integrated retrieval capabilities, along with book recommendation digital humans, can identify print book content using OCR technology and intelligently recommend relevant database resources and online resources displayed on screens, achieving one-stop precise promotion of knowledge resources. (3) Technology promotes application. Libraries should fully utilize knowledge integration platforms based on information organization and distributed storage technologies. Through online and cloud-based virtual resource storage platforms, libraries can integrate multi-disciplinary knowledge products. For example, based on dimensions such as discipline, course, instructor, academic year and semester, and student category (bachelor, master, doctorate), libraries can integrate various resources and data including print resources, e-books, and dissertations to establish teaching reference databases and discipline databases. This enhances the utilization rate of library knowledge resources and teaching connectivity, promoting deep integration between teaching resources and teaching activities.

On the other hand, scientific assessment of emerging technology feasibility is necessary. To ensure that emerging technologies effectively serve library knowledge service strategies, libraries must systematically review existing and planned business scopes, investigate the latest technological developments, and evaluate the feasibility of applying different technologies to knowledge services. During specific implementation, strengthening collaboration and communication between business teams and technology R&D teams, and enhancing supply-demand matching between technology-enabled service content and reader needs can achieve high alignment between emerging technologies and service content, promoting coordinated development between knowledge services and emerging technologies. For already adopted emerging technologies such as holographic virtual interaction, image-text recognition, and 5G, libraries should establish and improve maintenance and upgrade mechanisms, usage evaluation mechanisms, and reader feedback systems. By strengthening advantages and remedying weaknesses, and allowing demand updates to drive technology upgrades, libraries can promote deep integration between technology and knowledge service operations.

3.4 Flat Incentive System Construction

In the process of empowering university library knowledge services with new quality productive forces, implementing a top-down multi-stakeholder co-governance and co-construction model promotes the convenient and efficient delivery of knowledge services.

First, establishing a flat knowledge service work group structure is necessary, with clear role positioning and responsibility scopes for each group member. Given the breadth and complexity of knowledge services, which encompass not only the systematic organization, arrangement, and processing of literature data resources but also the deep integration and precise analysis of scientific research

data resources, visualization of data integration results, and even interoperable retrieval of related data across multiple service dimensions, strengthened collaboration among departments such as literature resource construction, subject consultation, technical support, and circulation and collection is essential. For example, establishing temporary task groups by selecting librarians from various departments through self-nomination or departmental recommendation enables them to collaboratively complete specific knowledge service tasks within designated timeframes. Flat work group structures can effectively shorten decision-making chains, reduce communication costs, improve work efficiency, and ensure the provision of high-quality knowledge services covering the entire chain and throughout the entire process for readers.

Second, establishing incentive measures and constraint mechanisms in libraries serves as an important guarantee for stimulating librarians' subjective initiative to actively participate in knowledge services and improving service quality. Incentive measures focus on examining whether librarians actively participate, with relatively low requirements—librarians simply need to participate. These measures should be quantifiable and operational, detailed down to the completion of each work report and the success of each precise service. For example, establishing a service claim mechanism encourages librarians to actively claim readers' knowledge service demands and provide services based on their personal strengths. Assessment mechanisms focus on examining librarians' service effectiveness, with relatively high requirements—librarians need to provide quality and quantity-assured knowledge services. These mechanisms should possess transparency and specificity, tracking the processing efficiency of each literature request and the response speed of each service demand to ensure continuous service quality optimization. For instance, employing quantitative evaluation indicators such as the Analytic Network Process (ANP), Analytic Hierarchy Process (AHP), and Decision-Making Trial and Evaluation Laboratory (DEMATEL) can establish a systematic and operational knowledge service performance evaluation system. Additionally, attention should be paid to post-service review work. By establishing effective service effect tracking and service evaluation mechanisms oriented toward reader needs and evaluations, libraries can timely adjust service content and elements based on feedback, continuously optimize service experiences, and enhance the overall effectiveness of knowledge services.

4. Concluding Remarks

Against the backdrop of the digital transformation wave in education and scenario-driven service innovation, university libraries have encountered unprecedented opportunities in the knowledge service domain. This transformation requires university libraries to evolve beyond static spaces for knowledge storage into dynamic pioneering roles for knowledge innovation and service upgrading. Knowledge service work urgently needs the wisdom infusion of new quality librarians, extensive integration of new quality data resources, integra-

tion and penetration of new quality technologies, and the deep coupling and collaborative innovation among these three elements. Through internalizing the progressive innovation hierarchy of “data-information-knowledge-wisdom-culture,” university libraries are gradually advancing knowledge dissemination toward trends of digitalization, intelligence, and wisdom, achieving deep excavation and efficient transmission of knowledge value. As frontier positions for knowledge services in the digital intelligence era, university libraries must firmly grasp the three major elements of librarians, technology, and data, and use them as the cornerstone for strategic layout. By planning team construction, embracing emerging technologies, and consolidating data foundations, libraries can provide strong knowledge guarantees and intellectual support for the cultivation of high-quality new quality talents in universities.

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

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