An Analysis of Knowledge Service Strategies for University Libraries in the Big Data Environment

Authors: Liang Binbin

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Abstract

Purpose/Significance] In the era of the knowledge economy, conducting comprehensive, systematic, and scientific research on knowledge services of university libraries in the big data environment holds significant theoretical and practical importance for promoting the high-quality development of university libraries. Method/Process] By reviewing existing research and employing web-based investigation and case analysis methods, this study collects and analyzes knowledge service models of university libraries. Results/Conclusion] In the big data environment, university libraries need to continuously innovate and reform their knowledge service strategies. By optimizing knowledge service resources, building knowledge service teams, improving the knowledge service environment, constructing knowledge service platforms, innovating knowledge service models, and other measures, they can build a knowledge service system that meets the demands of the era. Only in this way can university libraries better satisfy users' information needs in the big data environment and provide more precise and efficient knowledge services for users.

Full Text

Analysis of Knowledge Service Strategies in University Libraries in the Big Data Environment

Liang Binbin
Suihua University Library, Suihua City, Heilongjiang Province, 152061

Abstract

[**Purpose/Significance**] In the era of the knowledge economy, conducting comprehensive, systematic, and scientific research on knowledge services in university libraries within the big data environment holds important theoretical

and practical significance for promoting the high-quality development of university libraries. [**Method/Process**] This study reviews existing research and employs network investigation and case analysis methods to collect and analyze knowledge service models in university libraries. [**Result/Conclusion**] In the big data environment, university libraries must continuously innovate and reform their knowledge service strategies. By optimizing knowledge service resources, building knowledge service teams, improving the knowledge service environment, constructing knowledge service platforms, and innovating knowledge service models, libraries can build a knowledge service system that meets contemporary demands. Only through these measures can university libraries better satisfy user information needs in the big data environment and provide more accurate and efficient knowledge services.

Keywords: Big Data; University Library; Knowledge Service
Classification Number: G252

In today' s big data era, university libraries, as crucial centers for knowledge services, face the challenge of transforming and upgrading their service models. Big data provides university libraries with abundant information resources, and through data mining and analysis, libraries can more accurately understand user needs and achieve optimal resource allocation. Furthermore, big data technologies can assist university libraries in developing in-depth knowledge services such as academic search, intelligent recommendation, and personalized services to improve users' information acquisition efficiency and satisfaction. Therefore, in this new era, comprehensive, systematic, and scientific research on knowledge service strategies for university libraries in the big data environment is theoretically and practically significant for promoting their high-quality development.

1. The Connotation of Knowledge Services in University Libraries

Internationally, the concept of knowledge services primarily appears as knowledge-intensive business services. Kuusisto et al. define knowledge-intensive business services as commercial service companies that rely on knowledge or professional expertise in specific fields to provide clients with knowledge-based intermediate products or services that contribute to their knowledge processes. Ebersberger considers knowledge-intensive business services as innovation-related service activities conducted within innovative companies or provided externally. Domestically, scholar Zhang Xiaolin views knowledge service as a concept for understanding and organizing services that differs from information services in that it runs through the entire process of user problem-solving, mainly manifesting as user goal-driven, knowledge-content, and solution-oriented value-added services. Qin Xiaozhu et al. argue that compared with existing information service models, big data knowledge service models and construction processes increasingly tend toward personalization, autonomy, virtualization, and intelligence.

Synthesizing these domestic and international perspectives, we believe that university library knowledge services refer to the process by which university libraries utilize their knowledge resources and professional service advantages to meet the knowledge needs of internal and external users, relying on modern advanced information technology platforms and employing scientific methods to provide knowledge services.

2. Practice of Knowledge Services in University Libraries under the Big Data Environment

With the rapid advancement of digital construction in Chinese university libraries and the continuous increase in knowledge demands from internal and external users, library service functions have further expanded. University libraries fully leverage their advantages in knowledge resources and professional services to actively develop knowledge services for users both on and off campus.

2.1 Actively Developing Research Knowledge Services

In the new era of rapid modern information technology development, libraries, as university centers for literature and information resources, fully exploit their knowledge resources and service advantages to actively provide knowledge resources and services for faculty and students. Currently, the main content of research knowledge services in university libraries includes: first, providing researchers with access to well-known domestic and international databases such as CNKI, Duxiu, Web of Science, and EI to support knowledge resources; second, actively providing research data management services; third, offering sci-tech novelty searches and citation verification services; fourth, actively developing intellectual property information services; fifth, building institutional repositories; sixth, providing research support tools including research data analysis tools, literature management software, and hot topic tracking tools; seventh, building self-developed characteristic knowledge resource databases; and eighth, providing research space services such as seminar rooms and study rooms equipped with tables, chairs, computers, projection multimedia, and wireless networks. For example, the research knowledge services at Nanjing University Library mainly include sci-tech novelty searches and citation verification, intellectual property information services, lectures and training, ESI profiles of Nanjing University, and thesis writing skills, which have played a positive role in promoting the university' s research work.

2.2 Actively Developing Teaching Knowledge Services

In recent years, Chinese university libraries have attached great importance to providing knowledge services for educational teaching and have achieved remarkable results. First, they prioritize open educational resource services. Many university libraries have established open educational resource columns on their website homepages to provide free educational resources to users. For

instance, Wuhan University Library has built an open educational resource section on its website, including comprehensive open courses, foreign open courses, domestic open courses, and campus excellent courses, which are published on platforms such as the National Excellent Course Resource Network, NetEase Open Courses, and China Education Online. Second, they provide textbook and teaching reference services. Tsinghua University Library provides textbook and teaching reference services through its Teaching Reference Service Platform. After logging into the system, faculty and students can not only search and browse courses offered or selected in the current academic year but also retrieve reference book information designated for some courses, with some teaching references available for full-text reading. The system also provides electronic teaching reference services for textbooks and teaching references designated by courses, available to teaching faculty and enrolled students within copyright limits, and offers navigation services for some video open courses and MOOCs. Third, they provide teaching support services. Shanghai Jiao Tong University Library attaches great importance to teaching support services, providing various professional certification support services for academic departments, including support for national higher education engineering professional evaluation and ABET engineering professional certification. Additionally, it can provide customized support services according to specific needs, such as undergraduate teaching evaluation support services for all university departments.

2.3 Attaching Great Importance to Disciplinary Knowledge Services

In recent years, university libraries have actively carried out disciplinary knowledge services centered on first-class discipline construction. Disciplinary knowledge services refer to a deep-level disciplinary service that uses various databases or data sources as the foundation, with subject librarians as the core, to achieve comprehensive support for users' research processes by accurately understanding user needs, integrating and optimizing disciplinary resources, and employing advanced information technology. Currently, many Chinese universities have established disciplinary service organizations, built subject librarian systems, and formed professional disciplinary service teams. For example, China University of Mining and Technology Library has carefully built a subject librarian service team based on librarians' professional abilities and knowledge backgrounds, regularly visiting academic departments to deeply understand their academic needs and research dynamics, and providing targeted and precise services to users by leveraging the library' s rich resources. The library mainly provides literature 计量-based intelligence analysis services for disciplines, majors, and talents based on different levels of user needs, including disciplinary analysis, research innovation capability analysis, embedded research lifecycle services for research groups, and university talent analysis.

2.4 Actively Developing Student Development Knowledge Services

Talent cultivation is the primary goal of universities. As academic service institutions and cultural education organizations, university libraries play important roles in cultivating students' knowledge literacy and autonomous learning abilities, enhancing their humanistic literacy, strengthening their information literacy, and improving their psychological literacy. In recent years, Chinese university libraries have actively undertaken their educational functions and developed student development knowledge services, including: first, student course learning support services; second, providing public spaces for student autonomous learning; third, providing knowledge services to enhance students' humanistic literacy, information quality, and comprehensive abilities; fourth, student research support services; fifth, student social practice support services; sixth, student further education support services; seventh, student innovation and employment support services; and eighth, student mental health support services. For example, Wuhan University Library actively provides student learning support services, including: first, space and facility assistance such as seat reservation, study room reservation, multimedia reading areas, maker spaces, and self-service equipment; second, new student training; third, 90-minute lectures including thesis guidance, learning assistants, practical skills, cloud-top classrooms, and micro-reading classrooms; fourth, credit courses mainly involving information literacy and academic ethics training; and fifth, customized lectures, thesis inclusion and citation verification, online training, and doctoral and master' s thesis submission services.

3. Prominent Problems in Knowledge Services of University Libraries in the Big Data Environment

Despite certain achievements in knowledge services by Chinese university libraries in the era of rapid modern information technology development and big data, several problems remain.

3.1 Weak Knowledge Service Awareness

In the big data era of rapid modern information technology development, knowledge services are an important function of university libraries, and the capability and level of library knowledge services are important factors measuring the image of libraries in the new era. Overall, knowledge service awareness in university libraries has significantly strengthened, but some libraries, especially those in local universities, do not attach sufficient importance to knowledge services and rarely carry out knowledge service activities. This results in the incomplete realization of library knowledge service functions and the underutilization of library knowledge resources and information technology infrastructure, which not only wastes resources but also hinders library development.

3.2 Weak Construction of Professional Technical Talent Teams

Although the number of professional technical personnel for knowledge services in university libraries has increased to some extent, and the professional, educational, professional title, and age structures have significantly improved, local university libraries still do not attach enough importance to the construction of professional technical talent teams for knowledge services. The scale, educational structure, professional title structure, knowledge structure, professional quality and capability, and experience of professional technical talents all have obvious deficiencies, making it difficult to adapt to the needs of knowledge service work in the new era and seriously restricting the development of knowledge services.

3.3 Cumbersome Knowledge Service Business Processes

Currently, the knowledge service processes of university libraries basically still follow the business processes of traditional reference consultation work and fail to fully utilize modern information technology. Not many libraries design their knowledge service processes according to timeliness, scientific principles, efficiency, objectivity, networking, and intelligence, and there is still a gap compared with foreign university libraries' knowledge service process design. Consequently, current library knowledge service processes suffer from poor communication between users and knowledge service personnel, insufficient utilization of modern big data and other information technologies, and inability to maximally meet user needs, all of which seriously affect the quality and effectiveness of university library knowledge services.

3.4 Low-Level Knowledge Service Platform Construction

Currently, there are still significant differences in funding investment for library construction and management between "Double First-Class" universities and local universities, as well as in the scale and level of big data knowledge service platform construction. The scale, integration, and intelligence of knowledge service platforms in "Double First-Class" university libraries are significantly superior to those in local university libraries. "Double First-Class" university libraries generally have built one-stop integrated knowledge service platforms, connected to international online retrieval systems, and become central nodes or service centers of regional integrated knowledge service platforms, while local university libraries usually have management information systems for their own knowledge resources and knowledge retrieval platforms providing access to major domestic knowledge resources and some important foreign knowledge resources.

3.5 Monotonous Knowledge Service Content

Currently, university library knowledge services mainly involve research support services, teaching support services, disciplinary support services, and student development support services. However, overall, there is still a huge gap between

local university libraries and "Double First-Class" university libraries. "Double First-Class" university libraries, such as those at Peking University, Tsinghua University, Shanghai Jiao Tong University, and Nanjing University, provide knowledge services that are comparable to those in developed countries, with relatively rich content and diverse forms. In contrast, knowledge service content in local university libraries remains relatively monotonous, mainly focusing on reference consultation such as sci-tech novelty searches and citation verification, with relatively weak capabilities in teaching, research, and disciplinary support services and limited service content.

3.6 Small-Scale Socialized Knowledge Services

First, from the perspective of the proportion of universities conducting socialized services, "Double First-Class" universities have a relatively large proportion of socialized services, while local university libraries have a relatively small proportion. For example, a survey of the current situation of socialized services in 46 university libraries in Jilin Province, including Jilin University, showed that among the 46 university libraries, 18 schools provide socialized services to the public, accounting for 39%, while the rest do not. Among the 18 universities that provide socialized services, only 2 are fully open, while the rest are partially open, indicating a low degree of socialized services in university libraries in Jilin Province. Second, from the perspective of socialized knowledge service targets, they mainly serve individual members of the public, with few providing knowledge services for enterprises, institutions, and research institutes. Third, from the perspective of knowledge service content, the main content of current university library socialized services includes literature services, sci-tech novelty searches, citation verification, selective dissemination of information, intellectual property services, and patent services, with relatively few truly providing competitive intelligence services for enterprises and institutions.

3.7 Lagging Institutional Development of Knowledge Services

Institutional development is an important guarantee for determining the legitimacy, standardization, and quality of knowledge services in university libraries, involving various aspects such as job responsibilities of knowledge personnel, business processes and norms, management systems, qualification requirements, and charging standards. While university libraries have achieved certain accomplishments in knowledge service institutions, problems remain, mainly incomplete institutional development, with some institutions still lagging and lacking timeliness and contemporary relevance. The institutional development concerning knowledge services in the big data environment cannot keep pace with the times, and there are still gaps in institutional development regarding performance evaluation of knowledge services and management of knowledge service personnel.

3.8 Significant Disparities in Knowledge Service Capabilities

Currently, during the construction and development of university libraries in China, due to differences in attention from various universities and different funding investments, generally speaking, funding investment in "985" university libraries is higher than that in "211"universities, which in turn is generally higher than that in local universities. This has led to significant disparities in knowledge service infrastructure construction, knowledge resource database construction, knowledge service professional talent team construction, and integrated big data knowledge service platform construction. The knowledge service capabilities of "Double First-Class" university libraries are significantly higher than those of local university libraries. Therefore, local universities should attach greater importance to library digital construction, increase funding investment, optimize library infrastructure and knowledge resource database construction, and further improve knowledge service capabilities to truly make libraries the knowledge service centers of universities.

4. The Causes of Problems in Knowledge Services of University Libraries in the Big Data Environment

The causes of problems in university library knowledge services in the big data environment are multifaceted, specifically including the following aspects.

4.1 Failure to Break Free from Traditional Library Service Concepts and Insufficient Innovation

The main reasons for weak knowledge awareness, unreasonable knowledge service business process and organizational structure design, and small-scale socialized services are that, for a long time, some university library management has not emancipated their minds and pursued reform and innovation. They still operate and manage libraries according to traditional concepts, mainly targeting internal campus users, showing low enthusiasm for participating in socialized services and weakening socialized service functions.

4.2 Insufficient Funding Investment Constraining Knowledge Service Functionality

Due to funding investment differences between domestic "Double First-Class" universities and local university libraries, local university libraries have not made substantial improvements in knowledge service infrastructure construction, knowledge resource database construction, and professional talent team construction, directly affecting the realization of library knowledge service functions. Especially for local universities, knowledge service capabilities remain limited due to their own conditions and resource constraints.

4.3 Inadequate Understanding of the Development Positioning of University Libraries in the New Era

Modern information technologies such as the Internet, big data, artificial intelligence, and mobile Internet, along with concepts and ideas such as high-quality development, digital libraries, and smart libraries, have put forward brand-new requirements for the construction, development, and management of university libraries in the new era. Smart libraries use digital, networked, and intelligent information science as basic means to achieve intelligent service and management through the Internet of Things, representing a combination of perceptual intelligence and library service intelligence. University libraries in the new era should provide high-quality services for the strategic development of university teaching, research, and disciplines, actively carry out socialized services, and implement innovative transformation and sustainable development strategies. Currently, some university libraries have an inadequate understanding of development trends in the new era, insufficient knowledge and attention to digital and smart library construction, inadequate funding and energy investment, and limited thinking about how libraries should implement innovative development in response to era challenges, all of which seriously constrain library development.

4.4 Insufficient Reform and Innovation Efforts

Currently, the important position of most university libraries in their institutions has not been manifested, thus affecting management and professional talent team construction. Some local university libraries do not attach enough importance to library and information science professionals, rarely employing graduates from library and information science programs, and generally have relatively low educational and professional title structures, seriously affecting the construction of library knowledge service talent teams. Some library management lacks professional talents, resulting in inadequate top-level design and scientific planning for library knowledge services and management, which in turn leads to insufficient attention to knowledge service business, unreasonable business process and organizational structure settings, and incomplete institutional development.

4.5 Low Level of Modernization in Governance Systems and Capabilities

In the era of high-quality development with rapid modern information technology development, university libraries still have certain gaps between their governance systems and capability modernization construction and actual needs. In terms of top-level strategic development design, institutional and cultural construction, and institutional execution, libraries still cannot fully adapt to the requirements of governance system and capability modernization for libraries in the new era. Therefore, university libraries should highlight their own characteristics, take initiative and responsibility, comprehensively promote high-quality

connotative development, comprehensively improve knowledge service capabilities, levels, and quality, and accelerate the pace of governance system and capability modernization construction in light of the rapid development of modern information technologies such as big data, artificial intelligence, blockchain, and mobile Internet.

5. Strategies for Optimizing Knowledge Services in University Libraries in the Big Data Environment

5.1 Optimizing Knowledge Service Resources

5.1.1 Strengthening the Construction of Characteristic Knowledge Resource Databases Since the stock of knowledge resources varies among university libraries, to enhance their influence and core competitiveness, university libraries need to strengthen the construction of characteristic knowledge resource databases and create their own unique academic and cultural advantages. On the one hand, while meeting knowledge service demands, some literature resources play important guiding and reference roles in specific research fields. University libraries can increase procurement of authoritative, representative, and dynamic paper resources and excellent domestic and foreign databases according to their own nature, research direction, and development goals to improve collection quality. On the other hand, university libraries can use advanced science and technology and methods such as network technology and knowledge mining technology to collect, store, and process the academic and research achievements of their faculty and students to build school-specific characteristic knowledge resource databases.

5.1.2 Deeply Mining the Value of University Library Knowledge Service Resources Faced with the vast number and wide coverage of Internet resources, university libraries should implement analytical organization methods, increase resource investment, and leverage the advantages of emerging information technologies such as data mining and data processing in knowledge discovery and identification processes. They should collect and process Internet information and university library collection knowledge resources, and conduct secondary processing of information generated from data mining and intelligent analysis to excavate knowledge resources with deep utilization value. For structured and semi-structured explicit knowledge, university libraries can analyze, organize, and integrate it to excavate knowledge units that meet user needs. For unstructured information data, they can use visualization technology to organize it into video knowledge resource databases to facilitate user retrieval and extraction and improve the utilization efficiency of knowledge service resources.

5.1.3 Realizing Co-construction and Sharing of University Library Knowledge Service Resources In the context of the new information environment, user demand for knowledge services no longer satisfies single library

collection knowledge resources, making the co-construction and sharing of university library knowledge service resources a new development trend. Therefore, in the process of knowledge service resource construction, university libraries should adopt the concept of resource co-construction and sharing, leverage their own disciplinary background advantages or regional advantages, actively carry out knowledge service cooperation, and organize knowledge service resource databases, knowledge service platforms, and knowledge service expert groups from various university libraries to establish systematic or regional university library knowledge service alliance cooperation mechanisms. Using the Internet as a medium, they should build knowledge service resource sharing platforms and carry out cooperative and joint services to achieve the goals of knowledge service resource sharing and knowledge service team co-construction, enhance the utilization value of knowledge resources, and promote the improvement of university library knowledge service capabilities.

5.2 Building Knowledge Service Teams

5.2.1 Increasing Talent Introduction for University Library Knowledge Services University libraries should aim to accelerate the construction of personalized, user-demand-oriented, and research-demand-oriented knowledge services, actively introduce high-level talents, improve the talent hierarchy of university libraries, and enhance core competitiveness. In the talent introduction process, libraries should have overall and big-picture perspectives, plan talent recruitment programs based on their own position needs and development status, examine candidates' comprehensive qualities, attach importance to educational levels, capability qualities, and professional qualities, select talents according to position needs, and choose technical and management talents that meet library needs through professional knowledge and vocational skill tests.

5.2.2 Regularly Conducting Knowledge Service Training for University Libraries In the big data context, to adapt to the rapid development of emerging technologies such as cloud computing, data mining, and artificial intelligence and meet the personalized needs of university library users, knowledge service personnel should continuously learn and improve their capabilities. To this end, university libraries can regularly conduct professional skills training, invite experts in library and information science, computer science, and management to give lectures, or adopt internal learning and organize team external learning to carry out systematic training, improving librarians' knowledge, skills, and cultural literacy in various aspects. This enables library personnel to obtain the latest industry information in library and information science, timely supplement and update their professional knowledge, understand the development dynamics of various library departments, and guide librarians' work direction.

5.2.3 Focusing on Cultivating Compound Talents for University Library Knowledge Services On the basis of improving all librarians' knowledge service professional capabilities, university libraries can select outstand-

ing and high-performing talents according to personnel assessment results and knowledge service needs and cultivate them into compound talents for knowledge services. First, cultivate librarians to master relevant network tools and software proficiently, improving their capabilities in data mining, analysis, and organization. Second, cultivate librarians' academic research capabilities, requiring subject librarians to conduct in-depth research in their own disciplinary fields, be able to analyze and evaluate disciplinary development trends, answer professional questions, and provide development suggestions for library disciplinary resource construction. Third, cultivate librarians' system development capabilities to maintain library resource databases and network security construction. Fourth, cultivate librarians' education and management capabilities, improving management quality, conducting training courses for users, popularizing relevant legal and property rights knowledge, and purifying the library network platform environment.

5.3 Improving the Knowledge Service Environment

5.3.1 Creating a Favorable Policy Environment and Strengthening Intellectual Property Protection In the big data environment, university library service models face major transformation. To further enhance the diversification and intelligence levels of library knowledge services, the state and government should issue corresponding policies, regulations, and standards, and improve relevant service agreements for library data construction. University libraries should formulate suitable management and development norms based on relevant state and government policies to promote the smooth progress of library knowledge service activities and improve knowledge service efficiency.

The rise of network resources has facilitated resource acquisition, storage, and dissemination, but it has also intensified infringement issues, hindering creators' enthusiasm. To create a favorable innovation environment, the state should strengthen intellectual property protection from a macro perspective, grant creators exclusive rights to internalize the externalities of innovation achievements, and severely punish infringement acts. At the same time, university libraries and experts should strictly follow relevant intellectual property regulations, coordinate their property rights relationships, and create a favorable development environment for university library knowledge services.

5.3.2 Implementing Supply-Side Structural Reform To thoroughly implement the concept of comprehensive development, university libraries should coordinate their development strategies with government macro-control and deeply promote supply-side structural reform of knowledge services. To this end, universities should comprehensively improve the supply quality of knowledge services from the perspectives of investment, institutions, talent, and innovation. First, university libraries can adopt incentive policies, improve funding investment criteria, fully mobilize enthusiasm for library knowledge service construction, optimize knowledge service property rights structure and factor structure,

and promote resource integration. Second, libraries should strengthen service team construction, adhere to the principle of equal emphasis on professional quality and cultural quality, and establish and improve quality training and performance evaluation mechanisms. Finally, they should upgrade knowledge development technology, knowledge sharing technology, knowledge application technology, and knowledge innovation technology to create intelligent services, provide users with innovative knowledge service chains, and meet users' needs for acquiring diversified knowledge.

5.3.3 Forming Library Knowledge Service Alliances with Other University Libraries With the rapid development of information technology, university libraries can form library knowledge service alliances that go beyond co-construction and sharing mechanisms for collection resources to carry out collaborative services. For example, seven "211" universities in Wuhan formed a library knowledge service alliance to carry out joint education programs, allowing students to choose any major offered by the seven universities for minor studies to obtain dual degrees. Since students generally choose to minor in advantageous fields from other universities, this requires their home university libraries to fully grasp the disciplinary characteristics of other universities' advantageous fields to formulate corresponding knowledge service plans. Based on traditional library alliance collection resource interlibrary loan and data resource transfer services, this alliance of seven university libraries leverages each member' s information technology advantages and disciplinary field advantages to collaboratively carry out knowledge services, better meeting the complex, diversified, and refined user needs generated by joint education programs, realizing true co-construction and sharing of university library knowledge services, and providing an open external environment for university library knowledge services.

5.4 Building Knowledge Service Platforms

5.4.1 Improving University Library Information Infrastructure Construction Information data has become a production factor in the digital economy era, driving the digital transformation of nations, societies, and knowledge-intensive institutions. Information infrastructure that can deeply integrate, compute, identify, and extract data resources is the inevitable result of the evolution of university library traditional IT infrastructure toward digitalization and intelligence. Accelerating university library information infrastructure construction and building a complete and efficient information technology system has become the basic content of university library knowledge service platform construction. First, considering the current construction status of university libraries and future development plans, libraries should establish big data thinking and intelligently layout and plan university library upgrading and renovation. Second, to provide comprehensive, multi-level, and wide-ranging knowledge services, university libraries need to connect all interactive elements of the library, such as collection literature resources, digital network resources, databases, knowledge

librarians, and university faculty and student users, into an integrated intelligent grid to deeply analyze, mine, and integrate massive data generated by interactive elements, providing precise support for the development of university library knowledge services toward diversification, intelligence, and personalization, as well as data management and intelligent services. Finally, the improvement and upgrading of university library information infrastructure is a long-term planning process. Therefore, university libraries should combine their own reality, integrate forces from multiple campus departments and external social sectors, conduct comprehensive research and prudent study, learn from smart library development experience, combine actual university conditions and positioning goals, and formulate scientific and reasonable university library information infrastructure construction plans under the guidance of university authorities at all levels to systematically promote the digital transformation and upgrading of university libraries.

5.4.2 Building Intelligent Institutional Repositories for University Libraries With the advent of the big data era, investment in university libraries has increased dramatically in various aspects. Currently, foreign university libraries and research institutions have generally paid attention to and carried out the construction of intelligent institutional repositories. Although most domestic university libraries now have sufficient technical capabilities and librarian quality to build intelligent institutional repositories, they have not yet formed a complete theoretical foundation and management mechanism for institutional repositories or corresponding architecture norms. Therefore, university libraries urgently need to effectively integrate advanced information technology and disciplinary concepts under the big data background to strengthen the connection between libraries and university research management departments and establish a complete intelligent institutional repository mechanism and norms. Based on faculty institutional knowledge service repositories, through communication and cooperation between subject librarians and library users, they can jointly promote the construction of university library intelligent institutional repositories. Such repositories can gain recognition and support from teaching and research staff in collecting output achievements, ensuring the completeness of various output achievements, and can make existing output achievements truly become the extended foundation for their continued research in achievement utilization and research practice, ensuring the depth and expansion of disciplinary knowledge services.

5.4.3 Creating University Library Knowledge Sharing Spaces In the ubiquitous knowledge environment of networked information and digital libraries, university library services are gradually transforming from library-centered to user-centered, and university library user information behavior is shifting from obtaining information resources with fixed carriers in single forms to obtaining various types of information resources on ubiquitous carriers through multiple methods. University libraries must effectively combine

with users to build knowledge sharing spaces, enabling users to seamlessly obtain needed information resources anytime, anywhere, through multiple paths according to their personal preferences. In the ubiquitous knowledge environment, using big data information technology and various intelligent information service tools to build a disciplinary knowledge exchange and sharing space co-constructed by university librarians and users can combine information resource acquisition with knowledge innovation, providing users with continuous high-quality personalized and professional knowledge services. This transforms knowledge publishing methods and exchange modes from one-way, linear traditional knowledge chains into dense network-type knowledge sharing information networks. In knowledge sharing spaces, users are no longer simply knowledge demanders and users, and their feedback to university libraries is no longer merely suggestions for improvement but participants who use their own professional knowledge and practical abilities to make university library resource construction more reasonable. At the same time, university librarians can, in the process of communicating and interacting with users, on the one hand assist users in efficiently utilizing library data resources, and on the other hand continuously fill their own disciplinary knowledge gaps and continuously improve knowledge services.

5.5 Innovating Knowledge Service Models

5.5.1 Innovating the Development Model of Embedded Disciplinary Services With the rapid development of new-generation information technology, embedded disciplinary services aimed at meeting users' diverse knowledge needs have emerged. University libraries should fully utilize modern information technology, integrate big data analysis and data mining technology into the disciplinary service construction process, and innovate embedded disciplinary service development models. University libraries can provide professional information services for users based on their own network resource platform advantages, use various search engines and plug-ins to quickly read required resources for users, or carry out teaching activities through mobile terminals to transmit library disciplinary service information and knowledge resources in real time, achieving deep integration of information technology and embedded disciplinary services.

5.5.2 Utilizing User Portrait Technology to Provide Personalized Knowledge Services Since 2020, user portrait technology has been widely applied in library information push and personalized service research. Therefore, university libraries can conduct in-depth data analysis and mining of user behavior to achieve association and clustering of various information resources, thereby constructing user portraits to further improve the targeting of knowledge services. First, university libraries need to conduct in-depth analysis and mining of collected user behavior data (such as reading records, search habits, browsing traces). Second, they should conduct comparative analysis with static user data (such as college, gender, major) in management systems, rely on user portrait technology to establish group user portraits from

multiple angles, and analyze and mine the behavioral habits of various users, such as behavioral characteristics of users from different colleges, different majors, and different genders. Finally, based on clear user portraits, they should establish label systems for different types of users to achieve contextualized adaptation between recommended information and knowledge and users' dynamic information needs, thereby accurately providing target resources that meet users' needs.

5.5.3 Providing Socialized Knowledge Services University libraries have rich collection resources and can provide corresponding services to society on the premise of prioritizing service to internal faculty and students. First, university libraries can provide borrowing services for paper resources to social readers by handling library cards, clarifying borrowing permissions, quantities, and time limits to regulate borrowing behavior. External users can also access library electronic resources through remote access systems or remote access accounts. Second, university libraries can also provide information consulting services for social users, including not only basic information services but also high-level specialized knowledge services. Finally, university libraries should vigorously promote "university-locality co-construction," carry out resource co-construction and sharing with local governments and other public cultural institutions they lead (such as local public libraries, science and technology museums, museums, and cultural centers), better meet the increasingly specialized and personalized knowledge needs of the public, and improve service accuracy and user satisfaction. For example, the Dujiangyan City Library Alliance established in Dujiangyan, Sichuan Province, has opened five university libraries, including Sichuan Technology and Business Vocational College Library, and the city library to social users free of charge, advancing the socialized service process of university libraries.

6. Conclusion

In the big data environment, university libraries face unprecedented challenges and opportunities. To adapt to this new environment, university libraries need to continuously innovate and reform knowledge service models. By optimizing knowledge service resources, building knowledge service teams, improving the knowledge service environment, constructing knowledge service platforms, and innovating knowledge service models, they can build a knowledge service system that meets the needs of the times. Only in this way can university libraries better satisfy user information needs in the big data environment and provide more accurate and efficient knowledge services. At the same time, they should strengthen cooperation with academia and industry to jointly promote the development of university libraries.

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Author Contact Information:

Address: Room 1601, Unit 3, Building 16, Hongkun Yulong City Phase 1, Beilin District, Suihua City, Heilongjiang Province
Postal Code: 152000
Phone: 13555393428
Email: 1248669695@qq.com

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