

Research on Book Materials Management and Service Innovation Strategies of University Libraries in the Big Data Era

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Abstract: With the widespread application of big data technology, university libraries have become crucial hubs for knowledge dissemination, academic exchange, and talent cultivation in higher education institutions. They are also undergoing profound transformations in library resource management and utilization. Traditional management models suffer from shortcomings such as inefficient resource allocation, lack of targeted services, and low operational efficiency, making them inadequate to meet the evolving needs of faculty and students in the modern era. This study examines challenges in library resource management and service delivery within university libraries under the big data context, analyzing their root causes through practical case analyses. By demonstrating concrete approaches—including management optimization, service diversification, technological integration, and talent development—we aim to propel university libraries toward refined management systems and precision-oriented services. These advancements will enhance their pivotal role in academic talent cultivation and scientific research, ultimately driving institutional progress.

Keywords: Big data; University library; Library and document management; Service innovation

Online publication: May 21, 2026

1. Introduction

With the widespread application of big data technology in the education sector, university libraries are evolving from traditional “book storage and lending facilities” into “knowledge service and innovation hubs.” Library collections constitute the most vital assets of academic institutions, where their management and service quality directly impact teaching-research operations and the learning needs of faculty and students. However, most university libraries still rely on traditional methods for book procurement, classification, lending, and service delivery, neglecting big data applications to unlock resource potential and address personalized demands. This necessitates exploring how big data can enhance current library management practices and information services, while implementing concrete solutions to transform libraries into trusted knowledge hubs—a strategy of paramount practical significance.

2. Current status and challenges of book resource management and services in university libraries in the big data era

2.1. Prominent issues in library and information management

Driven by big data, China's socio-economic development has achieved rapid growth, fostering stable and healthy development across various industries and sectors. In light of contemporary development trends, libraries must further elevate operational standards. As vital components of urban development, these institutions should establish targeted management frameworks through a comprehensive analysis of public reading needs. By enhancing book management efficiency and quality, libraries can provide readers with richer reading experiences, expand knowledge reserves, and ultimately elevate overall literacy levels^[1]. The primary challenge in library resource management at universities today lies in its fragmented management approach, which fails to achieve rational resource allocation and optimal utilization. Most libraries still rely on outdated procurement methods such as teacher recommendations when purchasing books, while neglecting big data analysis of students' reading needs, faculty requirements, and academic trends. This results in book acquisitions that prioritize quantity over quality and form over practicality. Some professional books purchased by libraries are inconsistent with the academic disciplines offered by the institutions, resulting in prolonged neglect and wastage. Conversely, popular professional books are often understocked, leading to long queues for borrowing by students or faculty members, thereby failing to meet timely academic and research needs^[2].

In book classification and organization, traditional methods remain relatively simplistic, typically limited to basic subject-based categorization. They fail to leverage big data technology for in-depth analysis of book content and borrowing patterns, making it challenging to achieve precise classification and personalized recommendation systems. For instance, some university libraries categorize computer-related books solely into hardware and software categories without further subdivision into specialized fields such as artificial intelligence, big data, or network information security. They also fail to provide tailored book recommendations based on faculty and students' reading preferences, resulting in increased time expenditure for users in locating required information.

In terms of book lending management, most libraries are limited to basic functions such as borrowing and returning registration. They are unable to utilize big data technology to analyze and monitor borrowing patterns among faculty and students. These institutions lack knowledge about which books are highly popular, what types of books faculty and students prefer, and how to handle overdue or severely damaged books. Some libraries still employ manual recording methods, which are time-consuming, labor-intensive, and prone to omissions or errors, thereby causing inconvenience in management operations.

2.2. Prominent issues in library and information services

The main problems of book and document information services in university libraries are monotonous service modes and a lack of pertinence. Traditional services primarily rely on offline borrowing and in-house reading, lacking integrated online-offline service models. This fails to meet the demand for anytime, anywhere access to books and literature among faculty and students. During the pandemic when offline services were disrupted, many libraries failed to promptly implement online service measures, resulting in difficulties for users to access library resources and delays in academic and research activities^[3].

The service supply is disconnected from the needs of teachers and students, lacking targeted and

refined services. Most libraries provide standardized services without tailored approaches, whether in book recommendations, consultation responses, or thematic reports, failing to address the specific academic disciplines, academic years, and reading preferences of faculty and students. For instance, providing liberal arts students with an excessive number of science textbooks or introducing advanced academic works to lower-grade students results in suboptimal service outcomes, failing to effectively meet the personalized needs of the broader teaching and learning community.

The service personnel lack professional competence, making it difficult to meet the service demands of the big data era. Some library staff lack proficiency in applying big data technologies to understand faculty and student needs or develop the value of library resources, resulting in suboptimal user experiences in information retrieval and resource recommendation services. Moreover, some employees exhibit a weak service mindset, responding to faculty and student inquiries with insufficient enthusiasm and seriousness, lacking initiative and creativity. This has, to some extent, diminished the overall satisfaction of library users.

3. Core principles for innovation in library materials management and services in universities during the big data era

3.1. Centering on the needs of teachers and students

In the era of big data, the fundamental objective of improving library management and service models in higher education institutions is to better meet the growing diversity and personalized needs of faculty and students. By leveraging big data technologies, libraries can extensively collect and analyze information on borrowing patterns, search behaviors, and inquiry trends. This enables precise identification of preferred book categories, required learning resources, and research directions. Based on these insights, targeted management reforms and service innovations can be implemented, ensuring that library collections effectively support educational activities and talent development ^[4].

3.2. Supported by technology empowerment

Big data technology is an important support for the upgrading of university library management and information services. Libraries should proactively adopt big data technologies for collection, processing, and analysis to integrate and interpret collection resources alongside behavioral data from faculty and students. This approach enables refined library management and personalized services. Building on this foundation, big data solutions can facilitate seamless integration of online and offline services, overcoming temporal and spatial barriers while enhancing operational efficiency and service quality.

3.3. Orientation towards practicality and efficiency

Management and service innovation should not be divorced from the actual operational conditions of university libraries, adhering to the principles of practicality and efficiency to avoid superficiality. Innovative measures should be concise, easy to implement, and highly operational, effectively addressing current management and service issues to enhance work efficiency and service quality. This enables faculty and students to conveniently access library resources and enjoy various services, thereby maximizing the library's functional role.

4. Innovation strategies for library materials management and services in university libraries in the big data era

4.1. Innovating library resource management models to achieve refined management

In book procurement management, big data technology is utilized to establish demand forecasting models. Information such as borrowing patterns of faculty and students, search terms, and consultation feedback is collected to analyze reading interests and habits across different disciplines and academic levels. Procurement activities are then conducted in a targeted manner based on the school's disciplinary development plans. For instance, a university library utilized big data analytics to identify a consistent annual increase in book borrowing rates and higher consultation frequency for artificial intelligence and big data-related materials among faculty and students in its School of Computer Science. Consequently, the library adjusted its procurement catalog by increasing purchases of these titles while reducing acquisitions of less frequently used books. This strategy enhanced resource utilization efficiency and prevented potential waste ^[5].

In terms of book classification and organization, a refined classification system has been established. Big data technology is employed to analyze book content, further subdividing traditional subject categories based on themes, purposes, and difficulty levels. A book association database is created to interconnect related content, facilitating easy access for both teachers and students. For instance, a university library categorizes literary works into distinct groups such as classic literature, modern literature, and online literature. It also interlinks different works by the same author and books on related themes. When a reader borrows a book, the system automatically recommends related titles for reference, significantly enhancing reading and research efficiency for both faculty and students.

An intelligent book lending management system will be established for library services. By leveraging big data technology to monitor and analyze borrowing patterns of faculty and students, the system enables intelligent processes including borrowing registration, overdue notifications, book renewal, and damage reporting. For example, the system automatically issues notifications for books nearing expiration based on borrowing patterns of teachers and students to prevent fines; through analysis of borrowing data, it promptly identifies books with high borrowing volumes and high damage rates for replenishment and maintenance, ensuring effective utilization of library resources ^[6].

4.2. Innovating library service content to achieve precision-oriented services

Establish a personalized service system. Utilize big data technology to analyze borrowing patterns, search behaviors, and academic disciplines of faculty and students, thereby creating individualized user profiles for each member. Based on these profiles, provide tailored book resources, academic literature, and various service information. For instance, literature majors are recommended books on literature, history, and philosophy, while researchers receive curated content including academic journals, monographs, and cutting-edge research findings in their fields, ensuring targeted services. A university library implemented a personalized service program that leverages big data analytics to identify faculty and student needs, delivering precisely matched resources. This initiative has significantly enhanced reading experiences and learning outcomes, earning widespread acclaim.

Promote integrated online and offline services. Establish an online service platform based on big data technology to enable online operations such as book search, reservation for borrowing, renewal, consultation, and resource download, thereby overcoming time and space barriers. This allows faculty and students to

access library materials and enjoy corresponding services at any time. In addition, offline service facilities should be improved by adding self-service lending machines and self-service inquiry terminals within the library to simplify borrowing procedures and enhance operational efficiency. To create distinctive reading spaces, libraries establish dedicated areas such as quiet reading zones, discussion forums, and leisure reading areas tailored to faculty and students' needs, fostering an enjoyable reading experience and a conducive learning environment. For instance, a university library has launched an online platform where users can access collection catalog information and book reservations via mobile devices. Self-service book lending and returning machines installed throughout the library enable efficient borrowing and returning processes, offering convenience and speed.

Provide specialized thematic services. Leveraging the school's disciplinary development and the needs of faculty and students, utilize big data technology to develop distinctive resources and deliver specialized thematic services. For instance, by leveraging the school's core academic disciplines, we compile relevant books, literature, and other materials to establish specialized databases, providing tailored services for faculty and students. Regular lectures and book discussion events are organized, featuring expert speakers selected based on big data analysis of trending topics and actual needs. This approach not only enhances reading engagement but also elevates cultural literacy among participants.

4.3. Strengthening technology application to consolidate the foundation for innovation

Establish a big data management platform to integrate library and literature resources as well as teacher-student behavioral data. Integrate all library collection catalogs, borrowing logs, search logs, consultation logs, and other content onto a big data management platform for unified management and sharing, thereby laying the foundation for management and service innovation. Concurrently, implement robust security measures for the platform to ensure data integrity and confidentiality, preventing incidents of data breaches or loss.

Introduce intelligent technologies to enhance management levels and service quality. Based on big data, actively adopt various intelligent technical approaches such as artificial intelligence (AI) and the Internet of Things (IoT) to promote the intelligent development of library management and services. For instance, employing artificial intelligence technology to automate book classification, cataloging, and retrieval processes can reduce staff workload while enhancing operational efficiency. Meanwhile, real-time book monitoring via IoT technology facilitates easier access for faculty and students, enables effective book management, and provides timely insights into circulation status.

4.4. Strengthening talent development and enhancing service capabilities

Strengthen the training of existing employees to enhance their professional competence and technical proficiency. Regular training programs are conducted for employees on big data technology, intelligent technologies, and etiquette services, enabling them to master various big data tools. By leveraging big data technology, staff can better understand the needs of faculty and students, maximize resource value, enhance service awareness and quality, and deliver convenient and comfortable service experiences.

Introduce professional talents to optimize personnel structure. Actively recruit interdisciplinary professionals with expertise in big data technology, library science, information science, and related fields to strengthen library staff capacity and address the current issue of insufficient professional technical

proficiency among staff members. Meanwhile, improve the talent incentive system to stimulate employees' enthusiasm for self-directed learning and innovation capabilities, thereby enhancing their work motivation and creativity.

5. Conclusion

The era of big data brings new opportunities as well as challenges to book management and utilization in university libraries. There are still many shortcomings in management and services that fail to meet the demands of new developments. Innovating library resource management models to achieve refined administration, innovating service approaches to deliver precise services, strengthening technological applications to lay the foundation for innovative development, and cultivating high-quality talent to enhance service standards can effectively address challenges and promote the high-quality development of university libraries. In the future, university libraries should continuously intensify research on big data and actively explore various innovative management models and service approaches to meet the needs of faculty and students. By leveraging their roles in talent cultivation, scientific research, and cultural dissemination, they can further contribute to the overall development and advancement of higher education institutions.

Disclosure statement

The author declares no conflict of interest.

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