

# Construction of Service Model of Intelligent Libraries in Chinese Universities under the Background of Big Data

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**Abstract**—In the new era, college readers are in urgent need of providing personalized, mobile and intelligent intelligent libraries. This paper expounds the origin of the intelligent library from the multi-dimensional perspective, deeply analyses the new characteristics of the intelligent library from the multi-dimensional perspective, and summarizes the new functions of the intelligent library, in order to better cope with the competitive environment that the library is facing at present. This paper also expounds the connotation of University Intelligent Library and its intelligent service, and constructs the service mode of University intelligent library from three aspects: intelligent borrowing service, intelligent personalized service and intelligent mobile information service.

**Index Terms**—Big Data Age; Intelligent Library; Service Model; Intelligent Service.

## I. INTRODUCTION

Since the first decade of the 21st century, intelligent libraries have continuously become the hotspot of theoretical research and practical exploration in the global library circle. The rapid development of new generation information technology, such as big data, cloud computing, Internet of Things, mobile Internet, artificial intelligence, block chain, etc., has continuously injected new connotation and new momentum into intelligent libraries since the second decade of the 21st century. With the in-depth development and continuous advancement of the theory and practice of smart library, how will the smart library develop in the future? This requires answering a series of practical questions and discussing and recognizing them strategically.

At present, the realistic problem faced by university libraries is how to realize the transformation from traditional borrowing to intelligent service and from inefficient manual to flexible and intelligent under the background of the era of wisdom. Faced with these practical problems, the service mode of university library needs to be changed, and the new era requires that university library can provide intelligent service for readers [1-14].

## II. INTELLIGENT LIBRARY, INTELLIGENT SERVICE AND RELATED FUNCTIONAL REQUIREMENTS

### 2.1 Wisdom Library

From the spatial level, Wang Weiqiu and others pointed out that intelligent library is the organic combination and innovation of intelligent building and highly automated digital library by applying and installing new technology and intelligent equipment in construction.

From a technical point of view, Intelligent Library = library + big data + Internet of things + cloud computing + Intelligent equipment, which is the integration of perception intelligence and digital library service intelligence [1].

From the level of librarians, intelligent libraries require librarians to quickly adapt to the new information technology environment and service mode, learn and master new methods of data mining analysis, and provide readers with accurate and high-quality services [2].

From the service level, intelligent libraries transform traditional libraries by using big data, cloud computing and some intelligent devices to provide users with intelligent service management.

To sum up, intelligent libraries need to organically integrate the core elements of space form, technology drive, librarian embedding and management services. Intelligent space is the physical embodiment, intelligent technology is the support, intelligent librarians are the core, and intelligent service is the purpose.

### 2.2 Intelligent Service of Intelligent Library in Colleges and Universities

The service of university libraries is constantly improving. Traditional services include literature service, information service and knowledge service, but now the intelligent service has become the core service of University intelligent library. Intelligent service refers to the combination of reader's information behavior in virtual environment and entity environment, the combination of basic information of library documents and reader's information, the construction of a reader model that can fully and truly reflect the reader's personality and demand characteristics, and the automatic identification and perception of the reader's position and the current learning, research and work content, and the initiative to push related letters for them. Information and provide real, all-round, three-dimensional, suitable personalized services [4].

### 2.3 Functional Requirements of Library Intelligence Service

### 2.3.1 Knowledge Sharing

Knowledge sharing is an important means of knowledge innovation and Realization of knowledge value. It is the core of knowledge management in libraries. The main modes are explicit knowledge external sharing, tacit knowledge external sharing and tacit knowledge internal sharing. With the networking of information environment, digitalization of resource form and rapid popularization of mobile devices, readers' demand for knowledge sharing has changed to generalization and real-time. Through the use of new information network technology to realize the interconnection and sharing of library resources and readers, to provide an all-round and integrated service mode, and to realize the diversity, instantaneity and ubiquity of shared resources are the important purposes of information services of intelligent libraries.

### 2.3.2 Convenience of Use

The construction of intelligent libraries requires people-oriented and user-oriented, and convenience is an important factor affecting readers' willingness to use libraries. Under the background of rapid development of big data, cloud computing and Internet of Things technology, relying on the innovation and progress of information technology to provide readers with more convenient and fast information query and reading services, optimize the acquisition mode of reading learning solutions, realize the efficient management of intelligent and autonomous libraries, and let readers enjoy the convenience of intelligent Libraries better.

### 2.3.3 Service Efficiency

The rapid development of information technology poses a new challenge to the development of library intelligent service, which is efficient, sensitive and integrated. Especially with the continuous expansion and aggravation of the library building area and infrastructure load, as well as the increasingly rich and growing volume and carrying load of information, libraries are required to attach more importance to the use of intelligent technology to support and assist the library's service management work in an instant and efficient manner, to provide accurate, real-time and ubiquitous information services for readers, and to carry out emergency situations, namely Deal with it promptly and timely.

### 2.3.4 Service and Management of Intelligent Library

The service of intelligent library is embodied in the statistics and analysis of the behavior data left by the readers in the library by the intelligent equipment, so as to understand the readers' reading preferences and predict their professional needs, so as to provide all-round intelligent service for the readers. The management of Smart Library is embodied in that the smart library can input all the data and information, use all kinds of equipment skillfully, and improve the management efficiency better [7].

## III. NEW CHARACTERISTICS OF INTELLIGENT LIBRARY

### 3.1 Resource Allocation Optimization

If libraries want to maximize their service efficiency, they

must arrange the proportion of resource types required by readers at different levels to achieve the optimization of resource allocation. However, due to different levels of libraries, different degrees of open use and different proportion of budgetary funds, the proportion of digital resources is also different [8]. For example, the young and research-oriented readers of University Libraries and professional libraries are in the majority. Therefore, libraries need to invest more funds in digital resources which are easy to retrieve, easy to read and fast to update; public libraries in economically backward areas, whose readers are mainly ordinary people, should be inclined to purchase paper resources; public libraries in economically developed areas, whose readers have a higher demand for literature and information, should be inclined to digital resources. In addition, the wisdom library can expand the source of information resources as much as possible, effectively supplement its collection, and meet the reading needs of readers at different levels in a multi-level and all-round way. It is also the best way to allocate library resources.

### 3.2 Diversification of Service Patterns

The core of Smart Library is service. Its goal is to let users experience the convenience and wisdom of service. In the era of big data, if traditional libraries want to become intelligent libraries in reality, they must adapt to the needs of the development of the situation as soon as possible, meet the growing cultural needs of the vast number of readers, continuously improve the satisfaction of readers, and provide targeted and characteristic services for readers. Specifically embodied in: (1) Providing macro decision-making information. Libraries should regularly provide the government with macro-decision-making information on market development, urban construction and environmental protection. (2) Developing industrial service model. Library is the producer, disseminator and developer of information products. By carrying out online directory search, online retrieval and online thematic information service, users can obtain a wider range of information resources and carriers. (3) Developing paid services. At present, some libraries begin to provide paid services to the society, such as generation reproduction, generation retrieval and generation translation. Library services began to change from "simple service" to "active service management" mode [1]. (4) Developing multi-level information consultation services. Under the background of "Internet +", the mode of library service begins to turn to multi-level information consulting service. More librarians are engaged in collecting information, organizing ordinal information, analyzing comprehensive information, and evaluating information. They directly participate in market research, become the intermediary of information technology, increase intelligence input in every link of information service, and produce new books. Libraries' information service personnel are known as "online informants", "online surfers" and "online navigators". These new service modes facilitate users to use library's literature

and information resources, improve readers' satisfaction, improve the service quality of intelligent libraries, and also reflect the library's humanization, rapidity and one-stop efficient service characteristics.

### 3.3 Scientific Collection Structure

With the rapid application of the new generation of information technology, the personalized needs of users also increase. Intelligent libraries can provide targeted information services to users according to their different needs, and create an information service environment that meets their needs [2]. In order to avoid duplication and waste of document resources and make the collection structure more scientific, librarians can formulate a plan of document acquisition according to the actual needs of users. That is to say, under the mode of on-demand publishing, they can rationally arrange acquisition funds, optimize the collection structure of libraries, minimize the duplication of resource construction, coordinate traditional publications, electronic resources, on-demand publications and open access to capital. The proportion of source acquisition provides a strong guarantee for the scientific and rational construction of library collection resources.

### 3.4 Simplification of borrowing process

The traditional book inquiry and book borrowing in libraries are mainly based on manual service, which takes a long time and is cumbersome in procedures, thus creating obstacles for readers to use. Intelligent library simplifies the process of book borrowing. Readers can complete the whole process of self-help borrowing and returning books by holding a library card. The whole process does not require the involvement of librarians. In addition, readers can also pay attention to library micro-service (Wechat Service Number) to achieve online borrowing and booking.

## IV. NEW FUNCTIONS OF WISDOM LIBRARY

### 4.1 Intelligently Calculating Library Demand with Data

The demand of traditional libraries is to carry out personalized services according to users' reading needs, information needs, cultural needs and knowledge needs. The demand of intelligent libraries is not put forward by readers, but by librarians in order to better serve scientific research and promote academic information sharing under the big data environment, using the new generation of information technology to browse, search and select network information resources with certain academic value, and then making full use of large data to classify, evaluate and organize in an orderly manner, to provide value-added services such as navigation, browsing and retrieval for readers. Value-added services such as browsing and retrieval. For example, librarians capture readers' acquisition needs, interests and knowledge service needs by analyzing such data resources as personal information of readers, search paths, reading preferences, users' mobile trajectories and readers' related information, and provide services and resources for readers in a targeted manner [11].

### 4.2 Intelligently Perceiving the Dynamic Change of Library with Data

Traditional libraries predict future development trends and perceive new changes based on experts' experience and long-term follow-up of the library industry. In the face of emerging new things, ideas and concepts, in order to gain competitive advantage and lasting competitiveness, intelligent libraries must highly integrate human brain wisdom and computer wisdom, quickly perceive changes in the environment, and keep pace with the development of the times. In the era of big data, in order to better perceive the dynamic changes of libraries, intelligent libraries not only need the integration of human brain and Internet, but also need to use quantitative and qualitative analysis methods to judge the changes of Frontier hotspots and information technology development.

It also monitors the changes of Library and user's needs in real time. Quantitative analysis method not only provides data statistics and mining for intelligent libraries, but also provides planning and induction for the development of intelligent libraries. Under the environment of big data, libraries grasp the law of library development through intelligent analysis and calculation of data, and use the law of development to predict the future direction and dynamic changes of libraries, which further improves the library's intelligent service ability and level [12].

### 4.3 Use data wisely to describe the current situation of Libraries

The books and materials collected by traditional libraries are mainly paper-based and in a single form. Because of the limited amount of information, the limitation of time and space, and the easy loss of information, information resources can not be shared, which leads to the library can not play its knowledge dissemination function well. Intelligent libraries use evolutionary analysis or life cycle theory to plot development trajectories and breakout points, and use visualization technology and methods to plot the relationship between related concepts, discover the intrinsic relationship between data, and realize the intelligent judgment of the current situation of libraries [13].

### 4.4 Intelligent Analysis of Competitive Environment with Data

Traditional libraries mainly analyze their competitive environment and obtain relevant information through conference tracking and data collection. Intelligent libraries use the Internet of Things technology to collect and sort out the policies and regulations needed by users, patent technology and the development trend information of the library industry purposefully, and to analyze, collate, refine and compare various network information. Intelligent libraries provide information consulting services to users in the form of abstracts, reviews and so on. In addition, by comprehensively understanding market dynamics and competitors, mastering high-quality information resources, real-time describing and analyzing all kinds of dynamic data

and information with data, comprehensively scanning the current competitive environment and situation, using data wisdom to analyze the competitive environment, and quickly making judgments and choices [14]

#### V. CONSTRUCTION OF SERVICE MODEL OF INTELLIGENT LIBRARY IN COLLEGES AND UNIVERSITIES

In the new era, with the rapid development of big data, cloud computing and artificial intelligence technology, university libraries have proposed building intelligent libraries. This paper constructs three service modes of University intelligent libraries.

Constructing the intelligent lending service mode based on RFID technology: The Intelligent Library Platform Based on RFID technology can provide intelligent lending service. One is the mobile book borrowing service. Readers can complete the required book borrowing by scanning the bar code of the library collection through a sweep function. The second is the book lending service. The borrower scans the two-dimensional code of the holder's book lending. After obtaining the consent of the holder, he transfers the book to his own name and realizes the book lending procedure online. The third is book renewal service, when the books borrowed by readers are about to expire but have not finished reading, they can choose book renewal; the fourth is book reservation service, when all the books under a certain bibliography are in the state of lending, the reader can make an appointment for the book; the fifth is to help me find book service, when the reader can not find "in the library" books on the shelf, they can submit an application for finding books, books. After the librarian finds the book, he informs the reader through the intelligent library platform.

Build the intelligent personalized service mode based on big data technology: the intelligent personalized service mode based on big data technology is based on the platform of University intelligent library. First, perceive the data of reader's behavior, then analyze the data based on big data platform, and finally provide the intelligent service to the reader based on the analysis results. When readers visit physical libraries, they can perceive some behavior data of readers in libraries through radio frequency wireless sensors in libraries, such as the time spent by readers in a reading room, the activity area of readers, etc. Through statistical analysis of these data, we can know the books and areas that readers are interested in. Using the data, we can push the interested books and areas to readers by using the public platform such as library Wechat. Books or other literature resources. In addition, when readers visit virtual libraries, a large number of reader behavior data are formed through the unified service portal of intelligent platform to perceive the reader's identity, login location, login time, pages browsed, borrowing records, etc. Through data mining and analysis, the reader's reading interest points and reading habits are obtained, and a personalized reader data sharing platform is established for readers. Provide personalized services.

Building intelligent mobile service mode based on Adaptive Web pages: intelligent mobile service based on Adaptive Web pages requires that the data and application of intelligent library system service portal on PC and mobile terminals are consistent, and the service process and operation are also consistent. Through the construction of various forms of mobile application platform for readers to provide mobile information services, such as building Weixin library, library APP, etc. according to the user's habits. Mobile applications should provide the following services: providing readers with information on borrowing, online renewal, booking and other services; providing one-stop search services; providing subject services, readers can view, ask questions and reply to thematic materials such as teaching and scientific research; providing intelligent recommendation services to recommend content of interest to readers according to their reading situation.

#### VI. CONCLUSION

With the rapid development of information technology and the coming of big data era, the construction of intelligent library is facing severe challenges and new development opportunities. The transformation of traditional libraries into intelligent libraries is not only the objective need of social development in the era of big data, but also the inevitable requirement of self-innovation and development of libraries. The continuous deepening and practice of big data in intelligent libraries is conducive to better calculating library needs, perceiving the dynamic changes of libraries, describing the current situation of libraries, and predicting the competitive environment that libraries are facing. With the deepening of the theoretical research and practical exploration of the Intelligent Library, the construction of the Intelligent Library in the Big Data Age is no longer an idea, but a wise institution that truly exists around the public and provides intelligent services for the public.

In the new era, university readers are more in urgent need of library to provide faster, convenient and intelligent services. Therefore, university libraries should actively explore the construction of intelligent libraries that meet their own requirements and needs on the basis of the existing theory of intelligent libraries, and constantly innovate the service mode of intelligent libraries.

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