

Construction of Intelligent Library Service System from the Perspective of Artificial Intelligence

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ABSTRACT. *The extension of intelligent library knowledge service is the further development and upgrading of digital library knowledge service. It supports the comprehensive ability of library in teaching, scientific research, social management, cultural construction and social development. The extension of intelligent library knowledge service should change from resource-driven to service-oriented. The study found that 52 percent thought libraries should provide innovative services, 45 percent thought it would help readers understand high technology, 23 percent thought libraries helped them find jobs, and 14 percent thought libraries improved their job skills.*

KEYWORDS: *Artificial Intelligence, Library, Intelligent Services, Social Development*

1. Introduction

With the development of Internet of things, big data, cloud computing and other technologies, public libraries use these new technologies and products to provide users with innovative and convenient services. Users can access library services by themselves. The time and space limit of access is gradually reduced. Intelligent public library should combine new technology to provide users with intelligent services to meet the growing cultural needs of users and maintain the sustainable development of libraries. Compared with traditional libraries, intelligent library has changed a lot. It is no longer just a place for users to read and learn, but also a place for social, leisure and entertainment. At present, the intelligent construction of public libraries needs to be strengthened, and the intelligent services provided need to be improved. In the face of opportunities and challenges, public libraries should vigorously promote the intelligent construction of libraries.

The construction of library intelligent service system based on artificial intelligence has attracted the interest of many experts and has been studied by many teams. For example, some teams have found that the reform, innovation and progress of information technology in the big data environment have brought impact to the library industry again and again. Under the influence of big data and Internet of things, the library develops from traditional library, digital library and composite

library to intelligent library. Based on information technology, the intelligent library gradually grows and gradually enters the user's vision [1]. In addition, the organization and construction of intelligent library has become a hot spot in library theory and practice and an inevitable trend in future research. From the perspective of supply side, the quality and quantity of library knowledge service should be changed, and the library should provide more, better and updated service content and service form [2]. Some teams have found that in recent years, with the promotion and application of Internet of things technology and intelligent technology in the field of libraries, new user needs have been generated. The current development of libraries is manifested in the following aspects: the number of books borrowed and the number of visitors to libraries has decreased year by year, while the utilization rate of electronic resources has continued to rise, and the utilization rate of electronic teachers and multimedia resources has reached a new height [3]. Therefore, users' demand for knowledge content often exceeds that of literature, from paper resources to digital resources, from the digital collection of past literature resources to the current integration of data and knowledge resources, including open journals, open books, network resources, interoperability and open institutional knowledge bases, feature thematic resources and scientific research data. These innovations are the transformation of resource forms from literature information to data knowledge [4]. According to Wang Shiwei, through the application of Internet of things technology in many libraries, the attention of wisdom library in our country is low, which is still in the primary stage and needs to be developed. From the point of view of intelligent equipment, Wuen puts forward that intelligent library is a new type of library based on Internet of things and cloud computing. It is people-oriented and provides personalized intelligent service to users through intelligent devices [5]. Han Li believes that the wisdom library should always adhere to the concept of people-oriented, pay attention to user experience, let users feel that they are the focus of the library, the wisdom library can carry out a variety of humanized intelligent services for users, personalized push, Mobile reading and other services [6]. Although their research results are very rich, but there are still some shortcomings.

This study discusses the theory and practice of knowledge library knowledge service extension mechanism and the improvement of new service ability in data driven environment. Based on the Internet of things and cloud computing technology, the intelligent library realizes the characteristics of "interconnection, deep perception, deep fusion, convenience and efficiency, service innovation" by means of intelligent elements, and provides users with diversified and personalized intelligent services.

2. Method

2.1 Information Resource Class Approximation Calculation

When the $A, B \in R$, information resource A and the label set of the information resource B are S1 and calculated respectively, if the S1 is used as the reference

information resource to calculate the category approximation of the information resource, the following formula is used [7]:

$$w(s_1, s_2) = \frac{|Q(s_1 \cap s_2)|}{|Q(s_1)|} \quad (1)$$

Conversely, using S2 as a reference information resource uses the following formula [8]:

$$w(s_1, s_2) = \frac{|Q(s_1 \cap s_2)|}{|Q(s_2)|} \quad (2)$$

Where $W(s_i, s_j)$ is the category approximation, $Q(S1)$, $Q(S2)$ are the number of labels for the S1 and the number of labels for the category, and $(S1 \cap S2)$ are the coincidence numbers for the label of the S1 and the category.

2.2 Information Resource Scoring

Set $U1$ Th time period, total n unit information resources $\{x1, \dots, x2, x3, \dots, xn\}$, $U1$ score this n unit of information resources, $\{P1, \dots, P2, P3, \dots, Pn\}$, let $D(x_i)$ be the recommended score of the x_i , the recommended score is calculated using the following formula[9]:

$$D(x_i) = W(h, x_i) p_i = \frac{|Q(h \cap x_i)| p_i}{|Q(h)|} \quad (3)$$

2.3 Recommendation Algorithm Based on User - Situational - Resource Combination

First, we judge whether it is an old user or not, and if it is an old user, we use the algorithm based on the combination of user (history) and content, otherwise, we use collaborative filtering algorithm to recommend resources. When the user is an old user, the current situation information of the user is obtained first, and then the historical situation information of the user is matched to obtain the scene similarity between the current user situation and the user history situation. In the traditional user-resource matrix, the user-case-resource model takes the situation (location, time, equipment, network, weather) as a new dimension, and describes the situation information as a situational attribute vector to form the user-case-resource model[10]:

$$Sim(Context(c), Context(H)) = \frac{Count(C1c) + \dots + Count(Cic) + \dots + Count(Cnc)}{n \times N} \quad (4)$$

Using the information resources in the similar historical situation, the similarity degree between them and the proposed information resources is calculated, and the recommended score is calculated by weighted method. The formula is as follows:

$$Score_{ij} = weight \times Sim(Topic_i, Resource_j) \quad (5)$$

3. Experiment

3.1 Source of Experimental Data

This study obtained data through two questionnaires, mainly online questionnaire distribution and data recovery. Online questionnaires were mainly sent through our chat, email, QQ, social media tools. raw data were obtained from the following ways: first, the online links were automatically generated and obtained through the questionnaire star. Second, through WeChat and other social media to share questionnaire links, invite friends in the library information professional WeChat circle and library work circle forwarding and forwarding questionnaire links, and some professional libraries and information researchers also put forward constructive suggestions for the survey. The results show that the sample attributes are more comprehensive. Finally, the questionnaire documents are sent by e-mail to promote QQ-based questionnaire links, mainly for libraries and information research groups, especially some college teachers, which are more commonly used in the form of e-mail exchange. QQ links are mainly colleagues and friends, more comprehensive samples, including students, teachers, librarians and researchers, and questionnaires for students. Because many students have long experience in library information and information databases, most sample groups are more familiar with libraries and information websites, most of them are advanced users. The object of data research is librarians and intelligent library knowledge service users. A total of 326 questionnaires were obtained online, of which 311 were effective questionnaires, and the effective rate was 95.4%, which could fully meet the research needs.

3.2 Experimental Design

1 Literature research method. 2 Focus group interview method. 3 Questionnaire survey method. 4 System theory analysis.

4. Result

4.1 Intelligent Library Knowledge Service Model

Intelligent library knowledge service system is a structured system composed of physical layer, resource layer and service layer. The system model of intelligent library knowledge service is the description, imitation and abstraction of intelligent library knowledge service system. It describes the relationship between the elements of intelligent library knowledge service system in a certain form. According to the relationship between the three levels and the structure of the intelligent library knowledge service system, the model of the intelligent library knowledge service system is constructed as shown in Table 1 below. It can be seen from the table that the intelligent library knowledge service system model consists of three levels: service layer, resource layer and physical layer. The three situations are

interconnection, resource and service. Among them, the service layer is located at the service layer, the service layer is located at the highest level of the intelligent library knowledge service system, the resource layer is located in the middle layer of the intelligent library knowledge service system, and the physical layer is at the bottom of the intelligent library knowledge service system.

Table 1. Intelligent Library Knowledge Service Model

System Dimensions	Structural Dimensions	Situational Dimension
Intelligent Library Knowledge Service System	Service layer	Service context
	Resource layer	Resource context
	physical layer	Interconnected situations

4.2 The Internal Logical Structure of the Synergy of Knowledge Service Factors Intelligent Library

This study selects three dimensions and seven structures to measure the main factors that affect the extension of knowledge services in knowledge libraries, namely, the situational dimension of knowledge services (perceived motivation, perceived ease of use, perceived usefulness), the content dimension of knowledge services (basic services and professional skills services), the group dimension of knowledge services (group traits and social identity). The relationship between knowledge service situation and continuous use behavior is analyzed.

Table 2. Relationship between Knowledge Service Extension Theory and Practice Factors of Wisdom Library

	Theoretical aspects		Practical aspects		
	structure	measurements	dimension	essential factor	measurements
Theory model	user characteristics	UC1-UC6	group dimension	user demand	UC1-UC6, S11-SI5
	social identity			talent element	UC1-UC6, S11-SI5
	basic services	BS1-BS7	group dimension	resource elements	BS2, BS3, PEU2
	professional skills services	PS1-PS6		skills elements	BS6, BS7, PS1-PS6
	perceived usefulness	PU1-PU4	contextual dimensions	resource	BS1, PEU3, PEU4
	perceived ease of use	PEU1-PEU4		flat roof	BS4, BS5, PEU1
	perceived motivation	PE1-PE5		service	PE1-PE5
continuing use of behaviour	TU1-TU4				

4.3 The Challenges of Knowledge Service Talent Construction in Intelligent Library

First of all, the proportion of librarians with comprehensive library information, technology and multidisciplinary background is too small to form a service team that can guarantee the courage to gnaw hard bones; finally, in the age structure, the proportion of middle and old people is too large and the proportion of young people

is too small, which leads to the lack of vitality of knowledge service team, so we should introduce talents in urgent need according to the post demand, as shown in figure 1 below.

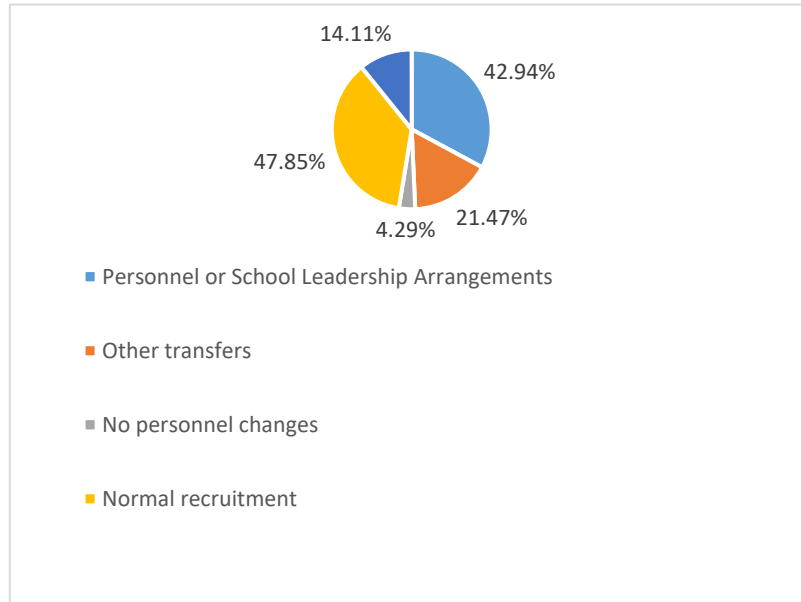


Figure 1. Main Ways of Talent Introduction in the Wisdom Library

4.4 Personalized Smart Services

Personalized intelligent service refers to the application of Internet, artificial intelligence, big data and other technologies on the basis of analyzing and studying the professional background, personality characteristics, knowledge structure and interests of library users according to the information needs of library users. Through system recommendation, push and user customization, library users are provided with more targeted intelligent services to meet their personalized needs. The basic characteristics of personalized intelligent service are pertinence, hierarchy, initiative and interactivity. The pertinence of personalized intelligent service refers to the special service provided by the library for different users; the level of personalized intelligent service refers to the different degree of attention paid by library users to the information needs, and the initiative of personalized intelligent service means that the library can meet the individual information needs of users, take the user as the center, can actively analyze the specific needs of its users, and actively push the information that users want; the interaction of personalized intelligent service refers to the deep interaction between user and user, library and user. Personalized intelligent reference service can be divided into personalized intelligent borrowing service, personalized intelligent reference service and

personalized intelligent recommendation service. Personalized intelligent reference service provides intelligent robot reference service based on artificial intelligence technology; personalized intelligent recommendation service provides personalized recommendation service for library based on big data technology; mobile intelligent lending service includes Alipay loan, WeChat loan, QR code electronic card loan and client APP loan. The research results of mobile intelligent lending service show that the coverage of WeChat lending services is the highest, reaching about 85%, while the coverage of Alipay lending and QR code electronic card lending services is low, about 30%, as shown in figure 2 below.

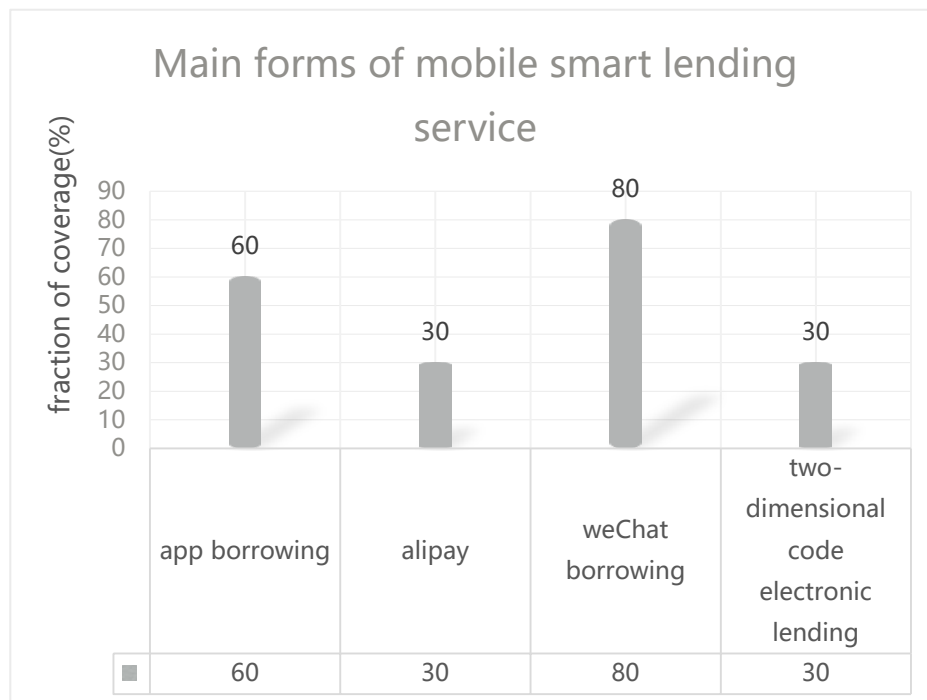


Figure 2. Coverage of mobile smart lending services

5. Conclusion

In the era of network and information technology development, with the arrival of knowledge economy, the original library services can no longer meet the personalized needs of users. The existing libraries have experienced the development of digital libraries and mobile libraries. At present, they are changing to intelligent, open and diversified complex libraries. The introduction of intelligent city has triggered the trend of library construction. At present, the development of intelligent library is still in its infancy, and there is no intelligent library in a complete sense. With the development of existing libraries, new technologies are

introduced to provide more intelligent services. In addition, all services provided by libraries are based on basic data. Based on this, it is necessary to explore the intelligent library service mode under situational perception to help the development of intelligent library.

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