

Research on Architecture and Function Design of University Smart Library Platform

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Abstract: In order to have a clearer and more comprehensive understanding of the functional structure of the smart library, and effectively solve the problems in the construction and development of the smart library. By comparing and analyzing the typical cases of the current smart library functional architecture, it points out the shortcomings that need to be improved, and emphasizes the application of artificial intelligence and big data technology, and the need for smart libraries to be comprehensive, not just the intelligence of several business systems. The intelligent library built with this functional architecture can realize intelligent management and intelligent services in the true sense.

1. Introduction

The continuous development of the Internet and the widespread application of information technology have profoundly affected the way humans acquire knowledge. On the one hand, the emergence of the World Wide Web has greatly expanded the scope of human cognitive activities; on the other hand, from the era of knowledge shortage into the era of information overload, the explosive growth of information has brought great challenges to humans' limited cognitive ability. At the same time, human knowledge needs present new features such as personalization, fragmentation, diversification, and integration. How to use the existing technology theory to organize and process massive information effectively, and establish an information resource supply mode that meets the new characteristics of human knowledge needs, has become an urgent problem in the current field of information and knowledge services. The main business goal of the library is to provide users with knowledge resources. However, as the rich Internet resources generally become a channel for people to meet information and knowledge needs, the utilization rate of traditional libraries is gradually declining, and even facing a severe survival crisis. Under the circumstances of both internal and external pressures, the library urgently needs a comprehensive service transformation to adapt to changes in the technical environment and the demand environment and achieve sustainable development of the library.

The library is an evolving social organism that continues to innovate services under the dual drive of demand and technology. Today, on the basis of traditional libraries, the form of libraries has undergone many changes such as digitization, networking, and mobility. In recent years, with the emergence of a new generation of information technology characterized by intelligence, scholars have proposed the concept of smart libraries as a new way of solving the existing crisis of libraries and new forms of library development in the future. In recent years, the research on smart libraries at home and abroad has shown a significant upward trend, and has become a hot topic in the field. It has also been initially applied in some library practices. As a kind of ideological form, the smart library is the product of the ubiquitous information society, and is the result of the integration of the development of information technology into the development of the library itself. The continuous development of information technology has continuously injected new vitality into the research of smart libraries. User service is the core of the smart library. With the transformation of technology, people's knowledge demand characteristics are quietly changing, providing the source of power for the development of smart libraries. From the perspective of literature research, researchers combined with the emerging information technology, proceeded from the aspects of library physical venue construction, service innovation, resource management, business reform, etc.,

and conducted continuous exploration and research on smart libraries for their development. Laid a good foundation. However, most of the existing research is carried out from the perspective of the supply side, and there is still a lack of attention to user needs. At the same time, most of the existing research has positioned the library users as the traditional passive role of receiving services, and lacks rich user information. Resource analysis and utilization. Therefore, it is necessary to focus on user needs and characteristics on the basis of tracking cutting-edge information technology, in-depth research on the theory and application of smart libraries, and explore theoretical guidance to deal with library crises.

2. The Concept of Smart Library

The concept of smart library is based on the growing development and maturity of cloud computing and Internet of Things technology, driven by the concept of “smart earth” proposed by IBM in the Foreign Relations Council in November 2008, and then accompanied by countries around the world. The upsurge of building smart cities.

Regarding its definition, foreign scholar Aittola put forward as early as 2003: The smart library is a mobile library that is not restricted by space and can be perceived; with China's increasing attention to smart library research, Yan Dong and Li Kaixuan have successively The formulas of “smart library = library + Internet of Things + cloud computing + smart devices” and “smart library = librarian + smart building + information resources + smart devices + cloud computing” are given in terms of structure Clarified the construction elements of smart library; from 2011 to 2013, Dong Xiaoxia, Wu En, Ma Ran, Han Li, Kang Bensi and other scholars focused on the technical level and further expanded and elaborated the definition of smart library: Digital, networked, and intelligent new libraries based on smart perception technology; during the period, Wang Shiwei published three consecutive articles on smart library literature, re-based on the core elements and values of the library Definition: Smart library is based on the support of information technology, focusing on integrated collaborative management, ubiquitous benefit services and green sustainable development strategy Future library.

Based on the relevant literature study, the author believes that the smart library is not an absolute abandonment of the traditional library, nor is it a product of the simple combination of the traditional library and the digital library, but is based on continuing to uphold the basic functions and obligations of the library. A more humane and smarter advanced form of books that fully utilizes the advanced nature of digitalization and informatization technology in the digital library and comprehensively and intelligently sublimates library business management, reader services, knowledge mining processing, space and energy utilization, etc. Pavilion.

3. Smart Library Service Model

Users and resources are the core elements of library services. In order to make smart libraries from concept to reality, this paper proposes the operation mode of smart library services from the perspective of user-resources binary analysis, one of which is based on libraries Explicit service provision model of existing resources, on the other hand is the implicit service provision model based on user behaviour analysis.

The construction of a smart library service model is based on providing resource services and giving play to the value of resources. The service presentation form is used as the dividing standard, and library services are divided into explicit services and implicit services. Explicit services include relying on physical resources, using intelligent perception, identification, and positioning technologies to realize automated presence, quick search, and self-service borrowing of library physical resources; relying on virtual resources, visualization through semantic network and Web3.0 And other technologies to achieve the user departure services such as semantic annotation of library virtual resources, heterogeneous integration, knowledge association, multi-channel access, humanized display and intelligent retrieval. On the one hand, the implicit service is to continuously collect, analyze and dynamically model the entire data of the individual behaviour of the user, grasp

the evolution law of the user's knowledge demand, and accurately predict the user's behaviour; on the other hand, by sharing and communicating with the library knowledge community users Collecting and in-depth mining and utilization of group behaviour information, constructing a knowledge network association relationship among users, and realizing collaborative filtering of knowledge.

The physical resource service model of the smart library greatly reduces the cost of physical space management and improves the satisfaction of users' presence experience. At present, the call number of the bar code record is generally used in the library management system as the unique identification mark of the book, and the management activities such as sorting, arranging, searching, and counting are carried out accordingly. This method solves some problems in the management of the collection of books, and also there are problems of difficult operation, high labor intensity, low degree of automation and lack of humanization. In terms of physical resource services, the smart library deploys wireless sensing, automatic identification, indoor positioning and other Internet of Things technologies in the physical space to realize the automatic sorting of library collections, quick resource search, and self-service book borrowing. First stick RFID electronic tags as the only identification mark of the book, scan the electronic tags, the system will locate the location where the book should be stored on the map, and at the same time arrange automated mechanical equipment to intelligently complete the work of shelf, inventory, sorting, etc. ; Reader's bibliographic query results, using indoor navigation technology to quickly find resources; finally, in the borrowing link, readers can automatically generate loan and return records as long as they scan on the self-service loan and return machine. The advantages of virtual resource services provided by smart libraries are mainly intelligent retrieval. Semantic annotation and heterogeneous integration are the main ways to achieve this advantage. Semantic World Wide Web technology (metadata, ontology, resource description framework, etc.) can: establish internal association rules between knowledge, improve the intelligent understanding of user search terms, and provide resources to users in a more efficient manner, namely No longer take a single document as the unit of knowledge organization, but take tagged, more targeted document fragments as the unit, to adapt to the diverse, integrated and fragmented knowledge needs of users; for multiple sources and multiple formats Heterogeneous integration of resources, providing one-stop search services and reducing user search costs; establishing multi-channel resource portals, building resource access to PCs and mobile terminals that meet user needs, and providing embedded services on platforms such as WeChat and Weibo ; In the end user display stage, develop visualization technology to provide humanized search results display; combined with the virtual processing of physical resources, and finally achieve the intelligent retrieval target for the user's explicit needs.

Smart library builds user's individual behaviour database by collecting individual behaviour data such as user search, browsing, download, evaluation, etc.; through analysis and modeling of the individual's full amount of data, accurate prediction of behaviour is provided to provide personalized knowledge needs for users Service. The behaviour of Web users is an aperiodic infinite long-range memory process. The next behaviour of users is not only related to current behaviour, but also affected by historical behaviour. The smart library continuously collects and stores the user's individual behaviour data, analyzes it, implements processing, and integrates value filtering. Based on this, a model that conforms to the user's behaviour law is constructed to accurately predict the user's next behaviour and acquire user tacit knowledge demand.

Based on the social relationship of the user's virtual community, the smart library collects user group behaviour data such as sharing and communication, constructs a knowledge network association graph of the user group, and uses the social relationship as a reference to achieve collaborative filtering of information resources. At the same time, the collection of small data of individual users can form big data of user groups, based on which the value mining activities of big data such as group dynamic clustering and knowledge structure comparison can be conducted to find potential common characteristics between different users and expand the scope of recommendations. To improve the quality of recommendations. User group big data can also be used for library service model reform, business process optimization and market competition

environment improvement.

From the perspective of resource-user duality, the service target of the smart library includes both the user's consciously expressed needs and the potential needs of users after intelligent perception mining. The hidden data of users are discovered from the behavioural data brought by explicit needs. Sexual needs, providing implicit needs to users in the form of personalized recommendations, and then transformed into explicit needs of users. Therefore, the explicit and implicit services in the smart service model are a spiral iterative relationship.

4. The Functional Architecture of the University Smart Library

The functional architecture of the smart library proposed in this paper is divided into three layers: perception layer, network layer and application layer.

The design of the perception layer and the network layer draws on the experience of. The perception layer includes RFID, mobile terminals, environmental monitoring sensors, video monitoring and other data acquisition modules and Zigbee, Bluetooth and other short-range communication and collaborative processing modules. The network layer includes the Internet, 3G / 4G / 5G, LAN network, etc. Above the network layer are application layers. At the application level, the entire process of cloud computing and information security technology is supported.

The various business systems of the library generally refer to business systems such as retrieval, editing, circulation, reading, reservation, consultation, office, positioning, book recommendation, etc., and even include access control, environmental monitoring, security monitoring and other systems. Each database system generally refers to a self-built characteristic resource library, a teacher 's thesis database, a teacher 's work database, a master 's and thesis 's thesis database, a knowledge base, an off-campus access system, an electronic resource access analysis system, a purchased electronic resource database mirror, and even a purchased electronic resource database. Resource database, etc.

The data of the above business system and the data of various databases, as well as the data of other information systems of the school need to be exchanged to establish a shared data center of the library. In order to make the shared data center more efficient and complete, it is necessary to consider the library's data standards and perform data processing on these data. It is worth pointing out that the format of these data are text, pictures, video.

The data of the sharing center enters the big data comprehensive analysis platform, where data mining and artificial intelligence technologies are used to generate the intelligence of various business systems. At this point, it is much easier to solve the intelligent problem of paper book procurement mentioned in the article. Of course, the difficulty is to mine relevant data and establish a suitable artificial intelligence model. New knowledge will be generated in each business intelligence, such as "A book is popular with teachers and students", "A student is excellent in learning" and so on. Based on the intelligence of each business, data mining and artificial intelligence technology modeling of all data in the shared data center and the newly generated knowledge data can achieve a relatively complete portrait of each teacher and student, providing wisdom for its portrait Service; similarly, the establishment of different models can achieve intelligent management and intelligent decision-making. These services can be displayed and interacted with teachers, students, librarians, and leaders through library portals, including mobile portals. At this time, this portal can also be called the "wisdom portal" of the library.

5. Conclusion

In the construction of university smart libraries, we should adhere to the user's personalized characteristics and needs as the base point, and take the core business of the university library as the foothold, clarify its smart functional elements and content, relying on the Internet of Things, cloud technology, big data technology To focus on setting up the overall smart function structure and promote the more systematic and in-depth development of smart libraries in colleges and universities.

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