



## ARTICLE

# Analysis on the Construction and Application of Smart Library

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### ABSTRACT

Combining the smart library management plan, recognize the importance of modern smart library construction, summarize the technology in the construction of smart libraries, aiming to demonstrate the innovative value of smart library construction through the innovation of construction programs, and to provide guarantee for the design of modern libraries.

## 1. Introduction

Through the analysis of the modern library construction program, the smart library as the goal of library innovation development, its innovation development, transformation development and sustainable development are more important content. Through the construction of the smart library, the library construction can be the focus, and gradually improve the overall security and stability of the library and the rapidity, convenience and accuracy of the library services, so that the librarians can better serve the readers. In the smart library work innovation, it is possible to realize the establishment of an interconnected library, an efficient library and a convenient library. In the library management system service,

the value of the smart library can be demonstrated to provide guarantee for the development of modern libraries.

## 2. The Background and Concept of the Smart Library

### 2.1 The Background of the Smart Library

Through the supercomputer and cloud computer, the Internet of Things is integrated to realize the integration of human society and physical system. This means that economically viable smart technologies will be used in almost all industries, in a variety of products, to create services that were not possible in the past. On this basis, no matter the natural system, the industrial system, or even the human beings, they will be more closely related

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to each other and form a variety of intelligent systems.

In early 2009, IBM put forward the concept of “Smart Planet”. Once this concept is put forward, it has received great attention from all walks of life. However, “smart community” and “smart school” have also come one after another. Based on this “smart” concept, the library, as the frontier of information service organizations, should seize the opportunity to promote the evolution of modern libraries to smart libraries through the systematic development and application of the Internet of Things.

## 2.2 The Concept of the Smart Library

Smart library is a smarter way to change the way users and library system information resources interact with each other by using a new generation of information technology to improve the clarity, flexibility and responsiveness of interactions, thereby achieving a library model of intelligent service and management.

Smart Library= Library +Internet of Things + Cloud Computing + Intelligent Devices, which realizes intelligent service and management through the Internet of Things. The smart library realizes communication between readers, communication between readers and libraries, communication between libraries, communication between readers and information resources, and communication between information resources through the Internet of Things. Its highest stage is that all parts are intelligently completed by the library, without manual intervention to achieve a “smart” state.

## 3. Basic Characteristics of the Smart Library

In the process of smart library construction, there are many kinds of library service modes, and the service modes of different libraries are different. The specific service modes are shown in Table 1.

**Table 1.** Main service modes in different forms of libraries

Service Mode	Traditional Library	Compound Library	Digital Library	Mobile Library	Smart library
Literature Borrowing & Returning	√	√	√	√	√
Lecture Training	√	√	√	√	√
Self-study Reading Room	√	√	√	√	√
Automated Management System		√	√	√	√
Weibo & Wechat Service System			√	√	√
Smart Security Management System					√
Self-services					√

The research found that there are certain differences

in the service modes in different library constructions. Among them, the smart library as a modern service management mode has obvious innovation value. The service modes of the smart library were analyzed, and the specific features are reflected in the following aspects:

### 3.1 Comprehensive Perception

Through the research of the smart library, it is found that in the process of library design, the identification of books and periodical entity information resources is carried out through the design of Internet of Things mobile phones, computers, radio frequency identification devices and global positioning systems. Through the analysis of China Mobile’s latest data, at the end of April 2012 from 30 provinces and cities nationwide, the wireless city portals in 302 cities were promoted, with the number of wireless cities reaching 16,000, with a growth rate of 10.4%. In the virtual background such as the database, the information of the user can be deeply explored through the use of information resources and book resources to realize the perception, measurement and capture of the deep information, and gradually increase the value of the information data acquisition.

### 3.2 Interconnection and Interworking

Combined with the management content of the smart library, the service mode is analyzed. The characteristics of Interconnection and Interworking are reflected in the following aspects: first, the ubiquitous nature, the so-called ubiquitous feature, is mainly that users can access the library services at any time, any place and anywhere. Moreover, the smart library has the characteristics of all-day development. Under the condition of multiple carriers and multiple dynamic channels, it can provide users with the book experience and maximize the value of user information and service methods; second, the characteristics of polymerization. through the analysis of the management system of the smart library, in the process of establishing various information resources, there are links such as cross-system application integration, cross-department information sharing, and network transformation and intercommunication. Through the construction of these service systems, a range of new resources can be aggregated. Realize the homogenization of library management methods. Moreover, in the construction of this kind of polymerized service system, the project investment cost can be reduced, and the maximization of economic value can be pursued, and the effective aggregation of library information resources can be satisfied, which provides a reference for the innova-

tion of modern library service management mechanism; third, synergy. In the case of the smart library Interconnection and Interworking, there is a service innovation model in which the smart library is dynamic. Users can communicate with users at any time by mutual learning and collaborative development to improve the consultation mechanism of analog information, which supports the innovation of modern library services.

### 3.3 Green Development

Through the analysis of the service system of the smart library, it is found that under the condition of sustainable development of the sushi library, library service management can be the focus, and the humanity, nature, health and harmony can be pursued through the protection and utilization of natural resources. Under normal circumstances, in the development of green libraries, the establishment of hardware facilities can be used to innovate the library's environmental protection mechanism, meet the core book service model, and reduce the pollution of library hardware resources. In the software construction, we can promote the scientific development of library services and guide the establishment of the library's sustainability.<sup>[1]</sup>

## 4. Existing Problems in the Construction of Smart Library

### 4.1 The Cost Factor in the Construction of Smart Library

In the process of library management construction, as a complex engineering project, there are restrictive problems at different stages of development, such as personnel reserves, equipment updates, software upgrades and management. For example, in the process of the development of the smart library, the initial investment in the Internet of Things was more, and the equipment of different models was in the range of 0.6-0.85 US dollars. Due to the large reserve of book resources and relatively high cost, it has an impact on the construction of the smart library. Moreover, in the construction of library resources, when there is a problem of financial deficiencies, the ultimate value of the smart library construction cannot be realized.

### 4.2 Restrictions in the Use of Technology

Through the analysis of the service work of the smart library, it is found that in the wireless sensor network service, as an important factor in the construction of the Internet of Things infrastructure, it is mainly through the digital signals of electronic media formed by the place-

ment of things, however, in the process of physical information collection and sorting of the Internet of Things, RFID technology, as a modern medium and low frequency design, as a modern industrial technology form, can effectively solve the late design problems, moreover, in the use of Internet of Things technology, the normative statistics of data can be carried out through communication technology, information monitoring technology and information encryption technology, and the standard type of information statistics is gradually improved, which brings restrictions on the processing of modern data information.

### 4.3 The Problem of Smart Library Privacy Security

In the innovation of the service library management method, as the final content of the Internet of Things technology, the privacy and security issues of the smart library can be taken as the focus, and the technical content of the smart library can be combined to process the data solution. The research found that in the RFID system construction, as the identification content of the radio frequency identification system, the label and the identification code can be analyzed, and the system can be scanned at any time to improve the overall value of the data information processing, and the information feedback identifier is Construction provides a reference. Moreover, in the information collection and processing, the personal habits and preferences can be handled in combination with the needs of the readers. When the problem of improper handling occurs, the information resources will be leaked, which will affect the project design of the sushi library.

### 4.4 The Problem of Smart Library "Information Isolated Island"

With the development of the management system of the memory library, there are relatively conservative and restrictive problems in the process of creating the library management mechanism, moreover, the existence of information development and shared resource design in the smart library has not been solved, which brings limitations to the information processing of the smart library. In the construction of China's smart library, it has not achieved the characteristics of full development. The lack of coordination and unified planning in the work has led to the waste of resources in the smart library and affects the integrity of resource construction.<sup>[2]</sup>

## 5. The Service modes of Smart Library

### 5.1 Framework Design of Smart Library

In the process of building the memory library, the service

readers will be the core, and combined with the modern information technology concept, the library will provide personalized and intelligent services. Under normal circumstances, in the design of the smart library, an innovative service mechanism should be constructed, and the establishment of the university's smart library should be taken as the research object. The specific construction framework is shown in Figure 1.

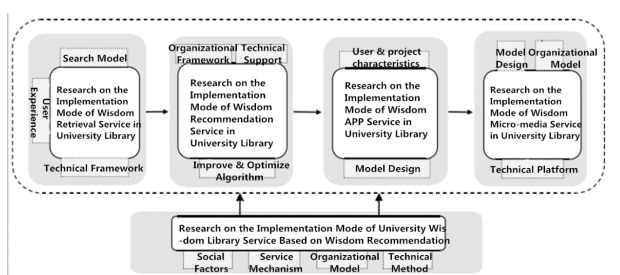


Figure 1. The framework of university smart library construction

## 5.2 The Smart Construction System

### 5.2.1 Service Process of Smart Retrieval System

For the consumer retrieval system, it is the basis for users to obtain information. Applying it to library services can improve the value of library information retrieval and demonstrate the fast, accurate and efficient characteristics of library service work.

In the context of this service retrieval, compared with the traditional service system, there are modern service features and the most relevant search results for users. Moreover, in the process of determining the retrieval result, the user satisfaction can be obtained through the optimization of the automatic retrieval strategy, and the user's smart retrieval experience can be improved to meet the innovation development needs of the smart library. At the same time, in the situation of the memory retrieval, in order to fully meet the user's established needs, it is possible to change the restrictive problems existing in the traditional new search, reasonably filter out the invalid information for the user, help the user to determine their own needs, and improve the book acquisition efficiency. Under the condition of the memory search, the search results can be targeted, avoiding the blindness of the book query, effectively shortening the query time of the book, reducing the difficulty of the book search, and improving the accuracy of the search service.

### 5.2.2 Smart Retrieval Model Design

Through the analysis of user behavior information, it can be found that the smart retrieval service has more

effective retrieval behavior, combined with data mining, association rules, etc., to improve the detailed processing value of information processing. In the corresponding position of the detailed information page, there is no login for popular user recommendation service. Through the retrieval and browsing schemes, the mechanism reduces the blindness of prominent queries and reduces the difficulty of book retrieval. In the research of smart retrieval, as a non-personal recommendation service mechanism, the effectiveness of data mining technology can be realized, and the processing method of network information source is combined to innovate the retrieval scheme and show the innovative value of library service management. Under normal circumstances, in the construction of the recommended model of the same, the recommended model of the same is shown in Figure 2. In the service system, the OPAC search engine is used to retrieve the construction of library resource information resources. The library model content can be combined to query data resources, provide potential information resources for users, and improve the value of search services.<sup>[3]</sup>

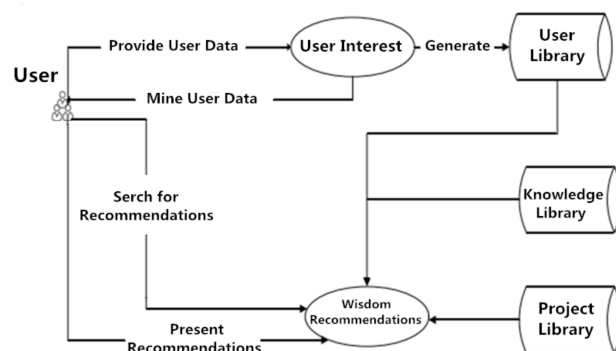


Figure 2. Smart recommendation model

## 6. The Application of Smart Library Core Technology

### 6.1 The Use of Mobile Internet Technology

With the development of information technology, in the process of using Internet information technology, combined with the "35th Statistical Report on Internet Development in China", we can find that, the scale of mobile Internet users has gradually increased, and the usage rate of tablet and computer Internet has gradually increased. This phenomenon means that the mobile Internet is gradually gaining popularity. In the past, the use of library resources, most of the use of PC interface, this interface form has a long loading time, unlimited use of flash typesetting, there are more defects, if these problems cannot be resolved in a timely manner, and it will affect the validity of

the establishment of the smart library. The first domestic research paper on the smart library was published in 2010. After that, the construction of the smart library developed rapidly. The search results are shown in Table 2. Through research, the research rate of the smart library is gradually improved, which supports the construction of the modern smart library. Therefore, in the process of constructing the memory library resources at this stage, in order to improve the reader's experience requirements, the innovation of the library service system should be constructed according to the existing problems.<sup>[4]</sup>

**Table 2.** The table of paper publication quantity of Smart library

Year	2010	2011	2012	2013	2014	April, 2015	Total
Quantity (piece)	1	6	15	40	78	18	158

Combine the characteristics of the smart library, build official Microblogs, official account, etc., and use Weibo, WeChat, service time, new book notification, etc., to improve the effectiveness of information query, and also realize the value of collection search. For example, in the process of using new technologies related to library and information, there are differences in different service systems. The specific technical forms are shown in Table 3. At the same time, in the library information activities and resource search, it is necessary to actively promote the library's service channels and create a library service system. In the process of resource search, in the process of resource search, the smart library can carry out the characteristics of the Internet platform, innovate the online collection of bibliographies and joint books, and improve the overall value of the information query of the mobile client. In the library mobile processing, the massive full-text database and collection documents purchased by the library can be released to realize the synchronous reading of the mobile client, which provides a reference for the use of modern smart library resources.<sup>[5]</sup>

**Table 3.** Service systems with different library and information

Service Technology	Industry Application	Resource Organization	Operating System	New Form Of Library
iBeacon, NFC, RFID, QR code, location service, 3D printing, WeChat, Weibo, smart reference question and answer	cloud computing WEB APP Mobile APPS	RDA, SKOS Ontology Big Data Linked data Program framework content analysis	Discovery systems, e-books, digital reading platforms, next-generation library automation systems, data services	Unmanned library Mobile library Smart library Fully automatic intensive library Maker space

## 6.2 The Use of Cloud Computing Technology

For the cloud computing system, as a pay-as-you-go service mode, users can provide available, convenient and on-demand network access mechanisms; reduce the cost of management work by realizing the construction of shared networks, servers, and storage and cloud software systems through resource resources. Moreover, in the cloud computing service system, as an important condition for library design, infrastructure can be combined with the basic conditions of library cloud computing to divide the facilities server. Under normal circumstances, it can be divided into server services, storage services, and network services. For the library technology department, it is necessary to innovate the service system for these computer technologies and network connection forms, and to show the overall value of library services, and provide reference for the design of modern library service management system.<sup>[6]</sup> For the current library services department, in the storage of computer technology storage, outsourcing construction, and self-built system, the development of library joint resources should be carried out in combination with cost and benefit characteristics. Demonstrate the standard system of library construction and the value of hardware facilities to support the innovation of library self-built projects, therefore, in the design of modern smart library, it should combine the characteristics of cloud computing technology and technical facilities to build the library smart platform and promote the stable innovation of modern library service work.<sup>[7]</sup>

## 6.3 The Use of All-media Technology

With the innovation and development of network information technology, in the process of building the smart library, through the technology development of the network-wide all-media fusion communication terminal, it is possible to integrate the peer devices for large customers. The research found that at this stage, some large enterprises, governments, military and other users gradually began to use the network-wide all-media technology. In the context of the development of the market, the library also recognized the value of the use of this technology. In the so-called network-based all-media convergence technology, through the use of communication terminal technology, the library multimedia resources services and project development can be realized, and the value of multimedia communication system construction can be demonstrated through the use of various hardware resources, and It integrates with resources such as audio, video and data to realize the combination, distribution and push of data resources, and demonstrates the value of multimedia

peer technology application, and provides reference for modern smart library service innovation.<sup>[8]</sup> Under normal circumstances, in the use of network-wide all-media technology, the rational development of library resources can be realized, therefore, in the use of library technology, the following should be done: First, the use of network-wide all-media convergence communication technology should be based on the free connection scheme, a variety of hardware and software innovation, showing the value of multimedia peers, moreover, in the network-wide all-media fusion, combined with the freedom of technology, the unified collection of audio, video and data can be realized, and the multimedia communication intelligent scheduling can be supported; second, the use of library network all-media technology can reduce user operation and maintenance costs, build a relaxed interactive communication system, optimize various types of learning audio and video materials, and provide users with a rich experience, which supports the optimization of large open online course systems.<sup>[9]</sup>

#### 6.4 The Use of Internet of Things Technology

In the process of building the smart library, through the use of Internet of Things technology, the rational use of the geographical location information of the book can be realized, and the efficiency of searching for the library resources can be improved, therefore, in the design of the smart library, how to improve the utilization value of library collection resources has gradually become the focus of attention. The development of the Internet of Things has gradually become a revolution after the PC technology, the Internet and wireless communication technologies, fully satisfying the value of the smart library construction. The research found that in the current stage of library construction, the use of the Internet of Things can fully reflect the value of electronic tags and readers. First, electronic tags can be divided into passive and active technologies as the identification technology of identification items. In the current use of library resources, passive electronic tags are usually used to determine the principle of wireless radio frequency identification; second, in the process of using the technology of radio frequency identification devices (RFID), the use of library resources should be the focus to realize the effective processing of the original magnetic strips and paper labels. As a one of the technologies in the smart library, RFID is widely used in the smart library. Through the use of RFID technology, it can fully realize the value of lighting, safety certification, fire and ventilation, and the speed and effectiveness of accurate positioning, greatly reducing the

workload of librarians, which can improve the satisfaction of user services, however, in the process of using RFID technology, reader tags need to be implanted, and reader privacy protection issues may arise, therefore, in the current stage of the service innovation of the service library, the use value of IoT technology should be improved. Relevant government departments need to introduce relevant laws and policies to fully protect the basic rights and interests of readers to ensure the value of the use of the smart library core technology.<sup>[10]</sup>

#### 7. Conclusion

In summary, in the process of building the current history library, in order to achieve the stable application of technology, the design of the marketing library should be combined with the innovation of the service system to fully demonstrate the value of the construction of the memory library resources, and provide reference for the integration and innovation of the modern library service system. Under normal circumstances, in the creation of the modern smart library system, the design of modern library should be the focus, combined with mobile data platform, cloud computing technology, network comprehensive body technology and Internet of Things technology, to innovate the smart library service work, thereby demonstrate the value and convenience of the use of the library technology, and guarantee the design of modern book service management.

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