

# Application and Trend of Mobile Digital Library Services

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**Abstract:** With the rapid development of the mobile communication technology, Mobile digital library system is becoming a new direction of digital library. This paper reviews the concept and characteristics of Mobile phone Library Services, discusses the situation of application, service model and the trend of mobile terminal service in China libraries.

**Keywords:** Digital Library; Mobile library; WAP; JAVA

## 1. Introduction

With the advent of information age, the integration between mobile communication technology and the Internet business has increasingly become closer, which makes the constant innovation of library service model, mobile communication technology and mobile Internet technology begin to penetrate into the digital library field, and thus create a new Library Service – Mobile phone Library. Mobile phone Library is a kind of digital library model, which can provide for mobile users to receive the provided library services by using mobile phone through wireless access at all times and places. This paper makes review of and sums up the concept of mobile library and their development process, and does a further study of the phone application in the digital library and development trend.

## 2. The Concept and Characteristics of Mobile Digital Library

In 2002, Zhu Haifeng and others proposed a new concept of mobile phone libraries technologies for wireless terminals applications in the digital library. He pointed out that the wireless library is a digital library for the user using a portable wireless terminal equipment, microwave, radio and other means to obtain the required document information, besides it is the further expansion of digital library. Huang Qunqing and others further refine the concept of the mobile phone library and its functions. He believes that mobile library service is the mobile users through mobile terminal devices (such as mobile phones, PDA) etc., which provide wireless access for them to receive library services, such as using mobile phone SMS or email functions to receive overdue notice issued by Library, or contacting books are borrowed, and users can also use the function of mobile Internet to search bibliographic information collection of books to read online text books and so on. "Mobile phone library" functions and features let readers use the phone at any-time and anywhere to inquiry, make appointment, report

the loss and other operations, breaking through the existing boundaries of the traditional model library service for readers, which is a new attempt to expand the extension of traditional library services.

## 3. The Current Application Situation of Mobile Digital Library

The application of foreign mobile phone libraries can be traced back around 2000, University Library in Toyama, Japan in September 2000 has develop the bibliographic query (OPAC) system of i-mode mobile phone. The United States has 10 public libraries or library networks, and 22 university library mobile phone libraries to develop the University Library services. So far, Finland, Japan, Britain, the United States, South Korea, Singapore and other countries have a number of libraries provide mobile information services in tests, and the phone application and research libraries in recent years has caused the constantly deepening exploration by foreign researchers in related fields.

At present, domestic university libraries carry less mobile phone library, Beijing Institute of Technology in December 2003 launched the first mobile phone library service, the service approaches take the SMS-based services, including books due reminders, appointment reminders, renewal, reservation, and mode is relatively simple. Subsequently, Hong Kong University, Beijing University of Technology, Southwest Jiaotong University, also launched the service after another. In July 3rd, 2006, Hunan Institute of Technology became the first one to open library with WAP mobile phone service. According to the survey, at present nearly 20 China's "211 Project" institutions have carried out mobile phone library service, in which Tsinghua University and Tongji University have more mobile phone library services and more functions.

## 4. The Service Model of Mobile Digital Library

At this stage, the domestic libraries mainly adopt

SMS platform and WAP mode to achieve mobile library services.

#### 4.1. The SMS Service

SMS has advantages, such as mature technology, full functions, strong two-way quality, and so on. Therefore, the domestic libraries take earlier to apply the SMS service in developing mobile services. Operations carried out include:

##### 1) *SMS notification*

Library system does daily check circulation database of readers in regular, if any book is about to expire or has extended, then the system will send reminder messages to users' pre-established phone number. Via SMS, libraries sent the recent museum's new book titles according to the different needs of readers, increasing the reader's attention of collection. Libraries can also send the related announcement of public information to readers, so that readers can understand the library service.

##### 2) *SMS query*

Bibliographic readers can make queries and reservations via SMS. Readers edit messages with personal information, sending to the library information machine, and the library information machine will judge whether the input library information is correct or not, while send query results of the appropriate bibliographic information to readers. Readers may also be informed by SMS query to renew books or make an appointment of books, and to realize reservation operation, by sending SMS commands to renew or make an appointment, then the system returns replies via SMS.

##### 3) *SMS Consultation*

Readers can send consultation request via SMS, the library SMS management system will automatically send format answers back to users, and it may also be sent to readers in the form of SMS by reference librarians.

#### 4.2. WAP Services

WAP (Wireless Application Protocol) technology allows users to use wireless devices like mobile phones online, through the small screen to access various websites. WAP-based mobile phone library offers more services than SMS, using the structure of WAP mobile phone platform libraries are generally divided into three parts:

##### 1) *user management*

Generally it includes user registration, cancellation, library cards report of loss;

##### 2) *WAP information*

It refers to a number of static information published by Library, readers can browse according to their need, such as the general situation of library, library rankings, opinions and suggestions, information, appointments, etc.;

##### 3) *Knowledge service of users*

It means that readers need to develop a personalized interactive service, such as due notice, book reminder,

library announcements, and consulting services.

At present, the domestic libraries are making practice on WAP-based mobile services. The National Library has launched the "Pocket country map" service, Tsinghua University Library has developed a WAP-based mobile digital library system, providing collection inquiry, personal loan information and Cross-database search of electronic resources and other functions.

### 5 Development Trend of Mobile Digital Library

#### 5.1. Mobile WAP Library Client Software Technology based on Java

JAVA development is another new mobile model after WAP development, despite that the earlier application is not very extensive, but has shown great vitality and vigor. Using JAVA platform, the existing WAP site features are integrated into the library software, with integrating and expanding a number of personalized multimedia mobile information services, which can compress WAP flow, reduce costs and save bandwidth based on providing more comprehensive services. software architecture System for client / server model, is divided into client, middle layer and data layer, mainly containing the following function modules: WAP network function module, the local library management system module, payment module, information access module, web browsing module, and instant messaging module.

With a common platform for handheld library developed by JAVA, can provide a more complete solution to the shortage of WAP, its system functionality, interactivity and other aspects has good performance. We believe that with the strengthening of mobile phone hardware processing ability and expansion of JAVA function, it will become the mainstream of future development. In the future, as the constant development of 3G, 4G technology, wireless mobile data communication transmission speed is increasing, we can integrate the current mature application, such as WEB2.0 and 3.0 technologies, into the software to enable mobile phone to make a set of reading, entertainment, interaction as a whole, through text, audio, video, and other styles, to provide a multimedia personal information platform for readers from borrowing books to reference service.

#### 5.2. 3G Technology Accelerate the Evolution of Mobile Library Services

As the advent of 3G era, transmission speed of mobile networks becomes faster and faster, band width is also bigger, coupled with the continuous development of mobile phone technology, smart phones have been able to achieve some simple functions of computer, as the phone can achieve search, download and browse the electronic document resource like computer. At the same time, the reading ways of people are also constantly

changing, new mobile phones' reading has become increasingly universal and popular. These factors provide

the object and technical support for realization of WAP services in mobile library:

**Table 1. Comparisons in client technology means of message, WAP, JAVA**

Mobile service technology	Characteristics of technology	Hardware and software demand	Use effect
SMS service	Simple realization, mature technology, but services provided is relatively simple and limited.	The hardware and software with SMS style needs lower requirement, as long as mobile phones with SMS messaging capabilities can use this service.	Advantages: timely, efficient, cheap, and cover a larger user groups. Disadvantages: format is simple, length is limited, complex information retrieval for the database cannot be achieved.
WAP site	Flexible system architecture, open protocol, and diverse realized form.  Library can use WAP site to provide richer and more powerful functions than short messages.	WAP service means slightly request higher, which need a mobile phone with built-in WAP browser. The current mainstream mobile phone can be suit.	And as convenient as on the Internet. The disadvantage of WAP mode is that effect varies from phones.
JAVA technology	JAVA client development is more flexible, and also can effectively reduce the network flow, it can provide more richer images, games and e-commerce contents for WAP.	It can take advantage of client and server-side advantage of their platform, in order to maximize function. However, not all phones support JAVA virtual machines at current.	Adopting a common platform for handheld library developed by JAVA, you can solve the shortage of WAP better, and system functions, interactivity, and other aspects also have been greatly enhanced.

1) The upsurge of mobile phone reading provides a service object for WAP function of mobile library, and as long as the library take full use of its own characteristics with sufficient literature information resources of network and strive to see close cooperation with mobile operators, which will certainly accelerate the development of WAP mobile library services.

2) 3G provides internet foundation for the evolution of mobile phone library services. Bringing faster data rates, greater network bandwidth and cheaper mobile libraries charge by 3G provides a solid network infrastructure for online consultation, on-demand video, online reading, e-resource access and download services such as WAP features of mobile library.

3) Smart phone provide terminal assurance for evolution of mobile library services. Powerful functions of smart phone, low price, and its extensive software support functions clear the terminal barrier for development and popularity of WAP of mobile phone library.

### 5.3 The Range of User Groups for Mobile Phones Laid the Foundation for the Development of Mobile Library

Mobile phones are the product of mobile Internet technology, mobile libraries will also continues to upgrade and progress accompanied by the development of mobile communications and other information technology, which has been particularly evident in the university. On the one hand, the digital library in China has basically formed a relatively complete system; on the other hand, mobile libraries in colleges and universities have a broadly usable basis. According to China Internet Network Information Center (CNNIC) released "China's

mobile Internet Behavior report," in February 2009 said that mobile Internet with quick access has earned the recognition of many users. Currently, in 298 million Chinese Internet users, the number of mobile phone Internet users has reached 11 760 million, accounting for 39.4% of total number of Internet users. In these mobile Internet users, there are a large group of students Internet users, accounting for 19.2% of the overall mobile phone users, and this lay the foundation of mobile library development, which is conducive to the popularity of mobile libraries in universities, promoting broad prospects for mobile library development.

The future mobile libraries will make progress accompanied by the continuing escalation of mobile communication technology. On the one hand, wireless communication become faster and faster and broadband is increasing, on the other hand, the processing power of mobile terminal equipment become more powerful, and more convenient to operate, so it " like the personalized services of World Wide Web, like Radio Network without sharing violation, and like the contents of printed books and newspapers in family." As the advent of 3G era and the push-off of a variety of applications, the Internet has moved from computers to mobile phones and other mobile devices, from offices, Internet cafes to pocket, then the mobile Internet and cable Internet will accelerate the speed of convergence. Compared with other media, mobile phones are more popular than computers, more interactive than newspapers, and more portable than TV, especially showing the particular features than other media, and almost spread all GPRS network infrastructure in the world, which enable mobile network having more larger freedom degree than the computer

network, and it can transfer containing text, images and sound for multimedia information, do online browse, file transfer, chat, and so on. Mobile libraries like a big net, integrating many things of the traditional media from content to technology. It will create a huge service space, becoming an indispensable means of library information service.

## 6. Conclusion

Mobile library is taken as a new mode of book information dissemination, and an information terminal with low barriers to entry way of released content let any time any place any person in any way to read any content of interest become a reality, which not only greatly enrich our world, creating a more diverse network of information dissemination, and from the popularity of the network, creating a greater value. As a platform of personal information including reading, entertainment, interactive multimedia in one, Mobile library change the path and ways of information dissemination to achieve the spread

of complete separation of content and carrier, so that make more diverse information and personalization of communication networks, which hasten a completely revolution of information dissemination.

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