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Application study on mobile communication technology in digital information service of library based on informatization

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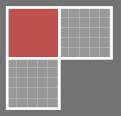
ABSTRACT

The modern era is the age of information and technology innovations, and it is embedded with the traces of intelligence and network both on the social life and production levels. With the deepening integration of the communication network and the Internet, the mobile information service is gradually implemented in different fields, and the library with a large number of information resources is no exception. With the influence and effect of various factors such as the drive of the time and the demand of customers, the library has entered a stage of digitalized information service. This study discusses the application of mobile communication technology in the information service of digitalized libraries, and it is designed to meet the readers' needs by improving the service quality and efficiency, thus to build China into a country of lifelong learning. this study uses research methods including document retrieval, comparative analysis and transplantation, and focuses on the information service that mobile communication technology provides and the problems that needs to be paid attention to in the implementation of the project. The outcome of the study is that the mobile communication technologies is embedded in the digital information service of libraries, and effectively expands the scope of service objects, improves the efficiency of service, and meets customers' individual requirements, and with the development of terminal equipment and mobile communications technology, library service may be realized in ubiquity. Of course, in this application process, some libraries will face various problems and difficulties, particularly the library resources integration problems that will arise, which will certainly be solved step by step as the technology matures.

KEYWORDS

Informatization; Library digitalization; Information services; Mobile communication technology; Application.



INTRODUCTION

As for the mobile communication technology in information service of digitalized library, many scholars have also conducted studies on the different aspects of it. Scholars Like Wang Boxia have done analysis in depth on the service content, method and project complementation of the issues, which gives this study great inspiration[1]. Scholars like Xia keqiang, have discussed the characteristics, content and implementation of the mobile library[2]. Scholars like Cheng Xiaoliang analyze with emphasis the system design plan, key technology choice and technical implementation of the mobile library, starting from the construction of the library of Chengdu University of Technology[3]. Luo Yuhong explores the individualized information service mode of the digitalized library combining with the present situation of domestic libraries' information service[4]. In addition, scholars like Lu Chunhua, Zhang Huiping, Mao Yihong, Shi Xiaoqing and other scholars have discussed the application of mobile communication technology in libraries from their respective perspectives, so I will not go into details here[5-8]. This study concentrates on the service content of digitalized library provided by mobile communication technology in order to meet customer needs to the greatest extent.

OVERVIEW OF MOBILE COMMUNICATION TECHNOLOGY

Under the common influence of computer network technology support, market competition and users' need, the mobile communication technology is going through a fast development. From the 1980 when the first generation of analog communication came out, the mobile communication system refreshed almost every decade. It has gone through the second generation of digital communication system, the third generation of multimedia communication system, and the fourth generation of users-oriented communication system, and the update of each generation is for the defects former generation system of and users' needs. The evolution of the mobile communication network and the differences between the generations are shown in Figure 1 and TABLE 1:

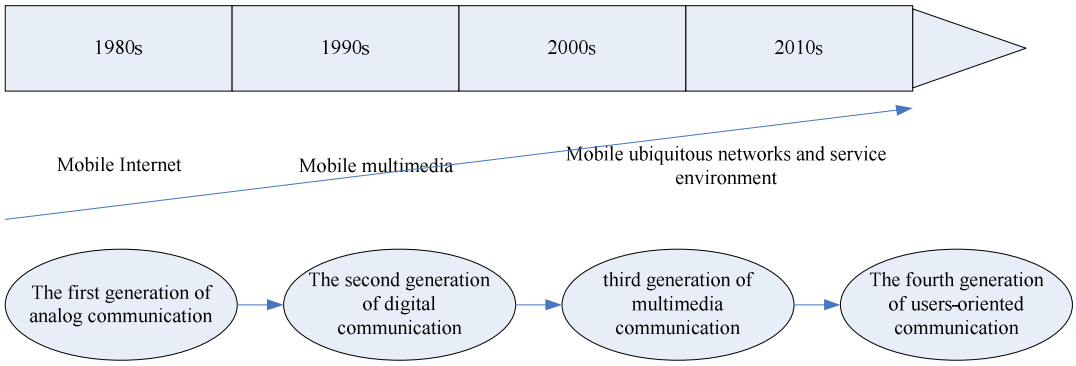


Figure 1 : Evolution of wireless communication in years

TABLE 1 : Differences between the 1G to 4G communication systems

	1G	2G	3G	4G
access way	analog (cellular)	digital (dual-band)	digital (multi-band)	digital
	FDMA	TDMA/CDMA	CDMA	OFDM
main service type	voice	Speech sound	Speech sound	voice based on IP
	----	Internet (text only)	Internet (text and images)	Internet (all resources)
coverage area	outdoor	indoor/outdoor	global	global
application purpose	supplementary to fixed telephones	mutual complementary with fixed telephones	important application of information and communication technologies	important application of high quality data communication
targeted users	enterprise user	business users and common consumers	communication users	broadband users
core network	based on circuit	Based on the circuit	based on circuit and packet-switched	all based on IP
primary standard	TACS,AMPS ect.	GSM ect.	WCDMA,TD-SCDMA,CDMA 2000,WiMAX	LTE-Advanced,806.12m

THE NECESSITY OF THE APPLICATION OF MOBILE COMMUNICATION TECHNOLOGY FOR LIBRARIES BASED ON INFORMATIZATION

In order to break through restrictions and fetters of education and the time and space of learning, mobile education and mobile learning have been put on the agenda. Mobile education is to provide interactive teaching and learning support services to all types of users the use with communications technology, network technology and multimedia technology, Internet and teaching server as the main carrier through wireless devices (such as mobile phone, PDA, laptop, etc). Mobile learning is a way of bi-directional wireless interactive learning with the support of mobile computing devices anywhere anytime. Although the mobile education and mobile learning has great advantages comparing with traditional education and learning, the biggest problem is still resources. With their vast resources, libraries can solve this problem, and the application of mobile communication technology are bound to change the mode of library's information work and service.

From the perspective of users' behavior, mobile communication technology has changed people's access to information and means of communication. With the scale production of wireless devices and the improvement of people's living standard, the ownership of wireless devices has been growing fast, from the laptop to the smart phone. But among groups owning wireless devices, college students account for a larger proportion, which to a certain extent determines the information serving object of the libraries is a consumers of mobile commerce. Therefore in the context of the information age, the digitalized information service of libraries needs to focus on the impact of mobile communication technology on users' information behavior, and to provide targeted information services to meet the information needs of users.

APPLICATION OF MOBILE COMMUNICATION TECHNOLOGY IN DIGITALIZED INFORMATION SERVICE OF LIBRARIES

For now, among the existing pervasive use of domestic mobile communication technologies, 3G is a relatively developed network technology, although on December 4, 2013, Chinese Minister of Industry and Information Technology issued "LTE/fourth-generation digital cellular mobile communication services (TD-LTE)," business license to China Mobile, China Telecom and China United Network Communication Corporation limited, but it needs experience to be used in library information services. Therefore, this study analyzes 3G network technology, and sets up a framework of digitalized library information service network system based on 3G network technology, as shown in Figure 2:

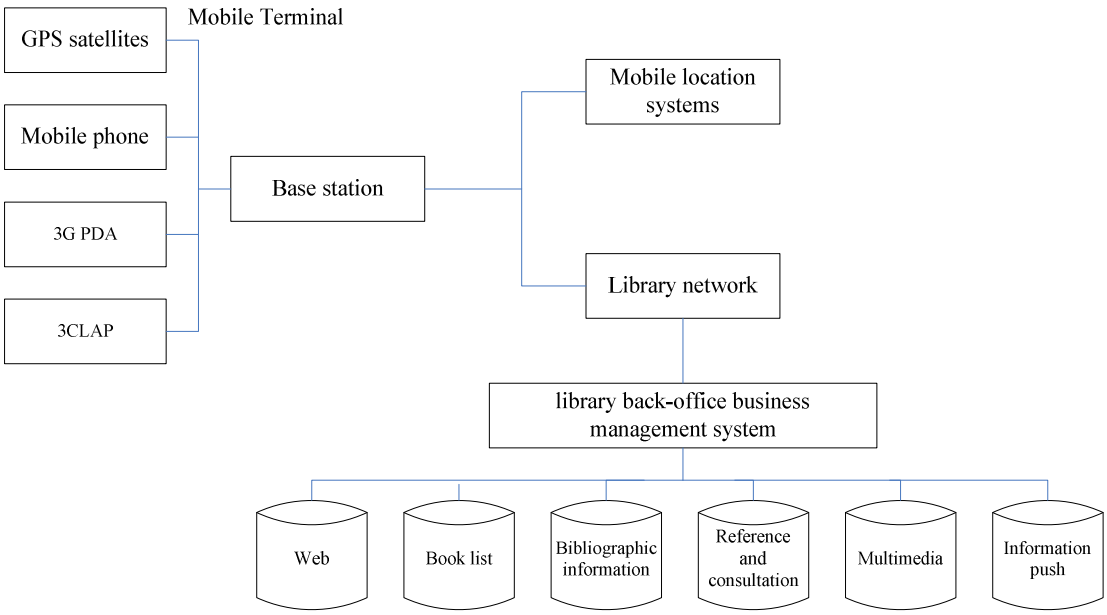


Figure 2 : Framework of digitalized library information service network system based on 3G network technology

Main services content via mobile communication technology

The first is the webpage compatible with mobile devices, including the library catalogue. Because there are some differences between libraries, and each they have different numbers of books, and this involves webpage compatibility issues of libraries, so as to provide users with more extensive library information, as well as navigation for users. Of course these compatible pages need libraries to contact with the provider and get them with license, purchasing or for free.

The second is traditional library information service. Such service includes consulting, E-book and periodical data. These services also need to solve the compatibility problem after using mobile technology. And many libraries also offer PDA version of journals and e-books, and integrates with original library resource by catalogue.

The third is the short message service. Mobile communication equipments (mainly mobile phones), general use text messages to find conditions of borrowing and returning books to the library, and send specific commands to handle the relevant self service. In other words, this massage service content is mainly for basic borrowing service, which are borrowing, appointment, and renewal, and it expands new functions based on the above, mainly are library guide function (mainly achieved by mobile positioning system shown in Figure 2), and OPAC retrieved positioning (mainly achieved by library back-office business management system shown in Figure 2) and virtual payment, among which, OPAC is the graphical plane graph of the location of library collection, and when finding books with OPAC, click the address of book collection, it can show the floor and room where the book is, but could not locate the shelf layer. For straight view of the business process of SMS platform, see how the SMS messaging platform connects the machine as shown in Figure 3.

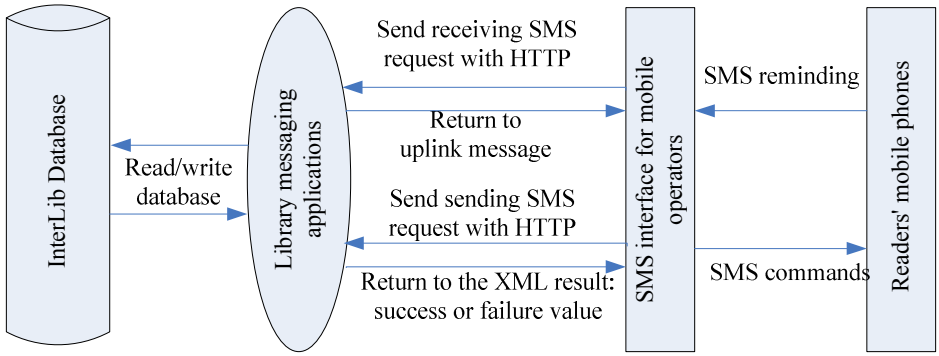


Figure 3 : Business process of SMS platform

From the above we know that the business process of the SMS platform can be divided into two parts: the text messaging system sends readers book expiration reminder messages, and readers provide text messages to self-operate library business, and receive and send text messages by HTTP requests. But in general, send SMS characters are required to be in brief instruction codes, such as CJ means seeing the current loan records of readers, XY means renewing all books, QX means canceling all appointments, and KT means the request to open SMS service. In addition, you also need to set the SMS administration system so that administrators can view the SMS platform information, manage users, and send and receive text messages through the system.

The fourth is mobile search, mobile RSS and mobile blog service. Mobile retrieved generally refers to the linking and integration of library search engine; mobile RSS generally is taking needed information through users of RSS customed service, and reading with handheld or mobile equipments, thus to achieve personalized information anytime and anywhere; mobile blog service is a personalized exchange platform that provides mutual interaction for discipline library members and users, to achieve sharing, storage and processing of information resources to the greatest extent.

The fifth is the browse, downloading and reading of resources. For now, mobile reading is mainly implemented by users through browsers or reading softwares for browsing, file downloading and reading.

Ways to provide services with mobile communication technologies

For now, there are two ways: one is providing services with compatible webpage browsing based on handheld or mobile devices. This approach requires wireless network support from mobile terminals, like WAP or GPRS. The second is providing services through messaging. Message function is the most basic function of the wireless terminal. And based on serving ways it can be divided into two kinds: separate service and united service. Libraries can achieve the former one through their own systems, while the latter needs to be achieved the combination with a wireless service provider. Which one libraries would adopt mainly depends on the type and function of mobile terminal devices that the service objects owns. Also note the technical standards while selecting service ways.

Problems in project implementation

First is the security and users' privacy. Library users need to send applications via mobile phones to a designated number and use real ID and phone numbers for confirmation and registration, it will inevitably involve the users' private information, and system security needs to be paid attention to in the implementation of the project. Security can generally be ensured through authentication, authorization, and IP address filtering. But some projects are not like that, and users can log in anonymously.

The second is that there is a direct relation between the content development and the supported mobile devices. Now main wireless devices are smart phones, laptops, and PDA, and screens of laptops are relatively larger, while the screens of PDA and smart phones are relatively smaller, and if the small-screen devices need to be supported, it is necessary to consider the development of the relevant resources content, whether its developing ways is to outsource or to self-develop.

The third is the copyright and storage problems of electronic documents in circulation. Because generally users of social libraries pay to keep books resources running, and generally students use books resources for free, but regardless of implementing ways, they will all encounter the problem of due access e-books (College students only have years while in

school to access, after graduating they also lose free access), under this situation the copyright of electronic documents will generally be protected through lock measures, and storage-related administrative work can be done through the Palm's digital rights management software.

The fourth is technical support. In the information service of informationalized libraries, to expand the service functions through the application of mobile communication technology will necessarily involve a lot of technical support, among which the reference and consulting work of libraries is facing technical and security issues.

The fifth is financial inputs. Since the digitalized library information service work is enhanced with mobile communication technologies, it need to deal with the upgrading of communication technologies, and this needs libraries to ensure the implementation of projects with certain capital inputs, and there are two ways of library funding sources: one is to become self-financing through effective operations, and the other is to get government or social assistance.

The sixth is the integration of network resources. Mobile communication have its own set of resource management mode before meddling in library information services, but after the intervention of mobile communication technologies, we need to solve the interoperability problems between different networks of libraries and problems of leverage resources, which is the integration problems of wireless campus. For colleges and universities, it is to integrate library resources, information services and campus life.

PROSPECT OF THE DEVELOPMENT OF MOBILE COMMUNICATION TECHNOLOGIES IN INFORMATION SERVICE OF DIGITALIZED LIBRARY BASED ON INFORMATIZATION

With the pilot operation and technological mature of domestic 4G technology, there must be 4G users among library users in the future, even may be the vast majority or all of them, which is the real problem that informationalized libraries must deal with. While in the process of digitalized library information service, scholars have proposed the concept and mode of ubiquitous service of libraries, which is a service that break through the barriers of the existing physical and digital libraries, embeds the library service into users' research study starting from the users' requirements, thus to provide customers with service that is intelligent, networked, around the clock and open. This service mode of libraries has ubiquity in the time and space, objects and mode, content and means, of service. In other words, the informationalized libraries are no longer limited by the space and time, and can be accessed anytime and anywhere; the service objects are no longer limited to the school or the administrative district, but to more groups and cover all corners of the society, achieving the transition from "library-oriented" to "readers-oriented" (as shown in Figure 4 specifically); the service content is no longer single and passive, but sending personalized service to readers and continuous service with the co-establishing and sharing mechanism of the libraries; the access way is no longer visiting the library, and readers can make use of information resources service provided by the library with the context-aware technologies and the application of new technologies such as location based services technologies via a variety of terminal equipments. In order to highlight the differences between mobile library service and ubiquitous library service, see TABLE 2 for a clear comparison.

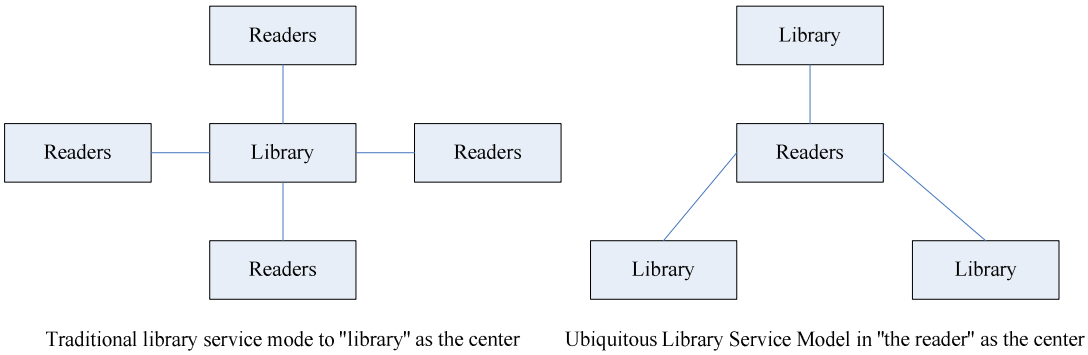


Figure 4 : Comparison of service modes of libraries

TABLE 2 : differences between mobile library service and ubiquitous library service

	Mobile library services	Ubiquitous library services
Service mode:	Passive service	Active service
Service content:	Library development and some digital resources	A variety of information and knowledge resources
Service platform:	SMS text message, WAP service platform	Cloud computing platform, context-aware system, and LBS service platform
Service center:	Library-oriented	Readers-oriented
Terminal equipment:	Mobile phones, tablet PC and other mobile devices	A variety of terminal equipments

CONCLUSION

This study discusses the application of 3G digital communication technologies in digitalized library information services in depth, and prospects the ubiquitous library service that will be achieved in the future. But limited to conditions, this research inevitably has some defects, and needs to be further improved in the future.

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