

## Survey and Analysis of the Current Status and Strategies of Mobile Services in U.S. Urban Libraries [Withdrawn due to Academic Misconduct] Postprint

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**Date:** 2023-07-26T00:00:00+00:00

### Abstract

[目的/意义] This study aims to investigate the mobile terminal service models of urban public libraries in the United States. [方法/过程] A total of 138 urban public libraries in the United States were selected as statistical samples to conduct research and analysis on the current status of their mobile terminal services. [结果/结论] The research findings indicate that urban public libraries in the United States should make improvements in several aspects, including reading recommendation and guidance services for mobile reading media, enrichment of library mobile terminal resources, increase and categorization of children's books, comprehensive research and analysis of user needs, and meeting the needs of different library user groups. Simultaneously, this study proposes corresponding strategies to address these issues, which are also applicable to mobile terminal services of libraries in China.

### Full Text

### Preamble

Vol. 63 No. 9, May 2019 *ChinaXiv Cooperative Journal*

### Survey and Analysis of the Current Situation and Strategy of Mobile Services in American Urban Libraries

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## Abstract

**[Purpose/Significance]** This study aims to investigate the mobile terminal service models of American urban public libraries. **[Method/Process]** A total of 138 American urban public libraries were selected as statistical samples to examine and analyze the current state of their mobile terminal services. **[Result/Conclusion]** The findings indicate that American urban libraries should improve their reading recommendation and guide services for mobile reading media, enrich mobile terminal resources, increase and categorize children's books, conduct thorough investigations and analyses of user needs, and better serve different user groups. This study also proposes corresponding strategies for these issues, which are applicable to the mobile terminal services of Chinese libraries.

**Keywords:** urban public libraries; mobile terminal services; American libraries; mobile information services

**Classification Number:** G258

**DOI:** 10.13266/j.issn.0252-3116.2019.09.016

With the rapid development of technology, humanity has gradually abandoned traditional lifestyles and entered a brand-new era of mobile internet. Traditional libraries can no longer meet people's fast-paced life demands [1], and an increasing number of individuals hope to enjoy library services without time constraints. Consequently, traditional library users have begun to accept the new model of connecting to mobile library services through mobile clients, while advanced mobile internet technology has also brought libraries and readers closer together. Therefore, libraries worldwide are vigorously developing mobile clients to expand their business scope [2], though the relationship between library mobile terminals and library users requires further research.

The United States is one of the earliest countries to develop mobile libraries. According to one survey report, there are 8,895 public libraries across all 50 American states and other regions, and such public libraries are playing an increasingly important role in American social development [3]. American urban libraries constitute the main body of domestic public libraries in the country, but how should these libraries adapt to the impact brought by mobile internet? How many currently offer mobile library services? What specific service items do these mobile libraries provide? What problems exist in the actual operation of mobile libraries, and what mature experiences have been gained? What are the future development trends for American urban public libraries? These questions require in-depth analysis by scholars to provide references for the mobile digitalization construction of public libraries in China.

## 2 Literature Review

### 2.1 Definitions Related to Mobile Libraries

The concept of ubiquitous computing was first proposed in 1991 to satisfy people's need to freely access required information without restrictions of time or

place. With good WiFi connectivity, its application scope has been further expanded [4].

In today's rapidly developing technological environment, various mobile terminals have emerged in the market, among which smartphones and portable video and audio players are the most widely used [5]. Currently, mainstream mobile terminals on the market each have their own characteristics, enabling users to conveniently and quickly enjoy internet services without temporal or spatial constraints. People have become very accustomed to using mobile terminals in their daily lives, which has greatly stimulated libraries' enthusiasm for developing mobile terminal services.

In summary, the author selected two types of mobile devices as the main research objects: smartphones and tablet computers. Existing research shows that library mobile terminals can provide two forms of services: one is the transformation of traditional library services to allow users to browse on mobile terminals; the other is the launch of brand-new mobile terminal clients by libraries, which can enhance user experience but requires significant investment in human, material, and financial resources [6].

Scholars have already conducted analytical research on the services that mobile libraries should provide. Research results indicate that mobile library services should include real-time push notifications of various information, library collection inquiries, book digitization, and more user-friendly APP development [7]. Compared with current realities, the development of mobile libraries still has a long way to go. New lifestyles are changing traditional industries, and research shows that traditional libraries are actively researching and developing mobile libraries designed to suit their own characteristics to attract more young readers [8]. Currently, mobile services provided by various American public libraries mainly focus on mobile-friendly homepages, mobile APPs, library information query systems, SMS notifications for business transactions, AR technology, and book digitization [9]. Based on this situation, this study will conduct in-depth research on mobile services currently provided by American public libraries, provide objective evaluations of American library strengths, analyze existing problems, offer reasonable suggestions, and provide theoretical guidance for the scientific development of mobile services in Chinese public libraries.

## 2.2 Current Operational Status of American Mobile Libraries

The United States has proposed medium- and long-term mobile library development plans suitable for its public libraries and has implemented the "New Development Plan of the American College and Research Libraries Association," putting forward relevant ideas for re-planning and constructing new libraries for future society. Mobile libraries provide users with convenient and fast access to information, while readers can also provide real-time feedback of their actual experiences to libraries to facilitate improvements. By providing mobile terminal services, libraries have not only significantly broadened the age range of readers

but also attracted groups with limited leisure time to utilize fragmented time to enjoy services provided by mobile libraries [10].

A 2007 study showed that with the rapid development and popularization of mobile internet and the improvement of related library services, the proportion of users enjoying library services through mobile terminals has increased year by year. Nearly 80% of American public libraries have registered Facebook accounts to push their services and development updates [11]. Since 2011, library services provided by American public libraries on mobile terminals have shown explosive growth, indicating that public libraries and the general public are increasingly relying on the convenience brought by mobile libraries [12].

In summary, in recent years, the American public's dependence on mobile terminals has grown increasingly strong, and traditional public libraries have also seen this opportunity for innovative development. Although mobile terminal services provided by public libraries are not yet perfect, given the huge social demand in today's internet context, traditional libraries should better improve the innovative services of mobile libraries.

### 3 Research Sample Data

Literature research results show that users primarily enjoy the various convenient resources provided by libraries for leisure purposes, with only a very small number of respondents indicating that they use library mobile services for research purposes.

According to statistics, the American Urban Library Council currently has 138 library members. This study takes these public libraries as research targets for investigation and analysis. First, we conducted research and analysis on the current status of American urban library mobile services to obtain statistical data samples. Then we used network communication software such as Facebook, mobile homepages, and library APPs to interview librarians from 138 libraries. Due to limited conditions, only 138 library staff members from some libraries were interviewed. Finally, combining the research results from literature [13-14], we obtained library mobile terminal visit volumes by statistically browsing various literature services provided by databases, reading e-books, watching quality courses, and customizing personalized functions suitable for their own needs. Through a survey analysis of 2,000 students combined with data from literature [15], all 100% of interviewed students had replaced their phones with smartphones, showing that they value and hope to obtain the convenience brought by mobile internet, which lays the necessary foundation for traditional libraries to develop mobile services. Starting from the usage of mobile terminal users, literature research results show that users primarily enjoy the various convenient resources provided by libraries for leisure purposes, with only a very small number of respondents indicating that they use library mobile services for research purposes.

## 4 Results Analysis

Through interviews and extensive literature research, the author compiled statistical data that includes not only library development plans but also a large number of actual user needs. Therefore, the author believes that the survey data in this study can truly and accurately reflect the development status of American urban library mobile services and some existing problems.

### 4.1 Libraries Providing Mobile Services

Among the selected 138 libraries, approximately 83% have launched mobile homepage services, making this the most popular form among libraries. The specific survey results are shown in Table 1 :

#### **Table 1 Distribution of Mobile Services in Surveyed American Urban Libraries**

The author attempted to browse the mobile terminal network homepage of each library. Although all could be accessed smoothly, nearly 20% of the mobile homepages were extremely basic versions with incomplete functions and small font sizes that made it difficult for readers to intuitively see key content.

### 4.2 Mobile Services of American Public Libraries

All mobile terminals of American public libraries include user access and functional analysis. Through further statistics, it was found that all mobile terminals contain the following contents: login interface, library activities, location, opening hours, detailed contact information, and related links, among which related links mainly include emerging social media such as Facebook. See Table 2 .

#### **Table 2 Content Analysis of American Urban Library Mobile Websites**

Table 2 shows that among the 138 surveyed American public libraries, approximately 99% of users choose to click and use the content retrieval services provided by libraries; the usage rates of resource download and technical support functions account for 96% and 97% respectively; the usage rates of contact information, social tools, and login interface reach 100%. However, it can be seen that American public libraries are not doing well enough in personalized content recommendation and new book push functions, with usage rates of only 25% and 33% respectively. At the same time, they also need to strengthen personalized push for purchases and interlibrary resources, which only have 57% and 63% user usage rates respectively. Therefore, American public libraries should try to develop corresponding extended functions to further improve user satisfaction with library mobile terminals. This requires libraries to use current advanced big data technology to conduct in-depth analysis of user needs, truly meet users' real needs, and ensure that the content pushed to different users matches their actual needs. Only in this way can the accuracy of public library mobile terminal services be improved to attract and retain more users.

### 4.3 Service Content of Library APPs

The mobile service projects launched by American public libraries are generally similar, but the specific content of these mobile services varies greatly. The main reason is that these APPs do not have a unified design standard, which also shows that different American public libraries have different understandings of mobile terminal services. Public library mobile terminals are generally developed by software companies on their behalf, and different software companies have different understandings of library mobile terminals. This requires libraries to independently set the functions that mobile terminals should have based on the demand characteristics of their own users. Another point worth noting is that academia should provide necessary theoretical references and practical methods for the design of library mobile terminals, so that American public libraries have something to rely on when building mobile terminals and avoid detours. At the same time, American public libraries can also use big data to analyze the demand characteristics of their user groups and formulate scientific and reasonable mobile terminal service content.

#### Table 3 Content Analysis of American Urban Library APPs

As can be seen from Table 3, the content pushed by American public library mobile APP terminals has a polarized characteristic. Among them, contact information, resource download, content search, and login interface have the highest click-through rates at 86%, 91%, 100%, and 100% respectively. The main reason is that these four functions are essential when users use APPs. However, the usage rates of other functions in Table 3 are unsatisfactory. Functions with click-through rates below 10% mainly include push notifications for children and teenagers, card packs, and fine charges, accounting for 4%, 6%, and 7% respectively. Functions with click-through rates between 10%-20% mainly include My Book List, My Library, My Subscription, and This Week's Popular Book List, accounting for 11%, 17%, 17%, and 19% respectively. Functions with click-through rates between 20%-30% are mainly user comments, bestsellers, and recent new books, accounting for 21%, 25%, and 28% respectively. Functions with rates exceeding 50% mainly include four items: full website, social network, barcode scanning, and latest activities, accounting for 57%, 69%, 76%, and 78% respectively.

In summary, the service content provided by American public libraries on mobile terminals does not receive high click-through rates from users. The main reason is that the content design of American public library mobile terminal APPs involves significant subjective factors and has not developed functions that attract large numbers of users, which is similar to the content analysis of public library websites. At the same time, the click-through rates of specific functions are lower than those of websites, which requires public libraries to further analyze users' specific needs and actual click preferences, and redesign the functions included in their mobile terminal APPs to attract more new users and retain existing ones.

#### 4.4 Library Mobile Terminal Reference Consultation Services

American public libraries can provide various resource reference services for different users and offer a series of consultation supports, which are relatively important for users. When users encounter problems, if they can receive professional consultation services from the library and such services can be obtained in a timely manner, it will increase user satisfaction with the library mobile terminal. At the same time, users can help improve library mobile terminals by promptly feeding back the problems they encounter during this process to the library operators.

Currently, when American public libraries provide reference consultation services on mobile terminals, the main platform used is the mobile website, which mainly has four functions: social media, SMS services, online instant messaging, and web forms (see Figure 2 [Figure 2: see original paper]). The most common mobile service that American public libraries can currently provide is the website. Data shows that approximately 88% of users choose the web form function when conducting reference consultations on mobile terminals. Compared with traditional telephone contact, the biggest advantage of this service is that it can be freely accessed without temporal or spatial restrictions, requiring only that users have a mobile terminal and internet access. Web forms also have a more convenient function: users do not need to use their own email to send consultation messages to the library; they only need to fill out a form on the library's mobile website with their actual needs, and wait for the library to reply to the consultation email. This interaction method creates a time buffer between the library and users, eliminating the pressure for immediate responses and allowing more time for consideration. However, this method has poor timeliness and therefore cannot be counted as instant mobile terminal service.

In summary, although web forms have certain benefits, their poor timeliness means that various services such as online communication and instant messaging need to be vigorously developed to enable users to communicate effectively with the library in a timely manner, and for the library to provide timely and effective feedback assistance to users. The survey found that this type of service is also a communication function preferred by users. Currently, about 44% of American public libraries have developed online instant messaging functions, while the proportion of public libraries that still maintain SMS services and social media consultation services is relatively low. Only 34% of public libraries still maintain SMS services, and the proportion of public libraries with social media consultation services is less than 10%. This not only shows that American public library consultation services can enable users to obtain professional answers and access various professional resources anytime and anywhere when encountering problems, unrestricted by time or space, but also demonstrates that American public libraries have a spirit of reform and innovation when formulating mobile terminal service functions from the user's perspective and fully considering users' actual preferences.

The above research shows that American public libraries can apply emerging media to the promotion of their mobile terminal services. Although the current application proportion of social media in American public libraries is still low, such functions already have a large user base, and public libraries should make full use of these tools to communicate with users. For now, instant communication functions such as social media still need time to be promoted.

#### **4.5 Social Media Functions of Library Mobile Terminal Services**

Research shows that social media has become an essential function of library mobile terminal services. All surveyed libraries adopt social media functions and place them in prominent positions on mobile terminals, allowing users to clearly see this function when entering the mobile terminal, which shows that American public libraries attach great importance to social media functions.

In the current context where numerous social media categories develop together, Facebook is the mainstream social networking software in the United States. Most surveyed American public libraries choose Facebook as their primary social media platform, but about 54% of surveyed public libraries also adopt another popular social platform—Twitter. These two platforms have gradually become the main social media platforms for public libraries, as shown in Table 4 .

#### **Table 4 Proportion of Social Media Platform Types Chosen by American Public Libraries**

As can be seen from Table 4, in addition to the two mainstream media platforms of Twitter and Facebook, two other media platforms have relatively high usage rates: Instagram and Pinterest, accounting for 78% and 50% respectively. In the field of video promotion, the YouTube platform occupies a large market share, with about 68% of libraries choosing this platform to promote their mobile service functions. This also shows that there are currently several mature mobile media platforms with high user acceptance available for libraries to choose from, and libraries do not need to consider too much when selecting media platforms—they only need to choose platforms with high user recognition.

#### **4.6 Mobile Terminal Reservation Services**

More and more users hope to reserve library resources through the mobile terminals launched by libraries. The services users generally want to reserve are computers and library meeting rooms. According to statistics, about 78% of American urban libraries have already provided mobile reservation services. Actual research shows that among surveyed libraries, the proportion using the web form function for meeting room reservations reaches 65%, which is the highest among all reservation services. The lowest proportion is the function of reserving exhibition areas through mobile terminals, accounting for only 5%. In addition, libraries should continue to improve the service functions of library meeting rooms to further increase their reservation service proportion, while functions with lower proportions should be further investigated to analyze user needs and

make improvements to increase reservation rates. See Figure 3 [Figure 3: see original paper].

#### 4.7 Mobile Terminal Printing Services

Currently, with the acceleration of people's work pace, instant printing functions have become particularly important. In surveyed American public libraries, mobile printing is placed in prominent positions. Through investigation and analysis, it was found that 48% of American public libraries currently provide printing services on their mobile terminals, and analysis shows that more and more American public libraries will add this function. See Figure 4 [Figure 4: see original paper].

The printing function set up by American libraries on mobile terminals aims to provide users with more convenient printing services. Users only need to operate on their mobile terminal devices, and after the library's printing equipment receives the print command, the printing operation can be realized. Undoubtedly, this service greatly improves user satisfaction with mobile terminals, but if this service could also specifically categorize who printed what and when, it would save users even more waiting time. During the investigation, it was found that the mobile terminal of the Oakland Public Library supports printing services, and users can use smartphones or tablets to realize printing operations.

### 5 Conclusions and Recommendations

Through in-depth investigation and analysis of the current status of mobile terminal services in American public libraries, this study found that among the 138 surveyed public libraries, about 96% have already implemented mobile terminal services. The mobile service functions are generally similar, but the specific content within each function varies greatly. Some content cannot fully satisfy users and requires further investigation and design.

In terms of library mobile terminal reference consultation, user demand is relatively strong. Libraries should provide users with more timely consultation services and should also set up printing functions on mobile terminals so that users can truly experience the convenience brought by modern library mobile services.

In summary, although mobile services of American public libraries are not yet perfect, their strengths and weaknesses can provide guidance for the development of mobile terminals in existing public libraries in China. Chinese public libraries can fully absorb the essence of American public libraries and avoid the problems encountered by American libraries in the development process of mobile services. Therefore, Chinese libraries should enhance their mobile services in the following four aspects, which are also important directions for American public libraries to improve their mobile terminal services:

- (1) **Fully investigate and analyze user needs to meet the requirements of different library user groups.** Libraries should collect and analyze specific user groups and their needs, grasp the patterns of user demands, formulate different types of mobile terminal services according to different user groups, and further improve functions such as new book push notifications, organizing various activities, and reference consultation. These should be placed in prominent positions on the mobile terminal interface to provide corresponding mobile reading services for various social groups. This can not only improve the loyalty of existing user groups but also establish a good public image for the library.
- (2) **Enrich library mobile terminal resources.** Libraries should further enrich the collection resources of mobile terminals to provide users with more resource services, thereby attracting new users and maintaining the loyalty of existing users.
- (3) **Increase children's books and classify them.** Mobile terminals should add children's reading columns, classified according to resource themes or according to the interest levels and reading preferences of different age groups of children, so that young readers can also fully enjoy the mobile services provided by libraries. This not only expands the types of library user groups but also enables libraries to undertake more social responsibilities and further expand their social influence.
- (4) **Provide reading recommendation and guide services for library users based on mobile reading media.** Library mobile terminals should focus on developing different types of reading modes such as intensive reading, extensive reading, personalized browsing, and random reading. User groups who prefer library mobile reading mainly exhibit the characteristic of fragmented time, that is, these users mostly use scattered time for reading. Therefore, libraries should develop mobile reading functions around such user characteristics. At the same time, public libraries should also redesign entertainment aspects to allow users to feel a sense of fun when using mobile reading services.

In conclusion, libraries should adapt to the needs of the times. After fully investigating the specific needs of various users, they should formulate corresponding mobile terminal service functions, fully undertake their responsibilities and obligations as social think tanks, ultimately provide users with personalized mobile services, and effectively enhance their own social status.

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## Author Contributions

Miao Jun: Responsible for writing and revising the full text;

Luo Ruilin: Assisted in collecting and organizing paper materials.

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## Special Issue Announcement

The “Frontier Hotspots in Library, Information and Archival Science” special issue organized by the *Library and Information Service* editorial office has finally met readers as we welcomed the 2019 New Year. This special issue received sup-

port from the 2017 “Chinese Academy of Sciences Science Journal Ranking” of the Chinese Academy of Sciences Science Communication Bureau. After a year of planning and solicitation, especially through a series of seminars organized or undertaken by the editorial office, we successfully assembled these 22 high-quality manuscripts. We thank all experts and scholars for their support of this special issue and this journal. We hope to break the boundaries of secondary disciplines, examine and promote disciplinary development from a higher perspective, discuss the latest developments and frontier hotspots in library and information science and archival science from different viewpoints, so that readers and researchers can better grasp the current status and characteristics of LIS and archival science and promote the continuous deepening and innovative development of academic research.

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*Note: Figure translations are in progress. See original paper for figures.*

*Source: ChinaXiv — Machine translation. Verify with original.*