# Practice and Reflections on Library WeChat Platform Development (Postprint)

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## Abstract

【Objective】To enhance the functionalities of the library WeChat platform, enabling patrons to quickly access data and increasing user engagement with library mobile services. 【Application Background】The WeChat services provided by most libraries lack real-time capability, have low automation levels, and are mostly limited to manual intervention. 【Method】Utilizing an Apache Tomcat + JSP + MySQL architecture and based on the WeChat API, we integrated data interfaces of in-house business systems to develop the library WeChat platform. 【Results】Implemented functionalities including patron identity authentication and legitimacy verification, usage reservation for mobile devices such as iPads, Millennium data interaction, and self-service FAQ (Frequently Asked Questions) capabilities. 【Conclusion】WeChat platform functionalities can be continuously enriched in practice, and the functional implementation presented in this paper serves as a reference for other libraries developing WeChat platforms.

## Full Text

### Library WeChat Platform Development: Practice and Reflection

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#### Abstract

[**Objective**] To enhance library WeChat platform functionality, enabling readers to rapidly access data and increasing user engagement with mobile library services. [**Context**] Most library WeChat services suffer from poor real-time capabilities, low automation levels, and heavy reliance on manual intervention. [**Methods**] We constructed a library WeChat platform using an Apache Tomcat + JSP + MySQL architecture, integrated with the WeChat API and internal library business system data interfaces. [**Results**] The platform successfully

implemented reader identity authentication and validation, mobile device usage reservation (iPads), Millennium system data integration, and self-service FAQ functionality. [**Conclusions**] WeChat platform functions can be continuously enriched through practice, and our implementation offers valuable insights for other libraries developing similar platforms.

**Keywords:** iPad reservation; Self-service FAQ; Integrated library management system; WeChat; Mobile social media

**Classification Number:** G250

In recent years, the widespread adoption of mobile concepts has triggered a global social media revolution. While platforms like Weibo, Twitter, and Facebook have seen declining activity, WeChat has emerged as China's most popular mobile social media platform, surpassing others in coverage and influence. According to official Tencent data, WeChat boasts 650 million monthly active users [**?**], with continuously expanding API interfaces and the introduction of original content protection features in January 2015 [**?**]. Consequently, most university and institutional libraries have shifted their focus from Web 2.0 site development to mobile social media platforms [**?**], constructing micro-service portals. Using the official WeChat platform of Xi' an Jiaotong University Library as a case study, this paper focuses on mobile device usage reservation, Millennium system integration, and self-service FAQ functionality. It explores methods for retaining users while revealing library resources, providing enhanced services to readers, and promoting effective dissemination of high-quality content on WeChat public platforms.

## 2. Current State of Library WeChat Application Research

The continuous opening of WeChat public platform APIs has made integration with internal library business systems feasible. Meanwhile, readers' growing dependence on mobile services has created an urgent need to transform WeChat from a simple messaging tool into a comprehensive service platform. Universities and research institutions have made significant efforts to enrich WeChat functionality in several areas: (1) **Information quality innovation**, striving for original content design for each message, with careful attention to both textual composition and visual presentation using third-party tools like YiQixiu and Xiumi; (2) **Interactive services**, with libraries such as Xiamen University and Southeast University providing intelligent consultation through WeChat chatbots; (3) **Integration of various library application systems** [**?**], including mobile libraries, Millennium systems, library homepages, seat management systems, and journal navigation systems, enabling more convenient services through data interaction; and (4) **Development of new functional modules** based on reader needs and library activity promotion requirements, such as mobile device usage reservation, "Most Beautiful Library" registration, and survey questionnaires.

For management convenience, some institutions utilize commercial management

platforms like Youzan and Weizhijia. The library community' s research on WeChat public platform construction extends beyond service functionality enrichment to consider user emotional and motivational factors [**?**], fully embodying a "reader-centered" philosophy.

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## 3. Platform Design and Implementation

**3.1 WeChat Platform Architecture** The WeChat platform consists of two components: a front-end WeChat interface and a back-end management system. The front-end encapsulates reader operations and converts them into HTTP requests sent to the back-end, which processes these requests by analyzing message types and distributing them to different management modules. By interfacing with various internal library business system data interfaces, the platform processes data and sends the results back to readers as response messages.

In addition to basic platform information management, menu management, and property configuration, the system provides six functional modules: user management, iPad reservation activity management, Millennium data management, FAQ management, homepage information management, and seat information management [Figure 1: see original paper]. Services such as viewing personal borrowing information and iPad usage reservation require unified identity authentication. User management handles basic information of WeChat followers, performs reader identity authentication and validation, implements unified authentication based on the Millennium system with single sign-on, establishes a WeChat user information database synchronized with Millennium system user information, and provides user information retrieval and batch export functions. The iPad management module primarily supports "iPad and other mobile device usage reservation" campaigns. Through text box management, it calls the corresponding activity module when readers reply with specified keywords, triggering the mobile device reservation module to obtain usage rights through a reservation process. Millennium data management enables personal borrowing information queries, circulation notice viewing, and reader status modification. FAQ management automatically replies to reader inquiries about keywords of interest, providing original, visually appealing real-time interactions. By establishing a keyword matching mechanism and graphical content block design, it enables automatic replies for seven major categories of thematic graphic information, including special lectures, MOOCs/online open courses, and more. Homepage information management automatically collects the latest news and opening hours from the library homepage and displays them in real-time. Seat information management captures data from the east and west campus seat

management systems to show real-time seat utilization.

**3.2 Reader Identity Authentication and Validation** **(1) Reader Identity Authentication:** The WeChat platform uses OAuth 2.0 technology to obtain the OpenID (the unique user ID on WeChat) from the WeChat server. It checks whether this OpenID has been mapped to a corresponding Millennium account in the WeChat user mapping table. If not mapped, readers must enter their Millennium account and password in the WeChat pop-up interface for unified Millennium system authentication. After confirming the reader' s legitimate identity, the corresponding relationship is added to the mapping table [**?**]. Identity binding supports single sign-on, allowing access to related services once bound.

**(2) Reader Identity Validation:** Since iPad reservation activities are targeted at students, after identity binding, the corresponding activity management module must collect interaction data between users and WeChat, categorize users into different groups, and provide this service only to student readers. The algorithm for extracting WeChat follower identity information based on Servlet and JDBC technology is as follows:

**Input:** WeChat binding user mapping table and WeChat user OpenID
**Output:** Reader identity, whether to call activity module

Traverse the WeChat user mapping table to extract user borrowing information based on the user' s OpenID.

Send an HTTP request to the Millennium system via XML, using the Millennium system Patron Update Web Service API to call the SearchPatrons method, returning the reader object information set patronFields.

Based on the dumpPatron(Patron patron) function, traverse the reader object information set, find the field with Field Tag 47 (representing reader type) using the getFieldTag() method, and extract its reader type value using the getValue() method.

Traverse the reader type mapping table to find the corresponding reader type for this Value.

Call the activity module for readers whose identity is student.

**3.3 Mobile Device Usage Reservation** The iPad and other mobile device usage reservation module has undergone three iterations, evolving from manual statistics to a commercial platform and finally to the WeChat development platform. In April 2015, the WeChat team developed a fully self-service mobile device usage reservation module using WeChat API interfaces [Figure 2: see original paper], solving problems such as long queues, manual intervention in activity results, and inability to display reservation lists in real-time. The process became more convenient and customizable.

When the WeChat platform receives the keyword "iPad loan" from a reader, it parses the information based on text box management. After verifying that the

reader has passed identity authentication and validation, it calls the corresponding activity module. Depending on whether the current time falls within the activity period, it invokes the appropriate response module. If within the activity period, the system accesses the reader iPad information database to check remaining iPad availability. If iPads are still available, it searches the iPad information database to confirm that the reader has not previously obtained a reservation slot. If not, it records the reader' s successful iPad reservation, adds a record to the iPad information database, decrements the remaining iPad count by 1, and after reading the updated data, the WeChat platform displays reservation results in real-time, finally feeding back information about all readers who have obtained iPad usage rights.

**3.4 Millennium Circulation Notice Data Interface Integration** The Millennium system sends personal circulation notices daily via email to readers who have provided email addresses in their Millennium profiles. However, most readers do not have email addresses in their personal information. To enable these readers to receive their circulation information in real-time, the WeChat team integrated the WeChat template message interface [**?**]. After binding their identity, the system automatically reads the daily circulation data files generated by the Millennium system, converts the text format, and sends four types of circulation notices to readers: overdue notices, hold pickup notices, due date reminders, and hold expiration warnings.

The WeChat public platform accesses the Millennium system through the WeChat management platform server, queries the reader' s borrowing card number based on the bound OpenID, and uses this card number with a specific traversal algorithm to read the daily notice data files generated by the Millennium system. It extracts circulation information corresponding to this borrowing card number, then uses a template ID to call the template message interface and send a Post request to the reader, pushing the circulation notice in a specified format. After receiving the returned data package to confirm successful delivery, it sends a notification to the WeChat management backend regarding the delivery status [Figure 3: see original paper].

**3.5 Self-Service FAQ** To provide real-time answers to various questions about library services, the WeChat platform offers a self-service FAQ system consisting of module activation, dictionary management, and graphic message management. It primarily responds to users by recognizing and matching keywords. Currently, the self-service FAQ recognizes keywords in seven categories: special lectures, library news, book recommendations, alumni introductions, available study rooms, iLibrary Space event announcements, and MOOCs/online open courses. These graphic themes focus on news and information relevant to readers' daily lives. The self-service principle is illustrated in [Figure 4: see original paper].

(1) After receiving a keyword query request from a reader, the WeChat

platform identifies whether the keyword falls within the specified category range; if so, it activates the self-service module.

(2) It identifies the keyword, performs word segmentation, parses regular expressions, and then searches the rule mapping table based on the parsing results, matching the message with keyword field values. It prioritizes matching higher-level keywords in the search result set, and upon successful matching, returns the corresponding graphic message ID.

(3) Based on the graphic ID, it calls the graphic message management module, extracts the corresponding graphic link from the graphic material library, replies to the WeChat server, and the WeChat public platform calls the message interface to push the corresponding graphic message to the reader while replying to the self-service module to confirm successful graphic message delivery. The design of the rule mapping table is crucial here, as it stores various recognizable interaction information. The keyword field stores regular expressions or text-format messages, while the "binding required" field indicates whether readers need to bind their identity to use the module.

## 4. Platform Evaluation

**4.1 Service Functionality Assessment** Analysis of WeChat platform service data [Figure 5: see original paper] shows that from July 2014 to November 2015, Millennium-related functions were used 35,740 times, library homepage access via WeChat occurred 6,682 times, Chinese resource and academic discovery searches totaled 3,559 times, and real-time seat information was accessed 1,964 times. Statistics from library training surveys and data analysis indicate that most readers have become highly dependent on experiencing Millennium system-related services through WeChat, particularly for personal borrowing information queries. Readers primarily obtain the latest library news through the official WeChat platform.

All these services have achieved automation, with WeChat platform updates occurring in real-time as homepage content is updated. Comparing the six days before and after the iPad usage reservation activity, the number of WeChat API interface calls and reader interaction messages showed significant contrast. Interface call numbers were substantially higher than interaction message numbers during both activity and non-activity periods, with integrated function operation interface calls accounting for over 91% of total average message counts during non-activity periods. On the day of the reservation activity, reader participation was extremely high with 167 interaction messages—several times higher than non-activity periods—while interface calls reached 459, accounting for 73% of total interaction messages and still exceeding 50%. These statistics demonstrate that WeChat integration with internal library business systems is highly valued and relied upon by readers, representing an essential approach to

increasing user stickiness.

**4.2 Service Convenience Assessment** The library has repeatedly used the WeChat platform to conduct survey questionnaires, photography submissions, and other activities in collaboration with the iLibrary Club. The presentation format and automation level of these activities significantly impact reader participation. Using the iPad and other mobile device usage reservation function as an example, we compare three successful iPad reservation approaches .

**Table 1 Comparison of Three iPad Usage Reservation Methods**

| Method | Steps for Successful Reservation | Number of Steps | Scalability | Supervision Level | Automation Level |
|---|---|---|---|---|---|
| WeChat Message | Leave message, verify, complete loan procedures | 3 | Not scalable | Manual | Fully manual |
| Youzan Platform | Register account, select iPad product, receive coupon, exchange coupon for iPad, generate order QR code, administrator scans code for verification and loan procedures | 6 | Scalable | Real-time supervision | Semi-automated |
| WeChat Integration | Identity binding, reply with specified keyword, reserve iPad, obtain usage rights, verify and complete loan procedures | 5 | Good scalability | Real-time supervision | Fully automated |

Statistical results show that although WeChat messaging requires the fewest steps, the entire process demands complete manual intervention. The Youzan platform, being a commercial solution, cannot be flexibly customized or aesthetically optimized, involves the most steps, and presents readers with transaction interfaces that, while not actual transactions, do not fully meet the needs of public welfare institutions like libraries or satisfy readers' real-time needs for obtaining iPad usage reservation lists. However, its QR code generation for automatic verification is a unique feature not available in the other two methods. The WeChat integration approach achieves full automation, with its greatest advantages being customizability, supervision capabilities, and good scalability.

Based on the WeChat platform, we compared iPad usage reservation activities in different time periods. On July 3, 2015, the library held a summer iPad loan

activity from 12:00-13:30, receiving 280 reader participation messages, with all 43 iPad reservation slots claimed within just 5 minutes. On May 7, 2015, a short-term mobile device usage reservation activity was held from 12:00-12:30. Although the number of devices was reduced by nearly one-third, reader participation messages decreased significantly, with only 6 devices reserved within 6 minutes and 21 total participation messages received. These statistics indicate that this phenomenon resulted from both smaller promotional efforts for short-term activities and readers' substantially higher interest in summer iPad loans compared to semester-long device loans. In practice, the WeChat team continuously adjusts reservation methods.

**4.3 Information Content Quality Assessment** Information content quality is reflected in originality and the balance between information sharing and exclusivity. As shown in , from January to September 2015, the WeChat platform produced 59 graphic messages, of which 40 were original, accounting for 67.8% of total push messages with substantial readership. The table reveals that thematic messages first published on the WeChat platform and not on the library homepage but of great concern to readers generated the strongest response.

Four categories—iLibrary Space/PBL, MOOCs/online open courses/book recommendations, university celebrations/festivals, and QA/services/statistics—were all first published on the WeChat platform with 0% overlap with library homepage content. iPad/laptop loan messages, covering reservation methods and borrowing rules, had a 14.29% overlap rate with homepage content. Library news and lecture training messages were entirely sourced from the library homepage' s latest updates.

University celebration/festival graphic messages partially consisted of reorganized and redesigned existing works, not qualifying as original content. MOOC/online open course/book recommendation messages sourced some course and book descriptions from existing university websites, with only three messages originating from the library-supported Xi' an Jiaotong University Library Committee' s "Book Review Collection and Good Book Recommendation" series, yielding a 15.79% originality rate. The remaining five thematic categories, regardless of whether they were first published on the WeChat public platform, are entirely owned by the library, resulting in a 100% originality proportion.

From January 1 to September 29, 2015, the top-ranked graphic message by readership was "2015 First Half-Year Service Statistics" under the QA/services/statistics category. The second-ranked "iPad/Laptop Loan Notice" and third-ranked "Library Route Navigation" belonged to the iLibrary Space/PBL category. The top message reached 4,322 readers—approximately 1.5 times the third message' s readership—despite having 4.7% fewer recipients (339 people). The top message achieved 1.5 times the graphic readership and double the forwarding/collection numbers of the second message. Meanwhile,

the average reading ratios for the top three messages were 61.75%, 41.75%, and 37.38% respectively. The concept of average reading ratio was mentioned in literature [**?**], though we believe it fails to account for WeChat user group management issues. Different graphic messages target different reader types and can be pushed to specific user groups. Although current practice typically shows that real-time delivery numbers equal total WeChat follower numbers, we believe this factor should be considered for future personalized customization trends. Additionally, while total group delivery numbers generally equal total followers, WeChat packet loss or interface call failures cannot be ruled out. Therefore, for differentiation, we propose the concept of "group user average reading ratio," calculated as follows:

Group User Average Reading Ratio = (Number of Readers Who Read the Graphic Message / Real-time Delivery Number for the Message Group) × (Total Delivery Number for All Groups / Total WeChat Followers)

**4.4 Reader Participation Assessment** Statistics show that from January 1 to November 30, 2015, the number of information interactions for self-service FAQ was primarily distributed between 1-5 times, with 1,420 readers participating in this range. July saw the highest participation, and although August showed a decline, participation continued to rise from August through November. Participating readers came from nearly 25 provinces, including readers from Taiwan Province. Male readers visited more frequently than female readers, with "iPad" being the most frequent keyword at 634 occurrences, including 297 instances of "iPad loan." This demonstrates readers' growing interest in the WeChat platform, particularly the "iPad usage reservation" feature.

Using the summer 2015 iPad loan as an example, the WeChat platform pushed a summer iPad loan graphic message on July 10, 2015. In the approximately 10 days before and after the activity (July 6-16, 2015), WeChat cumulative follower numbers increased by 111, with the most significant increase occurring on July 12-13, the day before the iPad reservation activity, particularly after the original graphic message was sent.

## Conclusion

Using Xi' an Jiaotong University Library as a case study, this paper demonstrates the construction of a WeChat platform by integrating the WeChat API with internal library business system data interfaces. By adhering to an original content philosophy and conducting deep data mining with unified revelation, this work provides a reference for university libraries to better develop mobile social media services. Currently, refined grouping remains underutilized in social media. We believe service enrichment should center on reader needs and institutional circumstances. In the future, the WeChat team can provide personalized one-to-many customized information services, continuously striving to deliver fresh experiences to readers.

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