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Research on the Construction of University Mobile Libraries Supported by Mobile Campus Platforms: A Case Study of the Weishao Platform (Postprint)

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Abstract

Objective: To develop a mobile library application based on the mobile campus platform, enabling patrons to conveniently access library information and services, thereby expanding library service channels.

Application Background: With the deepening of smart campus construction, universities have been actively developing mobile campus platforms, presenting new opportunities for libraries to expand their service channels; however, few institutions have explored this domain.

Method: By employing methods of opening and extending interfaces of existing library business systems, we provide mobile library users with inquiry and transaction capabilities for related services, and leverage Weishao' s platform functionalities and API interfaces to deliver comprehensive mobile library services.

Result: Developed a mobile library micro-portal based on the Weishao platform, implementing functionalities including user authentication, resource retrieval, "My Library" , information display, and information push services.

Conclusion: Constructing a mobile library based on the Weishao mobile campus platform aligns with current trends in university mobile campus development and can be widely applied.

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Full Text

Building Library APP with Mobile Platform on Campus —Case Study of Whistle Platform

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Abstract

[**Objective**] This study develops a mobile library application based on a mobile campus platform, enabling patrons to conveniently access library information and services while significantly expanding service channels.
[**Context**] With the advancement of smart campus initiatives, universities have increasingly built mobile campus platforms, creating new opportunities for libraries to extend their services. However, few libraries have explored this domain.
[**Methods**] By opening and extending interfaces of existing library business systems, the proposed application provides mobile users with inquiry and transaction capabilities, leveraging Whistle' s platform functions and API interfaces to deliver comprehensive mobile library services.
[**Results**] A mobile library micro-portal was developed on the Whistle platform, implementing user authentication, resource retrieval, personalized library spaces, information display, and push notifications.
[**Conclusion**] Developing library applications on mobile campus platforms like Whistle aligns with current trends in university mobile campus construction and holds promise for widespread adoption.

Keywords: Mobile service; Mobile library; Mobile campus platform; Whistle
Classification: G250.76

Against the backdrop of rapid mobile internet development and widespread adoption of large-screen smart devices, university mobile libraries in China have experienced swift growth with increasingly diversified service forms [1]. To understand the current state of mobile library services, we conducted an online survey of 39 "985 Project" university libraries. The findings reveal that SMS, WAP, APP, and WeChat Official Accounts constitute the primary mobile service channels [2]. Universities demonstrate strong commitment to mobile library development, with only two institutions lacking such services. WeChat Official Accounts prove most popular at 85% adoption, while 15 libraries simultaneously employ three different service forms to accommodate diverse user needs. Notably, no university libraries currently operate on mobile campus platforms.

We contend that library service innovation should transcend existing paradigms. As mobile campus platforms demonstrate initial success, libraries must actively integrate into the campus mobile ecosystem, leveraging these platforms to expand service channels.

2.1 Advantages of Campus Mobile Platforms

In recent years, Chinese universities have embraced mobile campus platforms to create integrated mobile ecosystems, with vendors offering solutions such as Ruijie Networks' "Whistle," Jinzh Education' s "Mobile Campus MCP," and Sudi Technology's "Weidi."These platforms serve as unified gateways for campus users to access diverse mobile services through a single APP, eliminating the need to install separate applications for each service. By interfacing with third-party systems, platforms facilitate the mobile transformation of campus applications while enabling schools to incorporate external software and overcome limited development capacity [3].

Building mobile libraries on campus platforms represents a future direction for university library services. This approach leverages existing campus mobile clients, reducing promotion barriers. Lightweight applications interfacing with current library systems minimize development complexity. Compared to WeChat Official Accounts, private campus platforms offer higher service priority and message delivery rates, as notifications remain separate from public information streams.

2.2 Value of the Whistle Platform

Whistle is a campus mobile platform integrating notification systems, instant messaging, campus social networking, and platformization features. Its hybrid private-public cloud deployment with real-name registration offers enhanced security and convenience compared to public cloud applications like WeChat, eliminating the need for separate student/employee ID binding [4]. Exploring mobile library services on Whistle provides significant value for expanding user channels:

(1) Robust Notification System
Whistle' s notification system operates on verified campus identities within authentic organizational structures, enabling libraries to precisely target specific groups or individuals and ensuring high delivery rates. Libraries can programmatically send automated reminders for due dates and subscription updates via Whistle' s notification interface.

(2) Rich API Interfaces
Whistle provides APIs for single sign-on, organizational structure, lightweight applications, notification systems, and QR code scanning. Libraries can leverage these interfaces to integrate with existing systems and rapidly develop mobile library applications.

(3) Lower Development Threshold
Whistle' s integration capabilities for campus application and data interfaces significantly reduce development complexity. Developers proficient in HTML5, combined with Whistle' s JS SDK, can create powerful native applications for Android and iOS with minimal effort.

(4) Clear Operational Analytics
Whistle' s cloud management backend provides detailed operational data to administrators at all levels, including application subscriptions, access statistics, access logs, and notification read rates, enabling data-driven service adjustments.

2.3 Construction Approach

The Library Micro-Portal built on Whistle operates atop existing digital library systems and data, transforming traditional desktop services into mobile offerings through Whistle' s notification system and open interfaces. The architecture comprises three layers (Figure 1 [Figure 1: see original paper]):

(1) Data Layer
This layer encompasses all structured and unstructured data from the digital library, serving as the unified data source for both traditional and mobile library services.

(2) Software Platform Layer
Built on the Whistle mobile campus platform, this layer hosts various campus mobile applications including the Library Micro-Portal.

(3) Service Layer
The Library Micro-Portal delivers services such as personal library spaces, OPAC, message push, and news announcements. Rather than developing functions independently, the portal integrates with existing digital library business systems through open or extended interfaces to provide inquiry and transaction services [5].

2.4 Operation Mechanism

The operational mechanism from user and administrator perspectives is illustrated in Figure 2 [Figure 2: see original paper]. Users logging into the Whistle client receive automatic authentication, accessing the Library Micro-Portal without re-entering credentials. Authorized librarians can access the Whistle management backend to handle notifications (including multimedia messages), group management, chat management, permissions, and operations. The Library Micro-Portal can also automatically send important alerts (overdue notices, reservation arrivals) via Whistle' s notification API, ensuring users receive timely reminders even when not actively using the platform.

3.1 Library Micro-Portal Construction

Development requires work on both the Whistle cloud management backend and private servers:

(1) Whistle Cloud Backend
Apply for a lightweight application to obtain an App Key and Secret Key for

integration into the Library Micro-Portal, enabling Whistle to verify the application' s legitimacy and prevent forgery.

(2) Private Server Deployment
The application runs on the university' s private server, developed using PHP, MySQL, HTML5, and CSS3. The UI employs a flat design with fresh, vibrant colors and a single-column waterfall layout for clarity. The page structure organizes functions vertically into search, message, and navigation areas (Figure 3 [Figure 3: see original paper]).

3.2 User Authentication

As the underlying mobile campus platform, Whistle interfaces with the digital campus unified identity authentication system during deployment, ensuring all campus applications can access verified user identities. The implementation establishes communication between Whistle and authentication servers, with the latter granting read permissions for user information. Upon first login, users submit their unified credentials; Whistle validates these against the authentication system and retrieves legitimate identity information [4]. This eliminates the need for separate identity binding or additional passwords, significantly enhancing user experience.

3.3 Resource Retrieval

Resource retrieval encompasses catalog searches, e-book databases, and e-journals. While Web-based retrieval is straightforward using existing search interfaces, displaying full PC page content proves unfriendly for mobile users considering screen size and data usage [6]. Transcoding technology filters search results, selectively presenting essential fields in mobile-friendly formats. For OPAC implementation:

1. Simulate OPAC login programmatically with parameters to retrieve page data as strings: `public string simulateLogon(string url, array arr){ }`
2. Analyze and locate field information: `public int locateString(string sourceString string aimString, int order){ }`
3. Extract necessary fields (title, author, publisher, call number, location, status): `public string locateString(string sourceString, int start, int end, int order){ }`
4. Reformat fields in HTML for mobile readability (Figure 4 [Figure 4: see original paper]).

3.4 My Library

"My Library"provides basic digital library services for viewing certificate information, current and historical borrowing, and handling renewals or loss reporting. Most library systems lack open interfaces for security and commercial reasons, offering only basic data import/export. To provide these services in mobile

libraries, interface expansion is necessary to enable data exchange and application integration without altering existing system structures [7]. We created a public interface layer using Web Services, authorizing mobile applications via IP-based access for read/write operations on library information systems (Figure 5 [Figure 5: see original paper]).

Interface implementations include: - `public array getUserInfo(string userid){ }` -Retrieves user identity details - `public array getHistoryList(string userid){ }` -Fetches borrowing history - `public bool renewBook(string userid, string bookid){ }` -Processes renewals - `public bool lossCertificate(string userid){ }` -Handles certificate loss reporting

The interface is shown in Figure 6 [Figure 6: see original paper].

3.5 Information Display

This module publishes library overviews and announcements. Rather than building a separate CMS, we employed the Bootstrap framework to responsively redesign digital portal content for mobile display (Figure 7 [Figure 7: see original paper]):

Collapsible Menu
The transformed navigation uses a toggle button for mobile screens:

```
<nav class="navbar navbar-inverse navbar-fixed-top">
  <div class="container">
    <div class="navbar-header">
      <button class="navbar-toggle" data-toggle="collapse" data-target="#responsive-navbar">
        <span class="icon-bar"></span>
        <span class="icon-bar"></span>
        <span class="icon-bar"></span>
      </button>
    </div>
    <div class="collapse navbar-collapse" id="responsive-navbar">
      <ul class="nav navbar-nav">
        <li class="active"><a href="#">Mobile Library</a></li>
        <li><a href="#">Library Overview</a></li>
        <li><a href="#">User Guide</a></li>
        <li><a href="#">Service Guide</a></li>
      </ul>
    </div>
  </div>
</nav>
```

Responsive Layout
Using HTML5 and CSS3 Media Queries, content divs for small screens (`@media screen and (min-width: 320px)`) adopt single-column, percentage-based elastic layouts for optimal mobile display [8].

3.6 Information Push

The Library Micro-Portal delivers two message types:

(1) Client Messaging
Whistle' s built-in messaging enables user communication and allows libraries to broadcast curated thematic content to specific groups via multimedia messages, similar to WeChat Official Accounts.

(2) System Alerts
Digital library system-generated notifications (due dates, overdue notices, reservation arrivals) are pushed to Whistle clients through the notification API, ensuring users receive critical reminders even when inactive. Both approaches enhance message arrival rates (Figures 8 [Figure 8: see original paper] and 9 [Figure 9: see original paper]).

4. Trial Operation Results

After two months of operation, the Library Micro-Portal attracted significant user attention. Whistle backend data shows 4,311 total page views and 3,517 unique visitors. Users rated the application 4 stars with 81.6% positive feedback. Comments highlighted the convenience of accessing library services through the campus mobile portal, particularly appreciating thoughtful features like overdue reminders. Suggestions primarily focused on expanding functionality beyond web portal parity, addressing the close PV/UV ratio indicating low usage frequency. Future enhancements will include study room reservations and library status notifications to increase user stickiness.

The parallel adoption of WAP, APP, and WeChat Official Accounts currently dominates university mobile library services, catering to diverse user needs. This exploration of mobile campus platform-based library construction aligns with university mobile campus trends, offering users a new alternative and expanding mobile library service models with practical significance.

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