



Study on Construction Scheme of Smart Library of Independent Colleges in the Informationization Context

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Abstract. Smart library is a kind of intelligent building that employs intelligent technologies in the course of construction, and is an inevitable trend of library development in the era of artificial intelligence and informationization. Through analysis of the current development status of smart library, this paper summarizes the necessity of applying the information technology to smart library construction of independent colleges. It takes the construction of Fuzhou University Zhicheng College Library as an example and introduces five intelligent construction systems of the smart library, which provides reference for the construction of smart library in related colleges and universities.

Keywords: informatization · smart library · independent college · artificial intelligence

1 Introduction

With rapid development of science and technology, the traditional technology-based library management has become more and more difficult to meet the needs of users in the new era, which makes it urgent to build a smart library based on intelligentization and informatization. Since its debut early in 2003 proposed by scholars from the University of Oulu in Finland, the concept of smart library [1] has been known to the public. In 2018, the Education Informatization and network security work essentials in 2018, issued by the Ministry of Education of China, pointed out the need to initiate the program for sharing educational digital resources and to closely integrate school teaching with big data and informatization technologies [2]. In this context, independent colleges, as an important part for development of colleges/universities in China, are free in library construction to some extent while sharing resources with their parent schools, because they have close ties with their parent schools [3]. This puts forward the demand for smart construction of the library in terms of service mode, collection resources and user management in the context of information technology.

2 Development of Smart Library

Development of information technology and artificial intelligence has provided strong technical support for realization of smart library. The modernized smart library is a combination of informationized technology, management and staff, in which the concept of smart services runs through the construction and management of the library [4]. Introduction of the information technology leads to higher operational efficiency of the library, mutual support of each module and relief of the readers from space-time limit in terms of reading and communication. In this way, the library constructed has the characteristics of both intelligence and humanization. Moreover, limited by technical means in terms of data classification and storage, traditional libraries suffer from increasingly heavy load in operation. Once there is a problem with the management system, irreparable damage will be caused to the library and its users. Smart library utilizes information technology for management of all materials which are converted into data, and more scientific approaches are used to guarantee the security and integrity of the collections to greatly reduce the risk of data corruption.

As an inevitable product of library development under the support of modern intelligent technology, the smart library also faces challenges during construction, which have become hotspots for academic research. Corral [5] studied the interaction between American universities and social platforms, and proposed the need for cooperation between the specialties through libraries. He also proposed to introduce efficient intelligent technology into the school's scientific research and improve the role of libraries in the fusion of disciplines.

The above studies show that smart library has received more and more extensive attention from universities at home and abroad, and put forward new requirements for library construction of independent colleges in the new era. In this paper, Fuzhou University Zhicheng College Library is taken as an example to explore the role of the information technology in smart library construction of independent colleges.

3 Construction Scheme for Smart Library of Zhicheng College

As independent college relies on and are closely related to the parent school in terms of hardware, software and faculty in the initial period of construction, the linkage with the parent school should also be considered during library renovation as appropriate. During renovation, Fuzhou University Zhicheng College Library makes full use of the information technology to build the following five sets of system.

3.1 Dual-Library System

This system connects the library of Zhicheng College to that of its parent Fuzhou University to realize united bibliographic retrieval and return/borrowing services at the PC side, and management of book resources and reader services at the WeChat side.

3.1.1 PC Side

Readers can borrow and return the books by scanning QR code or through face recognition on the cell phone, which relieves users from use of reader's card every time when they want to borrow and return books; the fee deduction system docked with the school's financial system allows the readers to deduct fees for overdue return, book defacement or loss in a self-help manner; readers can also submit their personal opinions and suggestions to the official backstage system so that the administrators and leaders are aware of the readers' suggestions and feedback in time; the collections of the library are divided into two parts: the self-purchased collections and the collections shared with these of Fuzhou University. Although each of the two parts has its own management system, both libraries are interconnected in terms of retrieval, borrowing and returning of books.

3.1.2 WeChat Side

Book search function: this function allows users to search the books in main library and its branches via keyword/title/author/publisher/ISBN, etc. In addition, users can be aware of the information about the books in the libraries by scanning ISBN standard barcode provided on a book.

Reader function: by binding reader's account to ID and cell phone, readers can borrow/return books simply by scanning the QR code without using a reader's card; in User Profiles, readers can also check their document information, borrowing history, book borrowing& returning history, etc. When the books are borrowed or returned or when the book reserved has arrived, readers will receive a reminder on WeChat in a timely manner; readers can make book reservations and renewal directly on their WeChat. The system will send intelligent reminders about book return to the readers whose books borrowed are about to expire according to the pre-set rules; readers can post and share their reviews about specific books on phone, or forward and like the book reviews from other organizations (for this function, a review mechanism is provided in the background system).

3.2 Seat Reservation System

The library provides students with spaces for self-study. For convenience, a seat reservation system has been established, which saves the seat resource information and student information in the background. Among them, the information about students is originated from the reader database; students make seat reservation through the mobile phone. They can reserve any free seat at any time 30 min after the current time point of the day, or at 6 fixed time slots of the next day, of which two slots are planned for morning, midday or evening, respectively; when selecting seats, students can visually check the seat resources (similar to the graphical seat selection service provided by airlines) and can view their reservation records after successful reservation.

Students should complete sign-in within 30 min before the specified time, by scanning the QR code on the table. If the students fail to do so, the system will automatically release the reserved seat and the students will be given the punishment for any violation. If the cumulative number of violation reaches 3, the students' right to reserve any seat will be suspended for three days. During the study or after the reservation period

expires, students need to sign out, and the system will automatically release the seats, and gather statistical data in the background about reservation, taking seats, sign-in/sign-out, violations, etc.

3.3 Venue Reservation System

As there are large meeting rooms, multi-functional rooms, etc., in the library, which provide venues for teachers and students to carry out academic and social activities, intelligent means should be employed for orderly management. Zhicheng College Library established the venue reservation system, on which the applicant can input the venue resource information in the background and fix the time slot for reservation. For each venue, there are 6 time slots available for reservation per day, of which two are in the morning, another two in the afternoon, and the other two in the evening. Each time slot lasts 2 h.

After selecting the unassigned venue and unassigned time, and filling in the reason in the “venue reservation application”, the applicant submit them to the administrator for approval. After receiving the applications, the administrator will review the information submitted by the applicant. If the application is approved, the reservation record will be generated. Otherwise, a reply about the approval result will be sent to the applicant. After the applicant obtains the approval, he/she can check the reservation record on the user side, and confirm the appointment within the agreed time and hand it over to the administrator to end the process. If there are any changes during this process, he/she can apply for cancellation of the reservation. If the application is rejected; the applicant can check the reason for rejection, and update and submit the application to the administrator for review until the application is approved. All users can check the status (occupied or vacant) of the venues in the near 7 days.

3.4 Face Recognition Channel System

As the campus card, which is a traditional approach for ID identification, cannot be effectively bound to the “individual”, there are problems such as entrusted card swiping, borrowing card for swiping, embezzled swiping, forgery and forgetting during access to the library. Inconsistency between individual and card makes it impossible to verify the real identity of students, which is inconvenient for the actual teaching management. With the deep integration of information technology and modern education management, the face recognition technology is constantly applied to various business scenarios of schools, including the entrance and exit management of libraries.

The system combines the intelligent face recognition technology (as shown in Fig. 1) and the obstructed channel control equipment such as swing gates and wing gates (as shown in Fig. 2), which can be deployed at the entrance of libraries to strictly authenticate the individuals who come in and go out of the premises and prevent unauthorized persons from access to important premises at will. In addition, it also helps solve the problems such as forgetting the card, embezzlement of cards, etc., thus enhancing personnel control capacity of important premises, and eliminating security risks.

The face recognition channel system of Zhicheng College Library has the following characteristics: standard access specifications, supporting access and expansion of



Fig. 1. Intelligent face recognition



Fig. 2. Swing and wing gates

various business scenarios; constructing a unified identity biometric database for centralized management and retrieval; desegmentizing the application modules to achieve data comparison among various business scenarios; ensuring the security of school data through the private cloud deployment; the face recognition database is simple to be built, as the photos can be imported from student's ID card in a batch manner or synchronously acquired from school data center; two mode of online /offline recognition become available.

The face recognition channel system consists of server/workstation, face authentication service platform, channel management system, face recognition tablet, channel machine, face recognition host (optional), etc. On this basis, the library introduces a one-way three-channel entrance. The system adopts artificial intelligence and information management technology to guarantee the orderly management of daily visit to the library. The system supports campus card, face and QR code authentication, and provides unified platform, unified authentication, unified data report and unified data services.

3.5 Freshmen Admission Education System

To know the library resources and services as soon as possible and make the campus card have the permission to borrow books from the library in time, the freshmen should actively cooperate with the library for entrance education and testing, and will obtain the permission to borrow books from the library only after passing the corresponding test. Based on Internet technology, the test can be done by freshmen themselves on computers or smartphones hooked up to the campus Internet.

The system provides question management service in the background, and the question bank supports inserting of pictures and videos, etc. Students can take the test on PC or mobile terminal. When the test is taken, the questions(e.g., 10) are randomly selected from the background, and should be completed within a specified period of time; after the questions are completed, students can click to confirm and submit the papers, and the system automatically corrects the paper and generates the test score; if the score is greater than or equal to 80 (configurable), the test is deemed to be passed, and a record and a logo are generated in the background database and synchronized with the library management system.

4 Conclusion

With development of information technology and emergence of the concept of wisdom, libraries are also transformed in a digital, intelligent and humanized manner. Smart library is a new form of libraries that relies on digital, networked and intelligent information technology, and are more efficient and convenient. It is the trend of the future library development, and can realize a wide range of interconnection and sharing to achieve a human-oriented and intelligent management and service model. Based on the analysis of the current development status of smart libraries, this paper introduces the five systems of Fuzhou University Zhicheng College Library, namely, the dual-library system, seat reservation system, venue reservation system, freshmen admission education system and face recognition channel system. It can provide reference for smart library construction of peer colleges.

References

1. Aittola M, Ryhänen T, Ojala T. Smart Library-Location--Aware Mobile Library Service //Human-Computer Interaction with Mobile Devicesand Services [C], Udine, Italy, Berlin: Springer, 2003.

2. Zhong Huan, Ma Xiufeng. Design and research of intelligent information service platform of university library driven by demand [J]. *New Century Library* 2020, (1), pp.43–48(in Chi-nese)
3. Liu Fuxiang. Research on the construction path of university smart Library [J]. *Journal of Qilu Normal University*, 2022, Vol.37 (4), pp.49-55(in Chinese)
4. Spangler, W.S. et al.A smarter process for sensing the information space [J]. *IBM Journal of Research and Development*, 2010, (4), pp. 1-13.
5. Corral S. Designing Libraries for Research Collaboration in the Network World: An Exploratory Study [J]. *Liber Quarterly the Journal of European Research Libraries*, 2014, Vol.24(01), pp. 1-4.

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