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Research on the Construction of Chinese Universities from Intelligent Library to Smart Library

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Abstract

The study aims to discuss the construction and development of university library, and transform the management and operation mode of university library, thereby realizing the transformation and upgrading to smart library. Taking Anhui University of Finance and Economics as the research object, first, based on the literature and data combined with questionnaire design and expert interview, data statistics was made on the development of smart library. Second, analytical hierarchy process (AHP) and big data analysis were applied to complete the construction of the smart library system. Third, based on the data analysis method, the problems in the construction of the smart library were discussed. The results showed that the Chinese smart library started late and developed rapidly after 2012; from information perception to smart service, the construction of smart library system had realized the transformation and upgrading of library construction; the key to solve the construction of smart library was to standardize library construction, realize resource co-construction and sharing, promote technological innovation, and strengthen the construction of smart librarians. To sum up, the construction of smart library is expected to make the library and librarians become the cooperative objects of teaching and scientific research in colleges and universities.

Key words: University; Smart Library; System Construction; Hierarchical Model; Smart Service

1 INTRODUCTION

In the construction and development of colleges and universities, the information resources that libraries can provide are rich and varied, and they shoulder the important mission of serving readers and providing great convenience for readers to engage in scientific research activities, it is also the core of academic and cultural exchanges [1]. However, under the background of the rapid development of information and communication technology in the Internet age, the development and management mode of traditional university library is facing great challenges, the rapid development of the Internet of things, blockchain and artificial intelligence in recent years has also brought the opportunity for the transformation and upgrading of university libraries, and promoted their development from intelligentization to wisdom. With the idea of "Smart Earth" , the strategic decision of "Smart City" and the construction of "Smart Society" put forward, "Smart Thinking" was introduced into the construction and development of the library in accordance with the development pace of the times, the concept of "Smart Library" came into being.

The concept of Smart Library was first proposed by scholars at the University of Finland, which came into being in the context of the development of intelligent technologies such as Internet of things and cloud computing, it is of great significance to the reorganization of the library business, the transformation of the service and the upgrading of the management, and is an advanced product of the integration of the intelligent building and the modern information technology. Smart libraries allow for full awareness of library books and digital resources, Librarian, and users, wherever and in whatever way they can be used, both can extract the static and dynamic information of the user according to the location of the reader and the retrieval method used, so that the smart way of

human-computer interaction can be applied to provide personalized library service for the user. The smart library has the characteristics of comprehensive perception, high-efficient fusion, ubiquitous convenience and so on. However, at this stage, the development of the smart transformation of our libraries is still in the initial stage, restricted by the talent construction, resource construction and other factors, it is urgent to break through its bottleneck.

This paper starts from the construction of the smart library in colleges and universities, selects the Anhui University of Finance and Economics as the research sample, and based on the literature and materials method combined with expert interviews and questionnaire design, analyzes the current situation of the development of the intelligent library at home and abroad, based on the analytic hierarchy process (AHP) , this paper completes the system construction of the smart library in colleges and universities, and further probes into the problems encountered in the process of the construction of the smart library and the ways to solve them, with a view to providing reference ideas and development direction for the construction of our country's university smart library.

2 METHOD

2.1 Data Acquisition Based on Bibliographic Method

Through the related literature material inquiry and the statistics, the literature material method application may realize for the research object deeper level understanding [6]. In order to analyze and study the development of smart libraries at home and abroad, this paper uses Web of science, Springer, China Knowledge Network and so on as the retrieval platform of literature materials, "Wisdom Library" or "Smart Library" and " Intelligent Library" were used as key words in the matching search. As of December 2019, the repeated literature materials were removed and the less relevant literature materials were rejected, a total of more than 2000 articles in Chinese and English were obtained. The corresponding time series distribution of domestic smart library is shown in Table 1 below.

TABLE 1 DISTRIBUTION AND CHANGE OF TIME SERIES OF SMART LIBRARY IN CHINA

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Reference	0	1	6	22	50	94	98	106	201	224	340
Percentage（%）	0	0.11	0.76	2.88	6.24	11.62	12.12	13.23	25.21	27.85	33.15

2.2 Selection of Research Methods

The DELPHI expert survey method, founded by the Rand Corporation, has the characteristics of statistics, anonymity and feedback, while the questionnaire survey method can achieve the combination of qualitative and quantitative research in the current study of society, so it's used a lot [7]. Based on this, this paper further combines the expert survey method with the questionnaire design, in the form of on-the-spot investigation, has carried on the interview understanding to the Anhui University of Finance and Economics' s development situation. The questionnaire is designed by using the LIKER5 grading method, which consists of three parts: the

first part is the basic personal information of the experts in different research fields in the Anhui University of Finance and Economics, the second part is the related content of the construction of the University Smart Library, the third part is the self-assessment of the experts' knowledge and familiarity in this field. Of these, 1 indicates that the content related to the smart library is "not important" and 5 indicates "very important". In this study, 20 experts who have some knowledge of library work, and who are associate research librarians or above (or associate professor or above) with bachelor degree or above were selected to carry out two rounds of questionnaire survey and interview. Among them, in order to judge the authority and validity of the design questionnaire, the authority coefficient CR is introduced, and the corresponding calculation is shown in Formula 1 below.

$$Cr=\frac{Cs+Ca}{2} \quad (1)$$

CS is the Coefficient of familiarity, and CA is the Coefficient of judging basis.

2.3 Hierarchical Model

Developed in the 1970s, analytic hierarchy process combines qualitative analysis with quantitative analysis analysis, and is characterized by systematic, concise, practical, less quantitative information and more emphasis on qualitative judgment, through the analysis of the responses of the lowest level of the target population and the combination of the weights of the indicators, the target population can be judged, and in its application, according to the nature of the target population, the research problem is decomposed into different angle factors, and each factor is a level, which completes the combination of the lower level of the subordinate relationship, and finally realizes the construction of the multi-level structure analysis model [8] . The whole process of analytic hierarchy process is a simulation of the human brain thinking process, through the evaluation of the importance of indicators left to the brain, and then transform the indicators into indicators can achieve the weight of the quantitative analysis, it can solve practical problems that cannot be optimized by traditional methods. Based on this, this paper applies the analytic hierarchy process (AHP) to the construction of Smart Library, and constructs the model of AUFE Smart Library Hierarchy, as shown in figure 1 below.

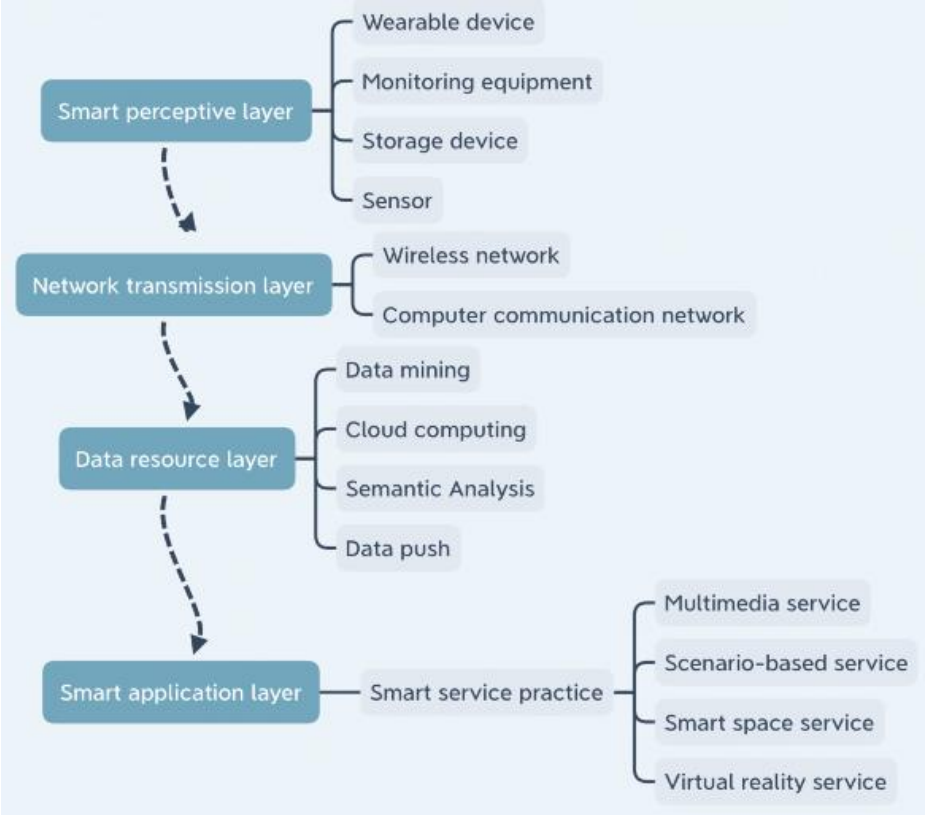
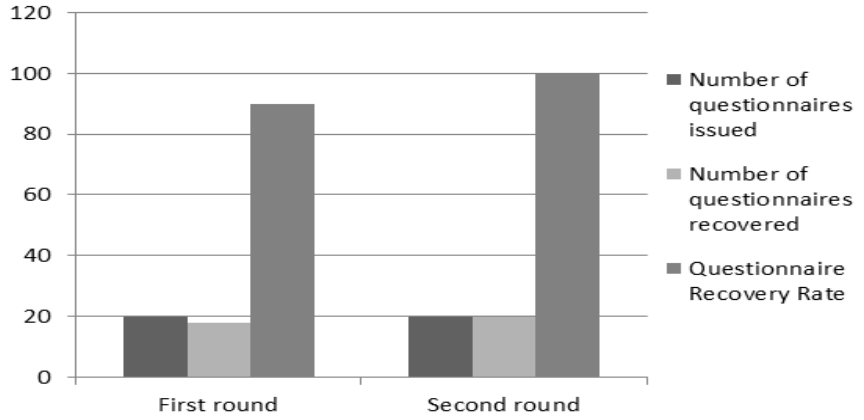


FIGURE 1 MODEL OF AUFE INTELLIGENT LIBRARY HIERARCHY

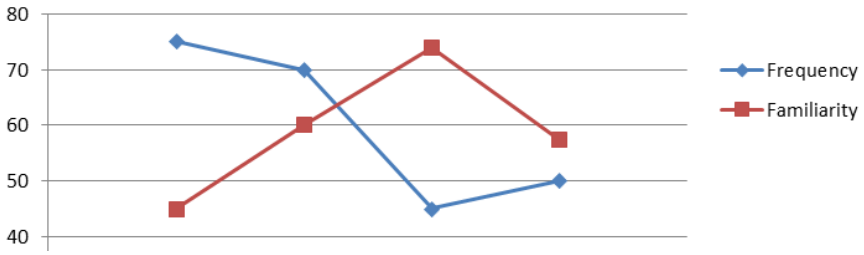
3 RESULTS AND DISCUSSION

3.1 Analysis of The Development of Domestic and Foreign Intelligent Library

In this paper, by using the method of Literature Review, expert consultation and interview, questionnaire survey and statistical analysis, the acquired data information is imported into the data analysis software SPSS 21.0, and the validity of the designed questionnaire is evaluated, the corresponding results are shown in figures 2 A and B below.



(A)



(B)

FIGURE 2 EFFECTIVENESS EVALUATION RESULTS OF THE DESIGN QUESTIONNAIRE

As can be seen from the graph, in the two rounds of surveys, the first questionnaire recovery rate reached 90% , the second questionnaire recovery rate reached 100% , it shows that the enthusiasm and participation of experts for this research content are very high. And the CR of 0.93 calculated by Formula 1 above shows that the reliability of this questionnaire is high, and the reliability of the selected experts is also high.

Through the above-mentioned research methods at home and abroad Smart Library Development Status Analysis, the corresponding results, as shown in figure 3 below.

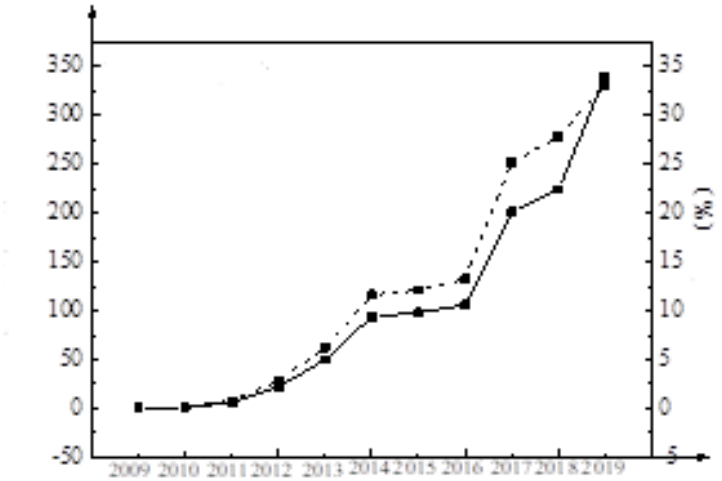


FIGURE 3 THE DEVELOPMENT STATUS OF DOMESTIC AND FOREIGN SMART LIBRARY

As can be seen from the diagram, in contrast, foreign research on Smart Library is earlier and more mature, while

Chinese research on this is relatively late. In 2010, there was only one piece of literature on Smart Library, and in 2011, the proportion reached only 1.3%. Since 2012, the amount of literature on Smart Library has been increasing year by year, and the proportion of published literature reached 27.84% in 2018.

The publication of literature materials can reflect the importance of the research in this field in a specific stage, which shows that the Chinese attention to the field of smart library is not very high in the development stage before 2012, the increase in literature since 2012 has to do with the rise and development of emerging technologies such as the Internet of things, cloud computing, blockchains, big data, and artificial intelligence. In the context of the rapid development of big data and computer information technology, it is imperative to realize the transformation and upgrading of university libraries from traditional libraries to intelligent libraries and then to smart libraries, it is necessary and significant for the construction of the infrastructure and service practice of the smart library in colleges and universities.

3.2 Construction of Smart Library

Based on the analytic hierarchy process (AHP), combined with data mining, cloud computing and wireless network technology, this paper takes Anhui University of Finance and Economics as the research platform and applies the smart library system to the statistics of a university's weekend book borrowing, as shown in figure 4 below.

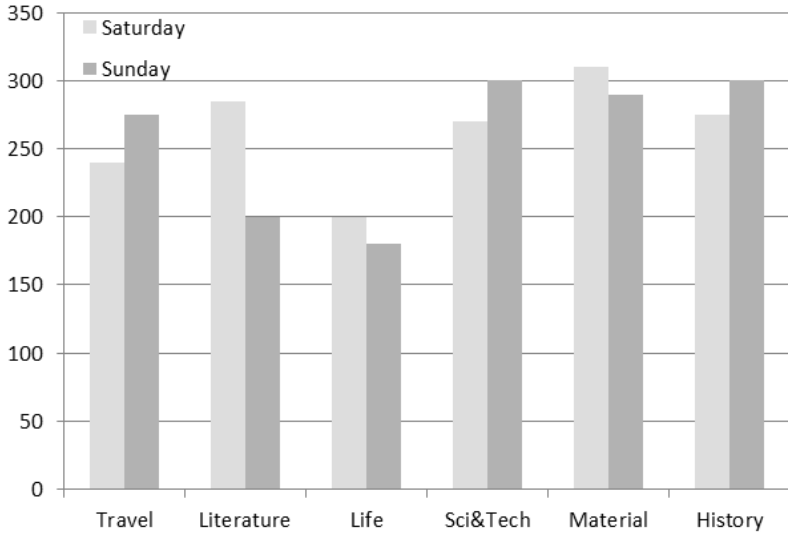


FIGURE 4 BOOK LENDING STATISTICS UNDER THE CONSTRUCTION SYSTEM OF SMART LIBRARY

As can be seen from the above picture, the borrowing of books in the library can be clearly realized in the smart library system. The smart library architecture is composed of four parts: the smart perceptive layer, the network transmission layer, the data resource layer and the smart application layer, it can sense and extract the data traces produced by the users in the application of smart library mode and service, then the distance between the current location and the library collection data is perceived through the network transmission layer, then, the collected data can be transferred to the core data resource layer of the hierarchical model safely, efficiently and quickly. In the data resource layer, the functions of data storage, user data mining and computing, recommendation and management can be realized, thus, in the smart application layer, we can realize the services of scene recommendation, user personalization, multimedia, smart space, visualization and smart practice in the smart library.

Under the environment of rapid development of modern intelligent technology, the system construction and innovation development of smart library is a service process from information perception to information mining and information processing to the discovery of Wisdom[9] . Based on the analytic hierarchy process(AHP) model and the intelligent technology, this paper presents a comprehensive system of smart library, which is helpful to realize the transformation of university library from passive and rigid mode to smart service mode, from single library service mode to cross-library service mode, to promote the integration of library management, scientific services, infrastructure construction and the enhancement of the value density of librarians' decision-making in university

libraries, which is expected to promote the development of university libraries into a collaborative place for scientific research, to promote librarians as collaborators in teaching and research.

3.3 Problems and countermeasures of Smart Library Construction

China's development in the construction of Smart Library is still at the initial stage, and there must be a series of problems in the construction process, taking the construction of Anhui University of Finance and Economics as an example, this paper analyzes and summarizes the existing problems and feasible solutions in the process. The analysis of the construction of librarian team is shown in figure 5 below.

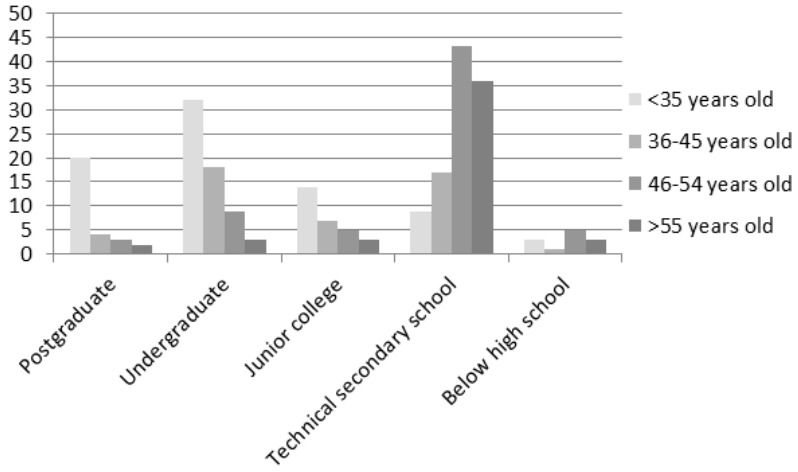


FIGURE 5 ANALYSIS OF LIBRARIAN TEAM CONSTRUCTION

With the analysis of the above picture, in the course of the construction of the current university smart library, the standardization of the management of the huge data and information flow, the promulgation of the supporting policies, the popularization of the service mode and the construction of the digital information resources, in the data processing background and the data service system, the establishment and perfection of the automated supporting platform and technology such as VR technology, IoT technology and data mining technology, the main problems in the construction of Smart Library are the high cost and the lack of software facilities such as the lag of the construction of librarians.

Based on the above-mentioned problems in the construction of the Smart Library, we should carry out the formulation of the relevant regulations as soon as possible, and construct the laws and regulations that the construction of the smart library lacks, so as to promote the standardization of the construction of the National Smart Library. On the other hand, relying on the big data structure, realizing the co-construction and sharing of various resources and facilities in the library, and promoting the establishment of the Library Cooperative Alliance, is the general trend in the smart construction of university libraries [10]. In addition, the development, innovation, and application of information technology should also be emphasized in the promotion of Librarian's creativity and invention in new technologies. We should change our values, strengthen communication and cooperation with the outside world, and promote the reconstruction of the library model. At the same time, we should strengthen the construction of the team of smart librarians, change the existing recruitment model, activate the stock of human resources, and train the learning-type librarians, it is of great significance in the construction and development of the library.

CONCLUSION

This paper, starting from the construction and development of university libraries, takes Anhui University of Finance and Economics as the research object, and analyzes the current development situation of Chinese and foreign intelligent libraries based on statistical analysis combined with qualitative and quantitative analysis, based on the analytic hierarchy process (AHP) , this paper constructs the system structure of university smart library, and probes

into the problems existing in the library construction. The analysis shows that the development of Chinese is later than that of foreign countries, and the rapid development has been achieved under the wave of the development of intelligent technology such as Internet of things, in view of the existing problems, it is feasible to standardize the system, strengthen the team building, and encourage technological innovation.

REFERENCES

[1] Zheng Lijuan. Research on the service open learning model of university library under Big Data [J]. Continuing Education, 2017(3):80-82.

[2] Katherine J. Lee, Brian D. McCarthy, Jillian L. Dempsey. On decomposition, degradation, and

[3] Voltammetric deviation: the electrochemist's field guide to identifying precatalyst transformation[J]. Chemical Society Reviews, 2019, 48.

[4] Good morning, Duan Meizhen. From Intelligent Library to Intelligent Library[J]. Journal of the National Library of Science, 2019,28(01):5-11.

[5] Kang-Yu Hsu, Poching DeLaurentis, Yuval Bitan, et al. Unintended Patient Safety Risks Due to Wireless Smart Infusion Pump Library Update Delays[J]. Journal of Patient Safety, 2018, 15(1):1.

[6] Montoya O D, Garcés A, Serra F M. DERs integration in microgrids using VSCs via proportional feedback linearization control: Supercapacitors and distributed generators[J]. 2018, 16:250-258.

[7] Antonio Rodríguez, Francisco Ortega, Ramiro Concepción. An intuitionistic method for the selection of a risk management approach to information technology projects[J]. Information Sciences, 2016, 375:202-218.

[8] Li Ying. Risk analysis of real estate investment based on Expert Investigation Method[J]. Housing and real estate, 2019(24):5-5.

[9] Guo Yao. Environmental Impact Assessment of mine geology based on Analytic Hierarchy Process[J]. Environmental Science, 2018(4):174-177.

[10] Cao Shujin, Liu Huiyun. Reader-centered Intelligent Library Research[J]. Library and information work,2019(1):23-29.

[11] Boone Morgane, De Koker Andries, Callewaert Nico. Capturing the ‘ome’: the expanding molecular toolbox for RNA and DNA library construction[J]. Nucleic Acids Research, 2018(6):6.

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