

Construction of Library's Smart Ecosystem in the "Smart+" Era

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ABSTRACT. *As the main force of the socialist public cultural service system, the library plays an irreplaceable role in the improvement of national cultural soft power. With the rapid development of society and economy, our country's urbanization has increased unprecedentedly, while various urban problems have gradually emerged. In order to solve the problems of traditional library preservation and operation, this paper proposes a new model of library development based on the era of "smart +". Through case investigation, a case template is constructed, and an evaluation matrix is created using comprehensive quantitative and qualitative analysis. , Use models to verify various influencing factors, and use reliable data to support the scientific nature of the conclusions. The extension of the knowledge service of smart libraries needs to be optimized and upgraded respectively. Experiments have proved that compared with traditional books, libraries in the "smart+" era have great advantages. In the operation of libraries, the operating efficiency of smart libraries is about 40% higher than that of traditional libraries. Personnel etc. are better than traditional library management. This shows that with the development of technology, smart libraries have increasingly become the development trend of library management.*

KEYWORDS: *"Smart+" Era, Smart Ecosystem, Smart Library, Book Lending*

1 Introduction

In recent years, with the promotion and application of Internet of Things technology and intelligent technology in the library field, new user needs have been born. The current development situation of the library shows the following aspects: the number of books borrowed and the number of people entering the library has decreased year by year, while the utilization rate of electronic resources has continued to rise, and the utilization of electronic teaching materials and multimedia resources has repeatedly reached new highs [1]. As a result, current users tend to have more urgent needs for knowledge content rather than literature, and shift from paper-based resources to digital resources, and from the digital collection of literature resources in the past to open journals and open journals. The integration of data and knowledge resources including books, network resources, interoperable and open institutional repositories, characteristic thematic resource databases and

scientific research data, these innovations are realizing the transformation of resource form from document information to data knowledge [2] .

With the help of advanced information technology, the smart library has better optimized its own functions, and is more conducive to solving the problems encountered, realizing the comprehensiveness of library knowledge services and greatly improving the service quality, making it superior to the traditional library form. In addition, the innovation of library knowledge service methods and development models will promote the development of the entire library into a smarter library [3]. Smart libraries no longer focus solely on the intelligent management of information technology and document resources, but instead emphasize knowledge services and the social environment of public culture, allowing users to participate in the library's knowledge services and public culture management, and provide smart services This view is the development goal of future libraries, that is, smart libraries [4]. An important part and supporting elements of a smart library are information technology and infrastructure. Its development also needs to pay attention to the development needs of the library itself, including the library's service functions, competitiveness, resource utilization, service methods, and management The transformation, promotion, alliance, improvement, and optimization of models, capital investment, etc. ensure that a series of needs closely follow the theme of the long-term development of the library. Based on the Internet of Things and artificial intelligence technology, smart libraries promote the sustainable development of library functions, their service methods, and resource development and utilization. Smart library is the core connotation of digital library, mobile library, third-generation library and new library. It is the main power factor driving the future development of the library. It is the library's new positioning, new image, and new ability. The dominant mode and highest form of future libraries [5]. For libraries in the "smart+" era, domestic and foreign experts also have many studies:

ChuJingli believes that with the development of the Internet and the Internet of Things, it is time for libraries to become intelligent. Traditional libraries have become increasingly difficult to meet people's borrowing needs due to the difficulty of book storage and access, and smart libraries rely on the development of the Internet. Transformation, smart library is an inevitable requirement for library development. With the intelligentization of library, library can play its true role, and the protection of books can be better than traditional book protection [6]; MaJing believes that the traditional The problem of difficulty in library protection is to re-plan and design the library based on the Internet of Things, use the Internet of Things to label, virtualize the books, classify the books in the early stage, and then use the Internet of Things to label, which can be solved through scientific and reasonable design Traditional library management's time-consuming and laborious management of the staff brought by books is a necessary measure for library transformation and upgrading [7]; MengQinglan believes that in today's rapid technological development, in the era of artificial intelligence, traditional library management is facing this transformational problem. , It introduced the intelligent library management, explained the conditions and advantages brought by the library

intelligentization, and compared with the traditional library, carried out related research on the library management in the intelligent era [8]. These studies have a certain enlightenment for this article, but because the samples of related studies are too small and have no real universal effect, it is difficult to really promote in practice.

Based on the research of smart libraries, this paper explores and analyzes the concepts, connotations and characteristics of smart libraries, library knowledge services, and smart library knowledge service extensions, forming some basic views and theories about smart libraries. Constructed the knowledge service extension research system of smart library [9]. The application of system dynamics and other theories has enriched the theoretical system of library development, and constructed a mechanism system model for the extension of knowledge services of smart libraries. It analyzes in detail the elements, functions, structural levels of the knowledge service extension system of the smart library and the goal, motivation and path of the knowledge service extension. The context construction strategy for the extension of the knowledge service of smart libraries is proposed, which specifically proposes strategies for the construction and optimization of resource context, technical context and service context, which are of great significance for improving the knowledge service level of smart libraries.

2 Construction Method of Library Smart Ecosystem in "Smart +" Era

The extension of the knowledge service of the smart library is the further development and upgrade of the knowledge service of the digital library. It is to comprehensively enhance the role of the library in social development and support its comprehensive ability in teaching, scientific research, social management, cultural construction and social development. Utilizing technologies such as big data, cloud computing, ontology, Internet of Things, inference engine, etc., to enable library services to develop in the direction of automation, integration, intelligence, visualization, and ecology, enhance library service innovation functions, and help users create new knowledge, solve new problems [10]. The extension of knowledge services of smart libraries should transform from resource-driven to service-led. It is specifically manifested in the construction of resources, from library-centric resource ownership to user demand-oriented resource acquisition; in the form of resources, it is manifested in the shift from paper-based resources to paper-based electricity (paper and electricity). Electronic) resource rational allocation, spatial resource reengineering and human resource reengineering change.

Reflected in the content of the service, from simply providing documents and data to providing information, knowledge and wisdom services; from a single document to a three-dimensional maker space, learning platform to provide a transformation; from the entire volume of literature borrowing service to the acquisition and transformation of fragmented knowledge. The extension function of the knowledge service of the smart library has changed from a service mainly based on document provision to a "people-oriented" service function mainly based on information transmission, data mining, spatial reconstruction, knowledge discovery,

and smart service [11]. The ultimate goal of the extension of the knowledge service of the smart library is to improve the knowledge service capability and level of the smart library, and to meet the increasingly diverse and personalized needs of users. For smart libraries, it is necessary to borrow the Internet of Things and cloud computing, and generally follow the following calculation methods:

$$d = \sqrt{\sum_{m=1}^x w_n * (r_{nm} - uq_m)^2} \quad (1)$$

$$d_n = \frac{1}{1 + d(r_n, uq)} \quad (2)$$

$$P = \sqrt{\frac{\sum_{a=1}^{a=x} (Rf(W(\gamma_a)) - Rf(W_0(\gamma_a)))^2}{\sum_{a=1}^{a=x} (RfW_0(\gamma_a))^2}} \quad (3)$$

At present, the definition of smart library in academia has not yet reached uniformity. Although different scholars describe their descriptions differently, their essence is also similar and has some commonalities. Fundamentally, smart libraries are considered to be a new type of library but cannot be separated from the Internet of Things. Based on the development foundation of, cloud computing and existing digital libraries and hybrid libraries, based on the "smart +" idea, smart libraries have the dual characteristics of digital libraries and the Internet of Things. The technical foundation of a smart library includes digital technology, intelligent technology, network technology, etc.; the core lies in the interconnection of characters; the essence is expressed in the sublimation of knowledge services to smart services. The intelligent library is positioned to realize ubiquitous and all-time services, with external characteristics such as ubiquity and borderlessness. The internal characteristics are manifested in the basic literature, information, and knowledge services, focusing on "people-oriented" "Smart services to meet the increasing needs of users and a highly personalized experience. Therefore, the smart library is a new revolution in the improvement, innovation and transformation of the service technology, concept and management form of the library industry.

3 "Smart+" Era Library Smart Ecosystem Experiment

3.1 Experimental Purpose

This paper is based on the theoretical results of intelligence, draws on the results of domestic and foreign theoretical research, and uses literature, comparative research, mathematical statistics, logical analysis and other methods to deepen the research and construction of the library smart ecosystem in the "smart +" era. Analysis of levels, study the use and characteristics of smart libraries.

3.2 Experimental Judgment

Comprehensive quantitative and qualitative analysis methods. Quantitative analysis is to analyze the data of the problem, using the intuition and clear essence of mathematics to reflect the existence of the problem; qualitative is to collect, read, organize, and systematically analyze the relevant theoretical results. induction. Some standards cannot be directly analyzed in a quantitative way, but can only be evaluated using a qualitative analysis method. The assessment standard system is constructed using a combination of quantitative and qualitative analysis methods, and formulas related to standard calculations are also given. And evaluation criteria.

3.3 Statistics

All data analysis in this article adopts SPSS19.0, statistical test adopts double-sided test, significance is defined as 0.05, and $p < 0.05$ is considered as significant difference. The statistical results are displayed as mean \pm standard deviation ($\bar{x} \pm SD$). When the test data complies with the normal distribution, the double T test is used for comparison within the group, and the independent sample T test is used for comparison between the groups. If the regular distribution is insufficient, two independent samples and two related samples will be used for inspection.

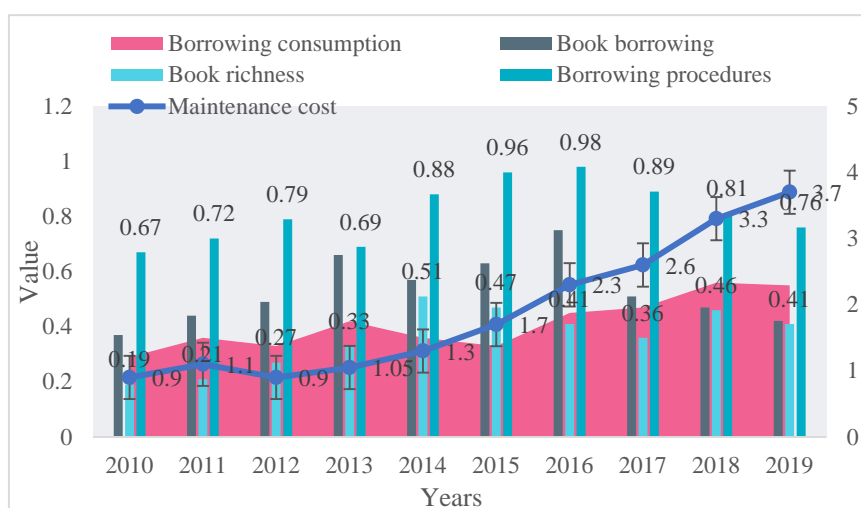
4 Experimental Analysis of Library Smart Ecosystem in the "Smart +" Era

4.1 Current Status of Libraries in Recent Years

We conducted relevant questionnaires and field surveys on the library's borrowing, maintenance cost, and convenience in recent years. We calculated the model and digitized it to clearly show the current problems in the library. The specific data is shown in Table 1:

Table 1. Current status of library management in recent years

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Book borrowing	0.37	0.44	0.49	0.66	0.57	0.63	0.75	0.51	0.47	0.421
Book richness	0.19	0.21	0.27	0.33	0.51	0.47	0.41	0.36	0.46	0.41
Borrowing procedures	0.67	0.72	0.79	0.69	0.88	0.96	0.98	0.89	0.81	0.76
Borrowing consumption	0.29	0.36	0.33	0.42	0.36	0.33	0.45	0.47	0.56	0.55
Maintenance cost	0.9	1.1	0.9	1.05	1.3	1.7	2.3	2.6	3.3	3.7

**Figure 1.** Basic situation of the library

From Figure 1, we can see that with the changes in practice, the various data of the library are changing, especially the maintenance cost is constantly increasing. In the past 10 years, the maintenance cost of the library management has increased from 0.9 to 3.7, more than 4 times, but its borrowing degree and customer satisfaction have not changed much from other time periods. This shows that the transformation and upgrading of traditional libraries is imminent.

4.2 Smart Library Under the Model

We conducted related tests on the data of the intelligent library management model, from the parameters of directivity, operability, completeness, stability and flexibility, etc., to compare with traditional libraries. The specific data is shown in Table 2:

Table 2. Comparison of various library data

	Directivity	Operability	Completeness	Stability	Flexibility
Book borrowing	0.686	0.821	0.752	0.729	0.531
Book richness	0.433	0.551	0.612	0.692	0.417
Borrowing procedures	0.522	0.668	0.775	0.715	0.787
Borrowing consumption	0.616	0.536	0.678	0.617	0.712
Maintenance cost	0.4	0.356	0.247	0.442	0.365

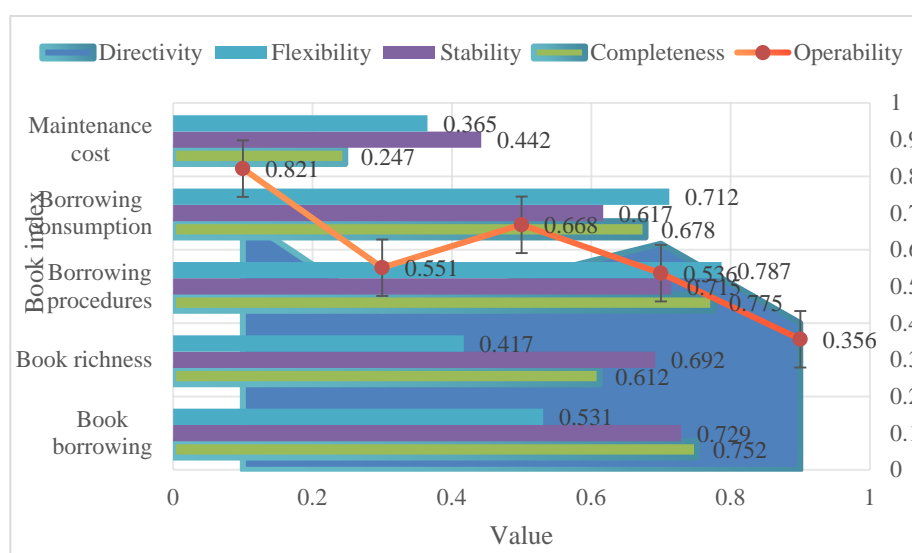


Figure 2. Smart library under the model

From Figure 2, we can see that in various parameters, smart libraries are better than traditional libraries, especially in terms of maintenance costs. Smart libraries are based on the Internet and cloud computing. Timely corrections were made to the problems of the smart library, which greatly reduced the maintenance cost of the smart library and greatly improved customer satisfaction.

5 Conclusions

With the advent of the era of big data, various algorithms and technologies related to data mining and utilization have been developed unprecedentedly and applied in various fields. The position and role of libraries in the information

dissemination link is destined to be functional in the era of big data. Upgrade, breakthrough and refined professional services. In the future, library data librarians will adopt more service methods that are integrated into the scientific research environment and embedded in the scientific research team, and cooperate with departmental personnel to combine computer technicians, data librarians, and subject librarians, so as to better to meet the diverse needs of scientific researchers.

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