

Research on Library Space Construction and Services under the Background of Smart Library

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ABSTRACT

The rapid development and application of the new generation of digital intelligence technology, as well as the continuous growth of users' personalized needs, promote the continuous innovation and reform of library functions and services. Especially with the rise of the meta-universe, the service mode of traditional library is undergoing innovation and reshaping from document service to information service, knowledge service and space service. As a "constantly growing organism", in the process of accelerating technological upgrading and deepening humanistic concepts, the concept, connotation, characteristics and construction path of smart space also develop and change. This paper mainly studies the transformation of library space construction and service under the background of the development of new generation technology and the construction of smart library, so as to better guide the development of smart space.

KEYWORDS

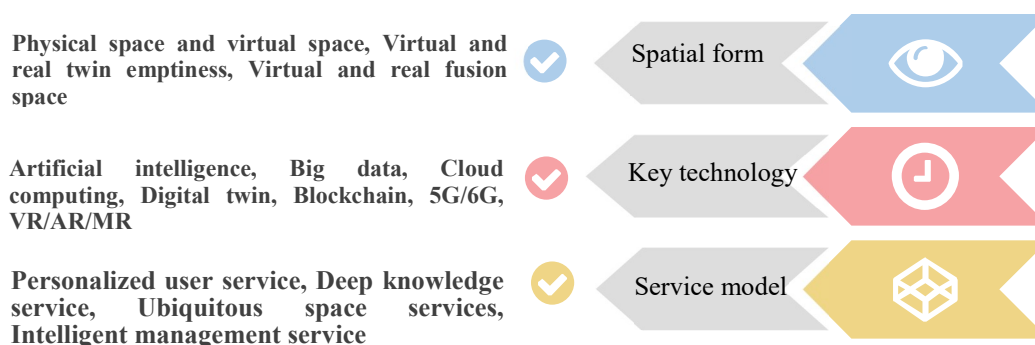
Smart Library; Space Construction and Services; International Information Sharing.

1. INSTRUCTION

Indian library scientist Ranganathan pointed out in the Five Laws of Library Science: "Library is a growing organism", which is a kind of advanced prediction of the sustainable development of libraries. And this "growing organism" is constantly innovating and reshaping with the needs of networking, digitization and intelligent development in the era of big data. The concept of smart space conforms to the connotation of smart library construction and a new round of scientific and technological revolution, and will become the spatial form of future research optimization[1].

The author believes that the so-called smart space is the product of digital intelligence technology and library space. By virtue of its human nature, experience and wisdom characteristics, it can accurately and effectively meet the diversified and fine-grained service needs of users, and gradually become a new trend of library space construction and service transformation. The form of intelligent space covers three stages of development: primary intelligent functional experience space with physical space as the main and virtual space as the supplement, intermediate intelligent service management space with virtual and real twins, and advanced metacosmic intelligent space with virtual and real integration. In terms of technology, it aims to create an immersive multi-sensory interactive experience scene with virtual and real integration for users through the enabling application of artificial intelligence, big data, cloud computing, Internet of Things, digital twin, blockchain, 5G/6G, VR/AR/MR And other intelligent technologies, and realize the global perception, ubiquitous interconnection and intelligent monitoring of library space(Table 1). In terms of service mode, the smart space is based on the people-oriented service concept, supplemented by intelligent technology, and attaches importance to the role played by the wisdom of users and the wisdom of librarians in the space operation process. Its essence is "People-oriented, technology as the wing".

Table 1. The basic elements of the Library Smart Space



2. RESEARCH ON THE SPACE CONSTRUCTION OF INTELLIGENT LIBRARY

Foreign research on smart space is earlier, in the 1990s of the 20th century, mainly from the perspective of smart space design framework, intelligent technology, intelligent equipment, and construction case analysis. In terms of framework design, Jeng TS puts forward the main framework of smart space, discusses the design and technology existing next to the smart space design, and discusses the design and technology problems existing next to the smart space design[2]. On the technical side, Sam DeLorenzo and others see smart Spaces as seamlessly interwoven sensor environments[3], creating a new sensor suite based on the Raspberry Pi that can be installed in various locations around campus buildings for collection purposes. In terms of devices, Wojcik Magdalena analyzes the current use of wearables in the library's smart space and the potential to improve the library's operational processes[4]. In terms of cases, Wang Zhongzhong introduced the experience of smart space construction of library in Brooklyn Campus of Long Island University from the aspects of needs assessment, spatial planning, building renovation and construction, and technology[5].

China's research on smart space began in 2005. Wu Jianzhong officially translated "information Commons" into "information sharing space", breaking people's cognition of traditional library space and leading the trend of library space reconstruction in the past decade[6]. In 2015, Liu Baorui et al. published an article on "Smart space" for the first time in the domestic library community, arguing that smart space is one of the five major Spaces constituting a library, which can constantly organize, integrate and order spatial knowledge through the library's self-optimization function and condense it into wisdom.

It can be seen that library construction and service has become an important research topic in the library circle.

3. LIBRARY SPACE CONSTRUCTION AND SERVICE PATH FROM THE PERSPECTIVE OF SMART LIBRARY

The degree of intelligent space will continue to affect the construction and realization of intelligent library. The IFLA Trend Report 2021 Update, published by IFLA 2022, lists the "return of physical space" as one of 20 overarching trends that will have an impact in the library sector over the next 10 years[7]. In order to better solve a series of problems faced in the construction of smart space, libraries need to specify a development strategy plan from the perspectives of technology, management, service, data and elements, clearly support the basic service concept of improving the value of spatial wisdom in the process of knowledge sequencing, dissemination and creation, and promote the integration of library smart space technology development, evaluation system, environmental perception and data.

3.1. Actively Integrate into the New Public Cultural Space Governance System

Since 2020, the impact of the epidemic and the wave of new museum construction have jointly promoted the return of the value of public space as a place of interaction. Especially in recent years, with the integration of culture and tourism as the main body led by the government, and driven by the promotion of high-quality regional economic development, the upgrading of urban cultural level and the strong culture province, public libraries have begun to integrate into the new public cultural system governance system through the integration of culture and tourism, public reading and literacy education. In the new library, non-contact palm vein recognition technology and face recognition technology are actively applied to complete reader identification safely and quickly, and RFID, AI, 5G and other technologies are used to accelerate the implementation of real-time question and answer, positioning and navigation and scenario-based service applications for space users, enriching the "small and beautiful" reading space service value system. In the new development environment, the library will continue to clarify how it can more profoundly meet the challenges faced by the government's emphasis on cultural digitization and the improvement of the efficiency of digital space cultural services through the transformation of smart space. As a library, we should take advantage of the east wind of national construction and actively integrate into the new public cultural space governance system.

3.2. Research on Smart Space Transformation of New Library

A large number of applications of smart technology in the innovation of library space services have prompted the construction of smart library to enter a substantial stage of advancement and achieved excellent results. Of course, in the transformation of smart space through the construction of new libraries in the future, there are still a series of difficult problems such as system architecture, environmental factors and data aggregation that need to be explored and solved.

3.2.1. Library Smart Space Service Architecture

The systematic design of library intelligent service is the guarantee for the effective realization of intelligent space service efficiency. The overall architecture of intelligent technology application and service mainly adopts the following modes: cloud computing architecture for deployment, ICT technology as the perspective, divided into five levels of elements and a support system, including infrastructure layer, network communication layer, platform support layer, intelligent application layer, application terminal and information security system layer[8]. Smart space service is related to the user's space use behavior experience and evaluation, and determines the effectiveness and timeliness of user space service acquisition. As Ke Yiping points out: After the test of global protests, library Wufu has developed into a "new normal of business" stage. In order to attract readers offline, it is necessary to create scene and experience space, rediscover the value of space, re-understand the library construction design, evaluate the value of space, and create a new type of space[9].

3.2.2. Elements of Library Smart Space Environment Design

The intelligent and intelligent construction of library building space is a comprehensive redesign of all design elements, including: guiding and promoting positive emotional expression through visual space perception such as color matching and interior lighting; With the help of furniture materials, noise sensors, temperature and humidity control and other effective tactile space design correct user attention, demand attention and presence; Through the division of functional areas, the space is rationally planned and the moving line is used. The design of the environmental elements listed above is not only the key content of place construction, but also the part that should not be ignored in the development of smart space at the infrastructure level.

3.2.3. Library Smart Space Data Governance Framework

In any industry, data is an important cornerstone of the architecture of the digital era, and so is the library. From "data island" to "collaborative construction", it is required to open and construct the data governance framework of smart libraries. The development and application of "small data", "dark data" and "zero data" in the operation process of smart library is the difficult part of smart spatial data management. Domestic public libraries have made some exploration, but they still need to overcome the difficulties.

4. TAKE THE APPLICATION OF DIGITAL TECHNOLOGY AS THE STARTING POINT TO BUILD A FUTURE-ORIENTED INTELLIGENT SPACE

Intelligent space is an important topic in the construction of new library space in the new era, and it is also a hot topic in academic research. At the domestic practice level, through cooperation with many external forces, the library integrates artificial intelligence, cloud computing, blockchain, Internet of Things, big data, virtual reality, 5G network and other technologies into the space, builds a new generation of smart service platform guided by the business needs of the whole life cycle of smart reading, and builds a holographic service ecological chain of "smart space + production + content + operation+extension"(Table 2). Make the smart space and service more accurate and humanized. The application of new technology has become a means for libraries to highlight their physical space service value. The spatial experience of users is mainly derived from the scene experience of using physical space or virtual space, the sense of acquisition of using space resources, and the value evaluation based on library space [7]. The development of technology has further promoted the smart space service to improve users' situational awareness.

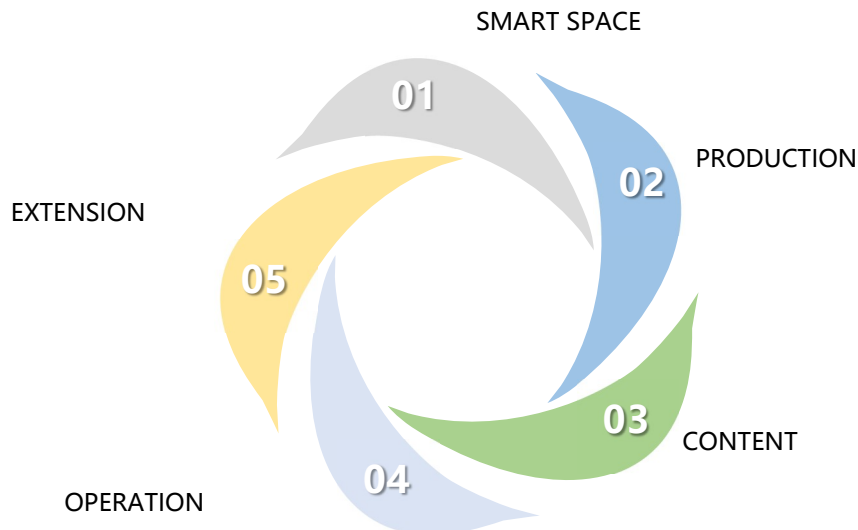


Table 2. A new generation of intelligent service platform in smart library

5. BASED ON "DATA FUSION" AND "SPACE PERCEPTION", BUILD A KNOWLEDGE SERVICE SPACE WITH VIRTUAL AND REAL INTEGRATION

The service scope of the virtual-real integrated smart space includes audio-visual scenes, cultural scenes and interactive fields. Therefore, library architects often attach importance to the abstract scale of space, such as symmetry, proportion, privacy and public, when designing smart space. And the sight, smell, hearing, touch, and even taste brought by the space. In addition to combining the local

environment, climate and green plants, the perception of these Spaces also needs to combine the local history, culture, products and other personalized elements. In addition, the personalization of smart space services also depends on the collection, storage and application of "small data" and "dark data" generated by the library in the process of space services.

6. PROMOTE THE INTEGRATION OF SMART SPATIAL DATA WITH "DEVELOPMENT AND APPLICATION" AS THE SAIL AND "OPEN SHARING" AS THE PADDLE

Library intelligent spatial data collection, storage, management and sharing is a systematic project, and there are still many difficulties to explore and solve. At present, the scope of smart spatial data mainly covers: temperature, humidity, light, noise, reader concentration and other spatial environment real-time monitoring data; Management data generated from business operations and services such as interviews, cataloguing, use of data banks, outreach and reading promotion activities; As well as readers' personal privacy data, historical borrowing and space event reservation data. Taking many established fact databases as an example, they are often faced with insufficient granularity and timeliness of data, mostly in the form of data islands, and involve many work such as data collection standards, confidentiality and sharing platform construction. China's public library community and subjective departments have also fully realized the importance of data collection and disclosure, and plan to introduce relevant industry standard guidelines. The promulgation of relevant standards will be conducive to promoting the statistics and research and development of library data space.

7. SUMMARY

Under the requirements of the transformation and development of smart space, how to reshape the future-oriented smart space system through thought leadership, value driving, technology application, service innovation, spatial evaluation, scene perception, and data integration is a comprehensive consideration that must be taken into account to realize the transformation of smart space. In particular, it is necessary to think about how to use the opportunity of smart space construction to further promote library services and teaching, scientific research and even public services in universities.

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