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## **Library New Directions in Knowledge Management : Recycling of technical design research of virtual and reality knowledge space**

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### **Abstract:**

**Objective:** *This paper focus on some new directions about management of library knowledge with a new environment including cognitive knowledge space, knowledge management technology, knowledge resource, knowledge service. It gives library profound change on entity knowledge space and virtual knowledge space and explains Internet technology, Internet plus, media tools, big data sets and others. This can re-shape the foundation, technology, tools and method to change to the new direction of knowledge management for layout library knowledge space, the means of use knowledge, information management tools and service object.*

**Method:** *Compare the changes and needs of the entity and virtual knowledge space and to reconstruct the knowledge space through reconstruction. It can analyze the theory and tools of modern information technology in virtual reality and use big data knowledge space to gather and coordinate the development of entity knowledge space.*

**Results:** *Virtual knowledge space management has the demand to access the accurate knowledge data rapidly with the ability to efficiently analyze large amounts of data, finding professional analytical methods and tool, the means of clean interpretation of serious of big data. Using available tools and methods get the evaluation results of the assessment of knowledge acquisition and reliable demand through econometric analysis. This change directly affects the Internet plus network as use tolls and collaborative control strategy. Entity space mainly as the sensory design and implementation and also focus on the timeliness of reality. Virtual space mainly use the knowledge-based data to effectively use the physical space. The actual examples shall prevail.*

**Findings and Value:** *Through the study of virtual and physical library knowledge and expounds the resource possession system of the new type library. The internal relations and external influences between big data analysis, library collection and use control mechanisms, also analysis the main factors and indicators affecting library and development of knowledge resource. Construction knowledge management and control system based on virtual environment and big data set using toll model experience and have further research on the strategy of spatial reengineering of knowledge management.*

**Example:** *knowledge management of Library*

**Keywords:** new knowledge management, collaborative space, technology virtual knowledge space, entity knowledge space

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## **Acknowledgments**

Great changes have taken place in knowledge resource construction ideas and knowledge planning of the new type library with technical development. The data types and collections continue to increase in the rich media environment, under the framework the digital library construction, which, in turn, promotes collaborative knowledge space, knowledge management technology, knowledge resources and knowledge services to the library entity knowledge space and virtual knowledge space to bring profound changes. At the same time, there are changes in information technology and resource types in the rich media environment, the new type library service framework, resource framework, knowledge chain framework, management framework (quality control framework), technical support framework, digital space knowledge framework, external support framework and so on, so it affects many fields such as environment, space, resources, new technology, management, coordination, realization process, service, use, security, preservation, outsourcing, interaction and other knowledge storage, utilization, development factors. Rich media and information technology data-based combine knowledge institutions, knowledge organization, knowledge sharing and other resource factors into reuse relations which constitute collaborative cognitive knowledge space connections ,including the rich media knowledge operation mechanism driven by new generation library of new technologies and new media technology, knowledge services and knowledge services support , resource integration (open access, institutional knowledge base), management strategy, knowledge space reuse etc.

## **1.. Virtual knowledge space environment and its construction**

### **1.1 Virtual knowledge space resource**

The new generation/type of library is not a simple stack of digital resources, but a huge library of resource, which consists of the digital representation of paper, self-built digital resources, purchasing, resources generated by the organization itself, open access to resources, network and network search resources, alliance shared resources, media resources

and media interactive resources etc. The new generation of library resources is the standard resource organization link that is the organic synthesis of multiple knowledge bases, being the combination of new generation/type of library virtual knowledge center, cultural center, education center, experience places and interactive center. In addition, it assembles with the external environment of the knowledge group clustering becoming the body of collaborative knowledge integration for the whole organic combination.

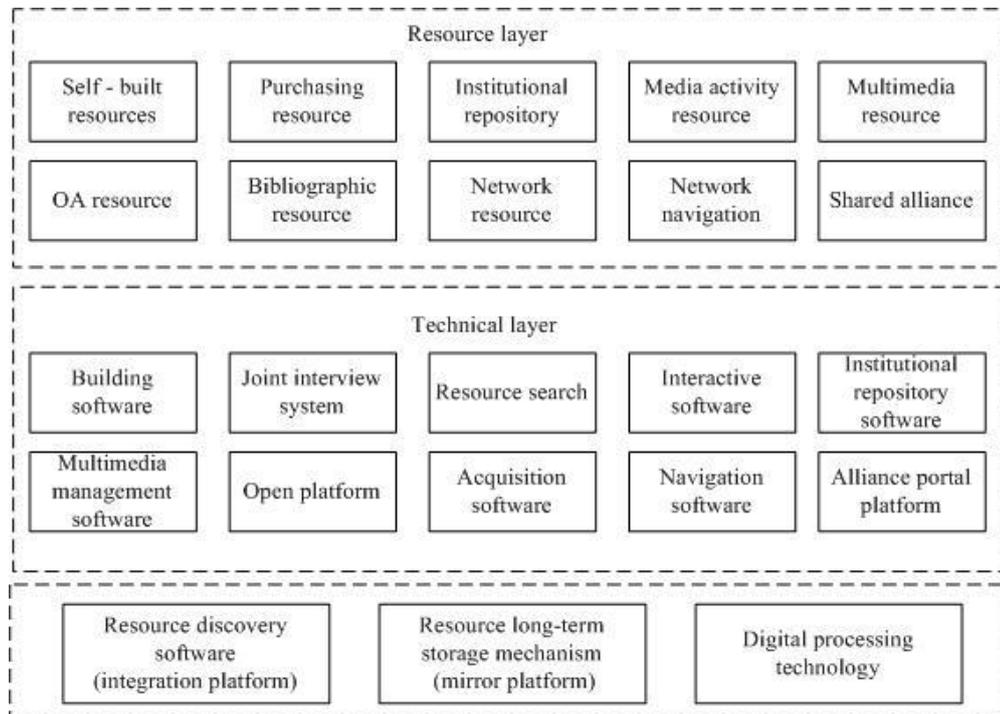


Figure 1:A new generation/type of library virtual resource framework, resource type, information technology service platform diagram

## 1.2 Virtual Knowledge Chain Framework

Knowledge chain framework is the analysis of knowledge, knowledge points, areas of research fields and its hot changes. It is based on the analysis of massive information resources, counting and analyzing literature, knowledge points and knowledge points of the co-occurrence relationship to provide a comparative analysis of multiple knowledge points. It reflects the evolution of knowledge points and trends, the attention of different times, the evolution of real knowledge points with time, finding out the relationship between knowledge points and the new research direction, trend and hotspot so as to achieve different ways and multi-dimensional visualization and visibility of the revelation.

In the coming rich media video era, readers' reception mode of visualization and interactive for knowledge becomes dominant, and content (UGC) user-generated gradually becomes a model of knowledge production and accumulation. Thus, the main strategies of multimedia UGC services in many universities focus on User extraction, analysis, active users participation in the rich media operating environment and the degree of acceptance of the body UGC service feasibility, multimedia production environment, information sharing space and librarians involved in depth etc.

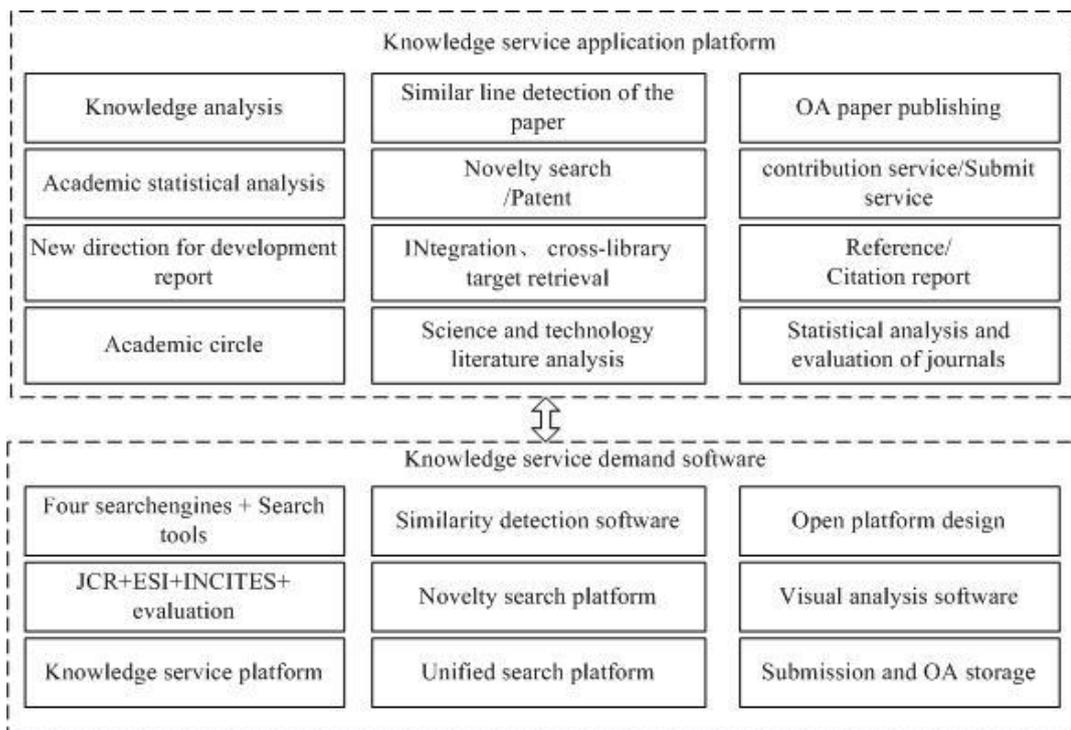


Figure 2:New generation/type library knowledge chain framework requirement, knowledge chain technology environment relation diagram

Focus on the organization, association and analysis, measurement, evaluation, presentation and service of literature, data, information, information and knowledge so as to achieve knowledge organization, knowledge evaluation, knowledge link and interactive knowledge services.

### 1.3Virtual Knowledge Management Planning Framework (Knowledge Quality Control Framework)

Library multimedia digital resource management accesses knowledge resource layer through itself rich media, and this digital resource management system is made on the relevant international standards. Resource management are mainly responsible for the following: firstly, classify, integrate and release network resources; secondly, integrate the various heterogeneous digital resources to form a unified search and use of the interface; then, release digital resources processed and indexed; at last, manage data, digital rights management and digital objects. In the rich media period, the new generation library virtual space management will improve the support management for interactive resources with the process of automatic interaction management increased by the resource.

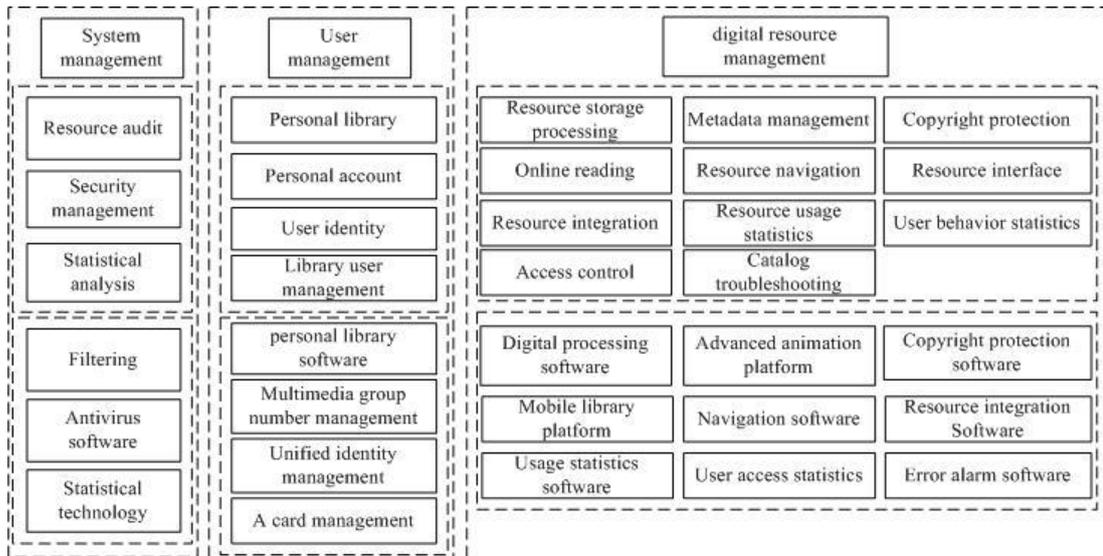


Figure 3: New generation/type of library management chain framework needs, management technology environment diagram

#### 1.4 Technical support framework for virtual space

During the process of construction environment of the digital campus, the new generation/type library is embedded in the support platform of the digital campus, which is shared by both the basic platform and the application layer. On the basic platform, network system relied on campus, pipe network system, Host storage, database middleware, cloud platform collaborate through the campus OA.

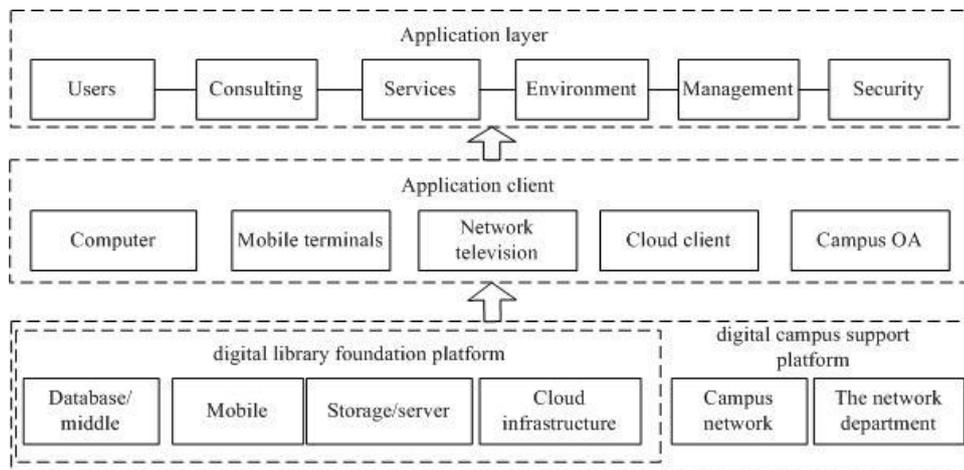


Figure 4: A new generation/type of library technology support framework based on information technology application relationship diagram

## **2. Reconstruction of physical space and construction of knowledge environment**

### **2.1 The content of physical space reconstruction**

In this new era, "space reconstruction" has become the important measures for library's transformation and upgrading with the rapid development of informatization, globalization, open access, cloud computing etc, and all kinds of ideas and new concepts such as passenger space, the innovation space, the space, flow space appear constantly. However, the current practice of library space recycling, more is barely limited to the transformation of the premises, that is, planning or making some unique learning and exchange of physical space in the library.

### **2.2 Collaboration of physical space with virtual space**

It is more important for realistic knowledge space integration and collaborative development. If some the design concept of intelligence library, such as intelligent service system, self-service system, automatic management system, large data analysis guide system, robot guide system etc are fully introduced and applied to the practice of space reconstruction, then , the collaboration of physical space with virtual space is adapt to the needs of library changing needs during the modern transition period, providing reader with personalized collaborative knowledge reading space so as to merge the construction of the intelligent library into our physical and virtual space reconstruction process.

### **2.3 Collaborative development concept of framework for physical and virtual digital space**

For the study of library science and the practice of the industry, Collaborative development concept of framework for physical and virtual digital space still need to further explore. Therefore, it is necessary to carry out research and exchange of virtual + real space reconstruction theory, virtual + realistic space design principle, virtual + real space layout and space reconstruction practice.

Direction of knowledge management for new generation/type of library, together with spatial cognitive knowledge, knowledge management technology, knowledge resources and the new environment of knowledge service, brings profound changes to the library physical space and virtual knowledge space. Compared with the change of physical knowledge space and virtual space and requirements, build knowledge space by space reconstruction in virtual reality to find and use big data knowledge space, gathering data to incorporate the development of collaborative knowledge physical space. Virtual knowledge space management need to quickly obtain accurate knowledge of data, and users need to evaluate the demand for knowledge acquisition and reliable evaluation results, so this changes directly affect the use of Internet + and network tools as well as coordinated control strategy. The physical space is based on sensory design and implementation, focusing on timeliness of the reality, while the virtual space is based on the use of data knowledge, effectively cooperating with the utilization of physical space. For development and use of space, library knowledge resources control the main factors and indicators, building knowledge management and control system based on virtual environment, large data sets using the tooling model. New generation of library implement the new scheme on space reengineering strategy.

### **2.4 External auxiliary knowledge management framework**

The first part is office automation software that is collaborative office (OA) software, OA's main functions are: task collaboration, unified office window, team communication and execution, business knowledge base, self-work management, integrated knowledge integration. The development trend of OA in the future is diversified, collaborative operation

tendency, and it can achieve the process approval function, integration, cloud services, data decision analysis, unified office portal and other multiple functions.

The second part is the library automation hardware, such as: self-help learning system, self-help search system, self-help guest room, self-help by the machine, reading newspaper machine, self-service system borrowed (self-service printing, photocopying, scanning), 3D printing, requirements, printing, Automatically play screen, etc

The third part is space auxiliary equipment and software, such as: information sharing space (personalized learning room), video conferencing room + visual wall, unattended reading room. Software such as: three-dimensional library space (virtual library), seat management system, learning management system, digital signage system.

### **3. Case of collaborative use of virtual knowledge Spaces**

#### **3.1 virtual space student self-learning system**

One of design cases : freshmen always harbor a good dream for the university and its library after they have got a letter of admission. They won't get to know about the library during the orientation given by librarians until they get enrolled. The design of the university library's self-service cognitive learning system for freshmen is aimed at training them to know about the library and to realize the objective of self-directed and individualized study that they can learn anytime anywhere before they start their college lives, which essentially changes the traditional learning mode, that is, only in the library can students perform acts of learning.

Different education modes are shown by designing virtual scene learning links and system, which enables freshmen to use self-learning, game based learning, and diversification of learning so that they can recognize these education modes from libraries. Then it describes a self-service freshman-library-entry learning system by using virtual-reality 2.5D (Pseudo 3D) technology to implement the teaching and scene interaction based on the animation and plug-ins, which contain micro films, videos, virtual reality, courseware, e-books, expert lectures, questions and answers. With the guidance of ASP+Ajax+Flash integral system, the technology makes freshmen obtain knowledge by using conventional digital teaching methods. At the same time, it innovates users' learning modes by embedding "living library" and "second life".

Thus, all library freshmen are able to have an autonomous, web-based and real-time study. The system platform consists of eight parts: emotional cognition, visual perception, scene blending, imitation learning, virtual scene, MOOCs class, Q & A test, and self-presentation. Therefore, readers can use the library to acquire information quickly, accurately and efficiently. For example, readers can have a free access to every corner of the library through the network by using the library virtual scene module, and unknowingly acquire knowledge about library by using media presentation module. As such, the system is introduced to a number of other universities.

The design considers the following aspects:

① The online self-service learning is realized in the virtual library by using web- and media-based computers and mobile phones.

② A variety of media means, such as virtual reality, streaming media, and network communication technology, are used to facilitate the reader to achieve a good learning effect in visual, aural, tactile and other areas.

③The fragmentation of learning content is to attract readers' interest and to ensure their learning at any time.

④With "Living Library" and "Second Life" learning modes built into, the system is integrated with such functions as training, learning, games, incentives and interaction to spur freshmen's enthusiasm of learning.

⑤Learning effect is evaluated by using accumulated point subsystem as an auxiliary means.

⑥Virtual reality technology allows students to experience real-life situations, so that students can take the initiative to participate in the process of exploring the library.

⑦The online picture wall allows students to present themselves and to express their reflections.

The design and its effect of self-service freshmen library training system in China University of Mining and Technology:

①Visual Perception consists of Watching freshmen library entry training videos. Under the guidance of message from the curator, students begin to explore a vast of the ocean of knowledge in the voyage of the library. By educational videos watching, generalization from the library, the use of rules and documents, information searching, space utilization and so on, students have a preliminary understanding of the library.

②Emotional Cognition consists of watching library microfilms. Library microfilms tell two real stories happening in the library. One is "paper for you"(paper is a harmonic tone with only in Chinese, pronounced zhi ): the guide of notes and paper in the story teaches students to find books by transcribing the call number, so the story enlightens students to grasp searching skills of the library. The other story is about the aquarium and the student who like the library was sent a little aquarium. The story is told in metaphorical terms. Fish was like students and water was like the ocean of knowledge, Close as fish deep. By watching the library microfilms, students will like the library and love knowledge here.

③Scenes: Entering the virtual library. The virtual library is a virtual scene shown by the ratio of 2.5-dimensional of a reality library, rendering mainly in the "Second Life" mode. Under the leadership of a virtual guide, freshmen can have an immersive experience for the layout of the library. During the process of the use, the guide may make an interaction task and Q & A(question and answer) in the form of checkpoints. The organization of the library, the spatial layout, and the use equipment, etc. will be kindly shown to freshmen. Through the way that what you see is the answer, their understanding of the library can be strengthened. A picture wall is set up where there are classic photos of the library. Freshmen can also publish up their photos and favorite pictures on the picture wall. The library is better understood by showing each other and feeling love.

④Inscription Learning: courseware. Courseware of self-service freshmen-library entry training is also an introduction to the library overview, library resources, electronic resources and borrowing rules. Its special is the civilized part of the convention with "we do not recommend ... .." "We do not want ....." "How will we choose ... .." and so on in the form of pictures to show freshmen. Civilized behavior is promoted and a harmonious environment is created. E-books: E-books are mainly introduced into library in detail in the form of texts. The first part of the e-book is about checkpoints to win points. The second part does not take the exam, which is an encyclopedia about the library where the use of the library, borrowing rules, Collection / electronic resources, rules and regulations will be described in detail, so that freshmen will have a comprehensive understanding of the library.

⑤Mu-class Classroom + micro lessons + reading promotion-Contemporary Famous Expert Perspectives: is commonly referred to "Living Library" video modes. The readers here don't read books in the traditional sense, rather than act as the real people. Drawn on masters' thought, freshmen can enjoy a spiritual feast here, such as counseling, college rituals, classic literature, etc.

⑥Open-book test: Library FAQ browse(Frequently Asked Questions). Students, who browse frequently asked questions, can find the answers of some detailed questions such as the library use, and borrowing rules.

⑦Interactive Learning - Real Time Answer: for other unknown problems or questions, you can look for answers through a virtual reference system or get answers by interacting real-time questions and answers.

The Self-service freshmen library entry training system is designed and implemented by multidimensional means to achieve online learning.

#### **4. The case of physical knowledge space application \_\_ physical space robot service system**

##### **4.1 The second design case: intelligent robot: finding the needed book gets easy by using RFID technology**

It often takes much time (and many people) to sort and check books, which is the most difficult part in library management. A librarian will make a mistake during his or her job no matter how carefully he or she does, as so, readers who come to borrow books will often miss the ones needed. A new type of intelligent robot for book management was successfully invented in Nanjing University, and it solves the above question. That is, intelligent robot is able to find book quickly and accurately.

Intelligent robot includes three parts: scanning devices, smart computers and smart bookshelves online with the query system, and it is in charge of collecting book information. A librarian put books to be sorted on the smart bookshelf below the robot, manipulating it walking. The intelligent robot identifies and displays the RFID tag information for each book, guiding the staff to the correct placement of the books for manual sorting. Readers can know the precise location of books required by query system even if before librarian could reorganize books, because the information the robot books scanned and stored is shared in the network.

The sorting and checking will be greatly improved by using intelligent robots, as it can make up for many disadvantages that artificial identification code is finished with error and omission. It is estimated that one intelligent robot can read two hundred thousand books of accurate information at the rate of two layers of a bookcase every time, that is, it can finish the work overnight, which can't be done by librarian.

##### **4.2 The second design case: intelligent robot: targeted reception and real-time consultation**

Targeted reception is finished by matching the library information consultation and intelligent robot, with the combination of laser sensor for autonomous navigation and library space position located by magnetic navigation. It can speak simple greetings by installing voice system at the same time. Relevant mobile APP is installed to undertake remote consultation service and so on.

#### **5. Conclusion**

The design implemented by new generation/type of virtual and physical library knowledge management space focuses on a variety of digital resources or non-digital resources in the library and the internet, offering readers convenient and efficient knowledge service mechanism as its purpose, as well as providing a set of advanced, practical and efficient solutions which is centered around digital resources processing, storage and management of digital resources and accessing to digital resources and services. It is to achieve the following:

Optimize the reader the configuration of space and ground: that is, expand available space for the reader in order to provide infrastructure for the reader, including: sufficient bandwidth and power systems, the ubiquitous wireless Internet equipment, open up larger space as digital public area, including multimedia appreciation space. The importance of library space shows that the value of space design is greater than that of paper literature layout.

System integration and data reuse: establish integrated link systems that provide integrated and one-step acquisition services at the content level of the literature; Provide an academic recommendation link based on user behavior (utilization) so as to offer reader a multi-data source aggregation navigation service and portal system.

Improvement of digital infrastructure platform and the online platform: the platform is adapt to the trend the rapid development of mobile Internet users.

Upgrade of digital resources: it is necessary to display and to reuse of resources, especially for the application of the original carrier, mobile carrier, visual carrier.

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