Multi-space Design of University Libraries from the Perspective of Maslow's Hierarchy of Needs Theory

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Abstract: With the in-depth development of information technology and the higher requirements of talent training for high-quality development, university libraries are facing the challenge of role and function transformation. At the same time, the user needs of university libraries are increasingly diversified, evolving from the utilization of library resources and the usage of learning and working spaces, into collaboration, sharing, innovation, social contact, experience, display, cultural exchange, intangible cultural heritage protection, emotional healing and others. Based on the literature research results and the user needs analysis, this study proposed to divide the multi-space of university libraries into six parts: collection space, learning space, office space, maker space, exhibition space and healing space. Then, from the perspective of Maslow's Hierarchy of Needs Theory, the specific needs of the six spaces in five levels of physiological, safety, love and belonging, esteem and self-actualization are analyzed. Finally, the corresponding design strategies were proposed to help university libraries transform and upgrade their roles and functions, and enhance the user experience.

Keywords: University Libraries; User Needs; Multi-space; Design Strategies; Maslow's Hierarchy of Needs Theory

1. Introduction

As the information center and learning space of colleges and universities, the library is one of the most frequently used on-campus venues for students and teachers. Its space design is the basic premise to realize all kinds of services. With the in-depth development of information technology and the higher requirements of talent training for high-quality development, university libraries are facing the challenge of role and function transformation. According to the "Compass of Academic Library Modernization (CALM) Report on Resource-Service Integration" jointly formulated by the Steering Committee for Academic Libraries of China and Peking University Library in 2025, over the past three years, university libraries have focused on creating research and training spaces, immersive cultural spaces for exhibition and other purposes, knowledge sharing and academic exchange spaces, and additionally, they are actively exploring new scenarios that seamlessly blend resources and services [1]. The report not only pointed out the challenges faced by university libraries in space design, but also clarified the optimization direction for the upgrading and transformation in space services.

2. The Increasingly Diversified User Needs of University Libraries

With the rapid development and upgrade of internet communication technology, users can conveniently and efficiently query and obtain electronic resources of collections remotely, as well as enjoy or reserve various library services online. The functions of university libraries have evolved from the protection and utilization of library resources and the provision of learning and working spaces into diversified services including collaboration, sharing, innovation, social contact, experience, display, cultural exchange, intangible cultural heritage protection, emotional healing and so on [2-4]. In other words, the role of contemporary public libraries has shifted from information providers to place creators [5]. Therefore, the space design of university libraries needs to fully investigate the use scenarios and core demands of target users, and use diversified and clear space design to meet the needs of target users, so as to transform and upgrade their roles and functions.

3. Maslow's Hierarchy of Needs Theory

Maslow's Hierarchy of Needs Theory was first proposed by Abraham Maslow in 1943. The theory divided human needs into five levels that rise from the bottom up in a pyramid, namely

physiological, safety, love and belonging, esteem, self-actualization [6]. This theory was widely applied in various research fields, especially in the study of psychology, user experience and human-machine interaction.

Scholars have tried to apply Maslow's Hierarchy of Needs Theory to the space design of university libraries. Based on Maslow's Hierarchy of Needs Theory, Yu Wei et al. divided the learning space of university libraries into basic guarantee space, collection space, learning space and expansion space [7]. Li Sainan et al. divided the future learning space framework of university libraries into basic guarantee layer, advanced expansion layer and core leap layer [8]. Li Xin et al. disassembled the learning space framework of university libraries into basic element layer and core service layer, and put forward construction strategies, including planning space construction scientifically, striving to improve user experience, building multiple social platforms, and innovating academic support services [9]. Deborah Lynn Christoffersen et al. established a corresponding relationship between the university libraries learning space attributes and Maslow's Hierarchy of Needs [10]. The above researches were constructive attempts to apply Maslow's Hierarchy of Needs Theory to deconstruct the user needs of university library learning space and put forward space construction advices. However, the above researches had certain limitations. They focused on the learning space of university libraries, and did not take other user needs into account, such as experience, display, cultural exchange, intangible cultural heritage protection, emotional healing and other aspects. This study will use Maslow's Hierarchy of Needs Theory to deeply analyze the diversified user needs of university libraries and propose more comprehensive space design strategies.

4. The Multi-space Design Strategies of University Libraries

Based on the guidance of university library space resource construction from the "Compass of Academic Library Modernization (CALM) Report on Resource-Service Integration" [1] and the "Compass of Academic Library Modernization" [11], as well as research by Gong Jiaoteng et al. on the spatial scenarios

construction of the future learning centers in university libraries [12], research by Yu Wei et al. on the division of university library learning space [7], research by He Li on the space design of intangible cultural heritage inheritance in university libraries [3], research by Liu Jingdian et al. on the emotional healing spaces in public libraries [4], and user needs analysis, the multi-space of university libraries was divided into six parts: collection space, learning space, office space, maker space, exhibition space and healing space. The discussion on the design strategies of multi-space was combined with Maslow's Hierarchy of Needs Theory, and the user behaviors and preferences were fully considered, so as to meet the user needs at different levels and optimize user experience. The corresponding relationships between the multi-space and the user needs was shown in Table 1-3. The physiological and safety needs are the most basic levels of needs and are necessary for all spaces. In order to meet these two needs, space design should ensure the provision of stable and reliable basic supply, such as water, electricity, lighting, ventilation, temperature and humidity regulation, communications, networks, toilets, cleaning, elevators, signs, emergency medical care, fire protection, safety guidelines, and fully consider the human engineering factors, so as to provide appropriate and intimate services for different groups of people on an equal basis. When discussing the design of specific spaces, if it involves physiological and safety needs, the above content will no longer be repeated, but only the content that is not involved or needs to be refined will be discussed.

4.1 Collection Space and Learning Space

Table 1. The Corresponding Relationships between Spaces and User Needs – Part 1

Space ＼ Needs	Collection Space	Learning Space
Self-actualization		✓
Esteem		✓
Love and Belonging		✓
Safety	✓	✓
Physiological	✓	✓

The collection space is the most basic space of university libraries, which stores a large number of resources of various media. In order to analyze its corresponding need levels, we should first clarify its corresponding user groups. The managers of the collection space are librarians, and the users are mainly students and teachers.

From the perspective of librarians, the main goal is to improve the utilization rate of collection resources under the premise of protection. From the perspective of students and teachers, the main goal is to swiftly and accurately locate specific library resources and easily obtain them. The corresponding needs of the collection space are mainly physiological and safety levels. In the collection space design, in addition to the general physiological and safety requirements, matters to be considered include but are not limited to:

(1) The resources of different media may have different requirements for storage environment. Special attention should be paid to ventilation, temperature and humidity, fire protection, etc. The health effects of these designs on users should also be evaluated;

(2) The planning of activity routes should pay attention to the availability of the identification system, avoid users' sense of loss and help to reduce useless or stray wander;

(3) The design of work space for arranging and maintaining the collection resources should pay attention to ergonomics, to help improve work efficiency and reduce potential occupational injury caused long working hours or repeated actions;

(4) With the advantages of quietness and privacy, the collection space can share a part for individual learning. The space design should try to reduce the sense of depression caused by the collection layout to the learning activities, and also consider the adverse effects of human activities on the storage environment.

The main target users of the learning space are students and teachers, and the core need is self-actualization. In order to help users achieve self-actualization, the learning space should first meet the physiological and safety needs to create a basic environment for learning. On this basis, through user-centered design, users are provided with emotional values such as belonging and esteem. Finally, it is possible to help users achieve the ultimate goal of self-actualization. In other words, the needs cover all five levels. It should be noted that the mission of the learning space is to provide users with space and related services to create favorable environment and conditions for self-actualization, rather than directly realizing self-actualization. From the perspective of spatial attributes, the learning space can be further divided into the individual learning space and the collaborative learning space. In the learning space design, in addition to the general physiological and safety requirements, matters to be considered include but are not limited to:

(1) The individual learning space design should pay attention to the quietness and privacy. Facilities follow ergonomics and appropriate combination of natural light and artificial light will help users reduce the fatigue. The noises should be blocked to a certain extent or covered by some white noises to reduce the external interference. Through an immersive learning environment, users can feels care and respect, and generate a positive emotional connection with the space;

(2) The quietness and privacy required by the individual learning space may reduce the space utilization rate and increase the construction cost, so it is necessary to balance and limit the design strategies. For example, the individual learning space can be layout near the collection space;

(3) Some disciplines require special furniture or facilities, such as drawing tables and chairs, moot courts, etc. If the space resources are sufficient, a certain degree of customization can be provided based on the needs of disciplines, to help users train their professional skills;

(4) The functions of the collaborative learning space include learning, cooperation, sharing, discussion, social contact and others, which may make noises and vibration that interfere with other spaces. Therefore, the space design should pay attention to the sound insulation, vibration elimination and relative issues. The location can be selected in the relative edge of the libraries, or near the convenience stores, tea room, bathroom and other locations;

(5) The collaborative learning space needs to be well divided internally to reduce the mutual interference between different learning groups. The software and hardware facilities supporting discussion, brainstorming, communication, recording, display and other collaborative activities should be integrated into the space, providing users with freedom and convenience to share inspiration, collaborate and promote common progress;

(6) Constructing academic lecture halls is a conventional solution to support academic exchange and knowledge sharing.

4.2 Office Space and Maker Space

The office space is the core activity space of librarians, where they complete work tasks,

communicate, cooperate, improve professional skills, strive for career development goals, and obtain organizational belonging and recognition. In other words, the needs cover all five levels. The office space can be divided into the internal office space and the external service space. The internal office space is the place where librarians work on a daily basis. The external service space mainly provides users with consultation and self-service. In the office space design, in addition to the general physiological and safety requirements, matters to be considered include but are not limited to:

(1) The office space is the place where librarians work all the year round. It is necessary to pay attention to the design of fatigue relief and occupational injury prevention, so that users are willing to work there and have a sense of belonging;

(2) As an external display window of universities, the libraries often need to hold activities of exchanges and visits, so the location selection of the office space should consider the design of the tour routes. The tour routes should not only guide visitors to efficiently shuttle between various spaces, but also be easily connected to the office space for in-depth communication, and not cause too much interference to other spaces;

(3) The office space can be roughly divided into the individual workspace and the collaborative workspace. Actually, work exchanges and communication often occurred in the individual workspace, the requirements for quietness and privacy are likely between the individual learning space and the collaborative learning space. These two workspaces should be located close to each other, but the space design should try to reduce the interference to ensure an appropriate work immersion for the individual workspace.

Table 2. The Corresponding Relationships between Spaces and User Needs – Part 2

Space \ Needs	Office Space	Maker Space
Self-actualization	✓	✓
Esteem	✓	✓
Love and Belonging	✓	✓
Safety	✓	✓
Physiological	✓	✓

The maker space is an incubation place for innovation and entrepreneurship. Its core task is to provide a platform with good entrepreneurial atmosphere for cooperation, development,

display and commercialization, rather than substitute the research and development function of professional laboratories. The user needs of the maker space show strong self-actualization characteristics. In the process of innovation and entrepreneurship, confidence, courage, integrity, self-esteem, self-driving, open mind and team cohesion are essential qualities, which means that the user needs of the maker space cover all five levels. In the maker space design, in addition to the general physiological and safety requirements, matters to be considered include but are not limited to:

(1) Display is an important attribute of the maker space. The location should be close to the exhibition space, and be integrated into the tour routes to increase the exposure;

(2) Users of the maker space have strong need for frequent external communication. The space design should pay attention to sound insulation, vibration elimination and other issues, reduce mutual interference with other spaces;

(3) Innovation and entrepreneurship need to overcome many difficulties, and people need emotional supports. Natural elements such as sunshine, breeze, running water and plants can be integrated into the space design to help users relax tension, feel care and love, and generate positive emotional energy;

(4) The maker space can integrate elements such as installation art, landscape, and semi-open space to stimulate inspiration. Presenting cases of innovation and entrepreneurship can be a way to enhance self-efficacy.

4.3 Exhibition Space and Healing Space

Table 3. The Corresponding Relationships between Spaces and User Needs – Part 3

Space \ Needs	Exhibition Space	Healing Space
Self-actualization	✓	
Esteem	✓	✓
Love and Belonging	✓	✓
Safety	✓	✓
Physiological	✓	✓

The exhibition space is the expansion space of university libraries, which has the important function of cultural exchange and inheritance. The exhibition objects can be research achievements, inventions, literature, artworks, awards, intangible cultural heritage projects, alumni collections and so on, which can enrich people's spiritual life and show the spiritual outlook of the universities. The display form can

be combined with physical and virtual simulation. The users of the exhibition space are mainly three categories: curators, exhibitors, and visitors. For the first two types of users, their needs cover all five levels. Curating is a comprehensive work, which coordinates the needs of different parties and requires high professional abilities, leading to the sense of accomplishment and self-actualization. For exhibitors, the opportunity to display their achievements, works and collections is a kind of respect and recognition. For visitors, the main purposes of visiting the exhibition are to relax, broaden horizons, socialize and promote thinking and does not involve the need of self-actualization. In the exhibition space design, in addition to the general physiological and safety requirements, matters to be considered include but are not limited to:

(1) The route design of the exhibition space includes both how to integrate into the overall visit routes of the libraries and the internal visit routes;

(2) The exhibition will be updated from time to time, which may change the decoration and need to handle and replace exhibits. Separate import and export for curating should be set up, and problems of sound insulation and vibration elimination should be pay attention to;

(3) Sufficient power supply and high-speed networks are required, so as to support the diversified needs of lighting and audio, as well as the expansion of virtual reality display;

(4) Some exhibits require accurate control of temperature, humidity and light;

(5) Reserve private space for exhibits storage;

(6) Set up reliable video surveillance points.

The healing space is an expansion space for emotional adjustment, helping users to establish a sense of belonging and identity, which can be treated as a part of the construction of spiritual civilization. The mental health problems cannot be ignored in today's fast-paced, high-pressure and competitive society. In addition to active interventions such as psychological scales, counseling and drug treatment, indirect emotional healing through the environment is also emerging. Space for emotional healing involves four levels of needs: physiological, safety, love and belonging, and esteem. The healing space provides users with a safe and comfortable environment, and through caring design, makes users feel love and esteem, and generate a sense of belonging. The direct goal of

the healing space does not include self-actualization, because this is a space that helps users temporarily put down their tasks, relieve stress, care for and accept themselves. Although it may have indirect help for self-actualization, self-actualization is still not the focus of its space design. In the healing space design, in addition to the general physiological and safety requirements, the matters to be considered include but are not limited to:

(1) The healing space does not necessarily need to be built as an independent space. Emotional healing elements can be integrated into the design of any other spaces, including the blank space, or a space for emotional healing can be built within other spaces;

(2) The healing space design can be realized through visual guidance, spatial order, color matching, material texture, light, pleasant fragrance, white noises, natural landscape, installation art, interactive virtual reality experience and other means, to create a slow-paced and low-pressure space experience, which helps users dredge negative emotions and realize self-reconciliation.

5. Summary

This study first analyzed the increasingly diversified user needs of university libraries. Combined with the literature research results, the multi-space of university libraries was divided into six parts: collection space, learning space, office space, maker space, exhibition space and healing space. From the perspective of Maslow's Hierarchy of Needs Theory, the user needs of the six spaces were analyzed, and the corresponding design strategies were put forward. It had certain reference significance for the upgrading and transformation of roles and functions, as well as the improvement of user experience.

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