Construction and Reflections on New Functional Experience Spaces in University Libraries: A Case Study of Shenyang Normal University Library (Postprint)

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Abstract

[Purpose/Significance] Space renovation has become an inevitable path for the transformation and development of university libraries, and new functional experience spaces constitute one of the core values of libraries.

[Method/Process] Based on an elaboration of the connotation and characteristics of new functional experience spaces, this paper introduces a brief overview of experience space construction in domestic university libraries, and taking the construction and service of the new functional experience space at Shenyang Normal University Library as an example, proposes in-depth reflections on the construction and service of new functional experience spaces.

[Results/Conclusions] Resource services, space services, and human-centered services have become the hallmark characteristics of university library services in the current era. With the in-depth development of space renovation and service innovation in university libraries, the establishment of a new functional experience space is highly necessary.

Full Text

Construction and Reflection on New Functional Experience Spaces in University Libraries: A Case Study of Shenyang Normal University Library

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Abstract:
[Purpose/Significance] Space transformation has become an inevitable path for the transition and development of university libraries, with new functional experience spaces representing one of their core values. [Method/Process] Based on an elaboration of the connotation and characteristics of new functional experience spaces, this paper introduces the general situation of experience space construction in domestic university libraries, and uses the construction and service of the new functional experience space at Shenyang Normal University Library as a case study to propose in-depth reflections on the construction and service of such spaces. [Result/Conclusion] Resource services, space services, and people-oriented services have become the defining characteristics of contemporary university library services. With the deepening development of space transformation and service innovation in university libraries, creating a new functional experience space is highly necessary.

Keywords: spatial reengineering; VR technology; new functional experience space; active learning

Space transformation has gradually become a focal point of attention in the university library community. Whether constructing new buildings or renovating old ones, libraries require scientifically planned layouts for a new era. Guided by the development concepts of new services, new spaces, and new experiences, various novel spatial forms have emerged, notably the quiet birth of "experience spaces," "functional spaces," or "maker spaces" in some university libraries, which the authors collectively term "new functional experience spaces." The industry currently lacks relevant standards and transformation models for space renovation, as well as evaluation mechanisms for design effectiveness and functional value, with most libraries adapting measures to local conditions and feeling their way forward. The *NMC Horizon Report: 2017 Library Edition* identifies "rethinking library spaces" as a mid-term trend driving technology adoption in academic and research libraries, emphasizing the importance of physical space transformation [1]. Therefore, reflective research on new functional spaces holds significant meaning. This paper uses the "new functional experience space" at Shenyang Normal University (hereinafter referred to as "SYNU") Library as an example, analyzing its construction and application from spatial characteristics and functions to reflect on the gains and losses of space construction services, aiming to provide inspiration and reference for future functional positioning of university library spaces.

1 Connotation and Characteristics of New Functional Experience Spaces

University library space transformation originated in the United States. After more than 20 years of development, relevant research and practice have achieved certain progress, yet few studies have explored the concept of "new functional experience space." Searches on CNKI using "university library multifunctional space" as the search term yielded only three relevant documents, with content

essentially unrelated to new functional experiences. Using "university library experience space" retrieved eight documents covering various new spaces different from traditional ones. Using "university library maker space" retrieved 212 documents, with 190 being relevant, indicating abundant research on maker space construction since 2014. However, searching for "university library new functional experience space" yielded zero results, suggesting this concept has not yet gained scholarly recognition and attention.

1.1 Connotation of New Functional Experience Spaces

The connotations of new functional spaces, maker spaces, and new functional experience spaces share similarities and differences: (1) Similarities: All are dynamic, open, interactive functional spaces; all are experimental spaces equipped with networking and new intelligent tools; all gather readers with shared professional interests; and all represent the integration and transformation of physical spaces, digital spaces, information platforms, and technical teams. (2) Differences: The term "experience" is directly incorporated into the name of new functional experience spaces, emphasizing that the primary function is "experience," implying that readers not only learn new functions but also engage in a relaxed and enjoyable experience that can reduce psychological burden and facilitate pleasant learning. New functional spaces and maker spaces, while not containing the word "experience," do not necessarily lack experiential processes in practice, but they tend to convey a sense of seriousness and heaviness to readers.

Based on this understanding, SYNU Library adopted "new functional experience space" as the proper name for its renovated space. Its design philosophy and service path follow the formula: new space + internet + intelligent tools smart space, and smart space + hands-on practice + technical guidance various experiences including language and technology, image and technology, design and technology, creation and technology, and research and technology. This represents a space-for-experience approach under modern technological conditions. Such spaces are not centered on physical books but on experiencing new tools and technologies, combined with professional direction creativity, communication, and interaction. While not uncommon in university libraries—with variations in name, equipment scale, and service quality—they are substantially similar and share consistent service objectives. Therefore, this paper uses "new functional experience space" as a unified term for such spaces in university libraries nationwide.

The emergence of new functional experience spaces is inseparable from China's "mass entrepreneurship and innovation" strategy. To promote this national initiative, the State Council explicitly designated 26 universities and research institutions as demonstration bases [2], undoubtedly pointing out a new direction for university library space transformation. Through the demonstration effect of these bases, many university libraries have adapted to their circumstances and created new functional experience spaces, albeit under different names. For

instance, East China University of Science and Technology calls it "Innovation and New Technology Experience Space," Shanghai Jiao Tong University calls it "New Technology Experience Zone," Zhejiang University calls it "System Experience Space," and University of Electronic Science and Technology calls it "Innovation Laboratory." The essence of these spaces is an open technology laboratory, driven by three converging forces: (1) industry demands and reader needs; (2) technological drivers such as artificial intelligence, blockchain, and big data; and (3) innovation drivers like creative education and innovation capability. Through replanning, functional upgrading, and service optimization, new functional experience spaces transform libraries into more knowledge-based, humanistic, and intelligent spaces, providing opportunities for interested and capable students to access various new electronic devices, tools, and technologies, and offering physical spaces for project-based creative development [3]. Physically, new functional experience spaces are relatively independent, fully equipped practical operation areas. Based on equipment such as iMacs, iPads, 3D printers, HP all-in-ones, digital pianos, phonographs, 4K high-definition readers, and computers, different equipment reflects different spatial experience directions and functions. Spiritually, they embody concepts of cooperation, sharing, and creation among students, providing authentic, realistic experiences that leave deep impressions and build awareness for future practical work. In practice, these spaces provide students with services to experience new technologies, devices, and applications, enabling skill enhancement and knowledge innovation through learning, practice, and sharing [4]. They serve as venues combining theoretical knowledge with practical operation, supporting libraries' role in the innovative talent cultivation system [5], and realizing a new spatial model of "library space + smart technology + personalized service + reader experience," making libraries true centers for knowledge exchange and innovation capability cultivation, integrated into the intelligent service era centered on readers, supported by smart technology, and marked by personalized knowledge innovation services.

1.2 Characteristics of New Functional Experience Spaces

New functional experience spaces are open and shared spaces guided by the principle of "students doing it themselves," emphasizing processes of initial acquaintance, experience, practice, and innovation. They feature distinct characteristics: (1) **Immersion**: Providing better presence for experiencers, allowing complete immersion in virtual environments through interaction between virtual 3D space operations and hands-on practice, facilitating sensory environmental cognition. (2) **Interactivity**: Offering vivid interactive experiences using interactive devices to simulate operations, effectively improving practical operation skills. (3) **Imagination**: Providing deep rational cognition through advanced equipment environments that serve as display platforms for assisted teaching, enhancing and stimulating imagination and creativity. (4) **Diversity**: Reflected in autonomous access thresholds, broad audience reach, and diverse technical content. Their main functions include stimulating creativity, reflect-

ing differences, highlighting experiential aspects, emphasizing communication, and achieving relevance. New functional experience spaces enable experiencers to fully combine visual, mental, and manual engagement, forming a comprehensive reading environment.

2 Current Status of New Functional Experience Space Construction in University Libraries

Space transformation in Chinese university libraries generally falls into two categories: first, new spatial planning and design in conjunction with new building construction, such as at Fudan University Library, Qinghai University Library, Ningbo University of Technology Library, and UESTC Qingshuihe Library; second, renovation of traditional library layouts, such as at Peking University Library, Chang'an University Yifu Library, Xi'an University of Architecture and Technology Library, and SYNU Library. While the former proceeds relatively smoothly, the latter involves difficult disruption of tradition, requiring alignment of concepts, funding, and timing. Nevertheless, these challenges have not halted the pace of library space transformation. Among library space renovation cases, new functional experience spaces are uniquely distinctive with diverse functions. Whether for learning experiences, research experiences, marketing experiences, or psychological experiences, any space combining learning, research, experience, initiative, and creation holds contemporary significance.

Online surveys show that few university libraries have built new functional experience spaces, possibly constrained by leadership concepts, renovation funds, and educational disciplines. Most of the aforementioned spaces were built by key university libraries, with different names but consistent educational goals reflected in their equipment and services: (1) enabling experiencers to move and communicate freely in comfortable environments to naturally obtain knowledge and information; (2) inspiring learning enthusiasm through new functional experiences to promote autonomous and initiative research and exploration; (3) combining learning wisdom with modern tools to create new products and social value, laying foundations for graduates entering society. Experience spaces represent an important service model and core function of libraries, with spatial planning and design being a series of transformations guided by service innovation and a new direction for future library development.

lists examples of such spaces created by some university libraries, categorized as new functional experience spaces for reference.

Table 1 Brief Overview of New Functional Experience Spaces in Selected University Libraries

Library	Space Name	Service Content
Shanghai Jiao Tong University	New Technology Experience Zone	Apple device experience zone and 3D HD projection equipment; interactive Pad large screen; multimedia digital newspaper system; 3D dynamic cinema effect experience
Shanghai Jiao Tong University	Digital Application Experience Zone	Library new technology experience: 3D movies, 3D printing, high-fidelity music appreciation; digital application experience services based on various brands and models of e-paper books, tablets, and other latest digital devices
UESTC	Innovation Laboratory	3D printers, 3D displays and 3D TVs, Apple computers, electronic bookshelves (Reading E-Station), self-service printers and copiers; full high-speed WiFi coverage in the laboratory
Fudan University Liberal Arts Library	New Technology Experience Zone	Provides experiential use of 3D printers, iMacs, iPads, e-paper book readers
Zhejiang University	System Experience Space	High-performance computer servers and storage arrays providing students with hardware conditions to build information systems themselves
East China University of Science and Technology	Innovation and New Technology Experience Space	Provides strong technical support and a platform for perceiving and learning new technologies; new technology experience services: 3D printing
Ningbo University of Technology	Digital Media Maker Experience Center	Maker production area (general maker equipment, 3D printing equipment, etc.); recording area; photography area; post-editing area (post-production for recording and photography); experience area (VR technology, somatosensory equipment, soccer robots, etc.) and display area (creative works display)

Library	Space Name	Service Content
Xi'an Jiaotong University	Multimedia Technology Experience Center	Software resources: computers equipped with SPSS, Adobe Premiere, VideoStudio, CoolEdit, Photoshop, etc.; hardware resources: computers, image scanners, cameras, video cameras, mobile readers, touch-screen TV-computer all-in-ones, desktop scanners, desktop Apple computers, Lenovo high-configuration PCs, projectors, screens, MAC and DELL workstations, touchable tablet computers
Renmin University of China	PBL Space	Assists PBL teaching; assists anatomy teaching; problem discussion; information retrieval skills improvement; free provision of iPads, iMacs, notebook computers, electronic whiteboards, and projection equipment; self-directed learning space, cooperative exchange venue, knowledge exploration platform

3 Practice at Shenyang Normal University Library

In the era of smart libraries, centered on technological innovation and reader needs, library spatial layout, functions, and services will undergo major transformations. SYNU Library's new functional experience space explores smart library service models, focusing on new technologies and user experience to provide application experience services for various latest devices, including mobile libraries, mobile multimedia course on-demand, and VR (virtual reality) technology.

3.1 Functional Positioning of the New Functional Experience Space

In library space transformation, layout, function, and service are three interrelated fundamental attributes. Reasonable spatial layout facilitates functional realization; functional adjustments conversely affect spatial re-layout; and spatial layout and function determine the depth and breadth of spatial services, which also adjust due to service innovation. The functional positioning of SYNU's new functional experience space is to provide digital application terminal experience

services for the latest digital devices. SYNU's new functional experience space is equipped with 3D printers, iOS systems, Xiaomi products, video and non-linear editing equipment, all-in-one computers, and recording studios, forming a diversified and open new functional space. It not only provides information resources and diverse new technology services but also serves as a discussion space for ideological exchange and collision. Through technical support from librarians in information acquisition and other areas, it creates an atmosphere for innovative practice and exploration, stimulating readers' innovative thinking [6], and "promoting knowledge circulation, creating communication environments, emphasizing multiple literacies, and stimulating community vitality" [7].

3.2 Introducing Readers to Apple and iOS

When the library's new functional experience space first opened, it launched Apple and iOS usage training. Fixed weekly Tuesday evening lectures and experiences were held more than ten times consecutively, with full attendance each session. Training content covered Apple and iOS usage technologies, from basic iOS programming knowledge to newly added language features; from AppKit libraries to common Cocoa design patterns; from Xcode techniques to Instruments knowledge. Swift is a development language launched by Apple in 2014, and many popular apps including Airbnb, KAYAK, TripAdvisor, Venmo, and Yelp are developed using Swift [8]. Incorporating the latest research achievements in programming language, Swift features advanced syntax, powerful performance, and high efficiency. Combined with the Apple all-in-one computers and iPads in the experience space, this opens a door to iOS programming for relevant majors and interested students, solving the dilemma of solitary self-study and providing a platform for communication and technology sharing with teachers and enthusiasts.

3.3 Guiding Readers to Experience 3D Printing Technology

3D printers were among the first equipment installed in the new functional experience space. SYNU's space has conducted training in 3D printing courses, frontier visualization, rapid prototyping, content scanning, and motion capture. Thursday evening lectures and internships in the experience space have attracted overflowing participation each time. Experiencers start from computer modeling, mastering relevant software for FDM 3D printers, including popular slicing software and 3D printer control software, then use this software to debug 3D printers and correctly print high-quality products. Guidance covers how to correctly set parameters, select printing materials, and add supports to models [9]. Through learning modeling, 3D printing processes, and materials, experiencers can intuitively appreciate the magic of 3D printing and learn to master it—knowledge difficult to acquire outside the new functional experience space.

3.4 Creating a Multi-Form Integration Model

Based on the above library practice cases and our library's space transformation operation and evaluation of overall planning, spatial layout, and environmental education, the creation of new functional experience spaces, despite differences in scale and connotation, all achieve integrated transformation of physical space, digital space, information platform, and technical team under unified planning concepts, following a diversified integrated development path of "physical space + virtual space + information space + technical team." The technical team is the soul of new functional experience space services; without it, the space's effectiveness would be greatly diminished. SYNU Library's technical team consists of the technical department head, big data manager, maker space manager, etc., each responsible for 4-5 experience space activities, conducting activity planning, accepting space reservations, embedding instruction, guiding tool usage, creative products, and experimental consultation, such as computer modeling and guidance on FDM 3D printers and new intelligent tools. This team endows the space with vitality and tension, supporting the maximum 发挥 of spatial functions. The new functional experience space is a sustainable, multi-dimensional space integrating wisdom, experience, collaboration, and creation, realizing sensory, interactive, emotional, and beneficial experiences for experiencers [10]. Only such spatial integration can break through traditional models, becoming spaces that highlight intelligence, enhance experiential aspects, emphasize communication, and stimulate creativity, shaping readers' sensory experiences and cognitive identity, extending library service functions, and becoming a new platform for mutual development between libraries and readers.

4 In-depth Reflection on New Functional Experience Space Services

Library space transformation is a long-term undertaking, and the creation of new functional spaces is ongoing. Practice proves that transforming university library spaces in the knowledge era to promote knowledge exchange and integration, innovative education and incubation, and other personalized extended functions is of great value. Library new functional experience space services are not only necessary but must also strive for development and innovation.

4.1 Scientifically Positioning Transformation Concepts and Design Schemes

Library space transformation must keep pace with the times while maintaining essential positioning; it must elevate transformation concepts while completing design schemes. Concepts are the foundation and core of library space transformation. Without well-recognized transformation concepts, scientifically reasonable design schemes cannot be developed, and transformation goals cannot be achieved. The current era emphasizes knowledge-based, humanistic, and intelligent concepts. Libraries should position knowledge services, center on readers,

base on artificial intelligence technology, and aim to develop library spatial intelligence services, building smart spaces and conducting intelligent services. To this end, traditional backward concepts must be broken, governance capabilities improved, and conceptual obstacles in space reengineering eliminated. Scheme design is the implementation path for library space transformation. Due to differences in training orientation, institutional foundation, and external environment, university library space transformation schemes cannot be uniform, but the design process should: (1) conduct proper planning by clarifying transformation timelines and specific plans, as clear planning leads to clear goals and scientific order; (2) conduct adequate research by learning from excellent library space transformation experiences while combining actual conditions and reader needs to formulate schemes adapted to the library; (3) provide supporting measures, as space transformation is a systematic project requiring comprehensive planning and rational allocation of human, financial, and material resources; (4) conduct space evaluation to timely improve and adjust spatial layout, functions, and services according to industry and reader demand changes.

4.2 Spatial Transformation Patterns Should Keep Pace with the Times

As mentioned above, although various new functional spaces have different names, they are all spaces satisfying creative education experiences, undoubtedly providing services for experiencing the latest digital technology equipment and digital application terminals. The development direction of libraries is toward knowledge centers, learning centers, exchange centers, and innovation centers [11], and space transformation should advance with the times. With rapid technological development, experience spaces transcend traditional library functions through innovation, requiring timely tracking and incorporation of the latest technological equipment to provide platform guarantees that keep pace with the times, broadening students' horizons and skills. It must be clear that experience spaces are not just physical spaces filled with a sense of technological creation but are integrated, intelligent solutions incorporating resources, culture, and services through spatial carriers. Experience spaces can provide interdisciplinary and cross-domain knowledge services to readers through multiple types and dimensions of information analysis, comprehensively supporting research and embedding academic literacy cultivation to reconstruct the core competitiveness of libraries. Therefore, university library new functional experience spaces must be built.

4.3 Excellent Team Services Coordinated with Space Services

If spatial layout and function are compared to a vehicle, then space service is like the driver's soul. Only perfect integration of vehicle and driver can fully 发挥 spatial functions and advantages. Traditional space services revolve around book and equipment storage, while in the era of smart services, space services have evolved from simple borrowing and utilization to higher-level, more diver-

sified spatial participation centered on reader needs. Space services in this era manifest as: (1) basic space services, including self-service, various reading activities, and conference reports; (2) core space services, including knowledge sharing, active learning, and innovation collaboration providing open spatial service experiences; (3) expanded space services, focusing on both internal expansion and externalization of space services to achieve unlimited and ubiquitous space services. Therefore, building a high-level space service team is crucial. Teams should consist of technical personnel, expert professors, reading promoters, and student societies. Technical staff must maintain new equipment operation, guide students in applying new knowledge, technologies, and tools, and lead planning of space experience activities. Additionally, reading promoters and student societies should play supporting roles in leading readers to various experiences and cultivating professional, practical, and innovation-entrepreneurship capabilities to better 发挥 the fundamental functions of space services.

4.4 Promoting Interactive Activities with Feasible Experience Plans

Before operating and promoting library space experiences, an action plan or service plan must be formulated to create systematic and targeted training content, establish goals for overall and departmental space services, provide direction, and better 发挥 spatial functions. New functional experience spaces can formulate feasible experience activity plans by semester, including complete schemes covering activity projects, target experiencers, training types, training methods, activity times, instructors, and activity budgets. With established activity plans, implementation can proceed in an orderly manner. Annual activity plans can be revised and replicated, with timely opportunities for continuous improvement and innovation.

4.5 Transmitting Positive Energy in the Sublimation of Knowledge to Wisdom

Libraries must not only disseminate knowledge but also elevate knowledge to wisdom through practice, a sublimation process that must proceed under positive energy guidance. Libraries should remain true to their original aspirations, keep their missions firmly in mind, and constantly transmit positive energy in service and education. Positive energy refers to ideological and moral standards. Morality is the foundation of personal character; without virtue, even full knowledge and skills cannot produce socially useful individuals. Therefore, cultivating students' ideological and moral qualities is more important than cultivating knowledge and skills. Traditional Chinese thought holds that virtue is the direction and soul of talent and the internal driving force for talent development, while talent is the basic condition and foundation for personal success. Between the two, virtue is primary and paramount [12]. Libraries should uphold the bottom line of knowledge and positive energy transmission in spatial activities, never forgetting moral and legal education while emphasizing new technology training, staying away from corrosion by social undesirable phenomena, firmly

maintaining communist ideals and beliefs, establishing correct worldviews, outlooks on life, and values, and preserving cultural confidence.

"Libraries are important symbols of national cultural development levels and crucial venues for nourishing national spirit and cultivating cultural confidence" [13]. To fulfill this responsibility, library transformation and reengineering must demonstrate broad vision, focusing on architectural spatial changes, functional enhancement, and flexible combination of space utilization, with space services being the fundamental starting point and destination of space reengineering. The irreplaceable role of university library new skill experience spaces as venues for disseminating knowledge and skills deserves in-depth exploration, construction, and promotion.

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Wang Yu and Hu Wande: Drafted the paper outline and wrote the paper;

Sun Peng and Liu Zhe: Contributed to writing and proofread the paper;
Lu Quan: Conducted data collection, investigation, and revised the paper.

Note: Figure translations are in progress. See original paper for figures.