Research on Library Space Reconstruction Based on Reader Attribute Analysis: Postprint

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Abstract

[Purpose/Significance] Currently, many libraries are confronted with insufficient space and aging environments, rendering space reconstruction an urgent and pressing major issue that requires immediate attention.

[Methods/Process] Based on the five-element requirement principle for library spaces, this study analyzes from the perspective of reader attributes that the root cause of library space shortage lies in the differential demands of readers for library space, and contends that understanding reader attribute characteristics is crucial for effective space reconstruction.

[Results/Conclusion] Corresponding strategies are proposed for different types of libraries to effectively address current challenges such as space shortage or high vacancy rates in reading spaces.

Full Text

Study on Library Space Reconstruction Based on Reader Attribute Analysis

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Abstract

[Purpose/Significance] Many libraries currently face insufficient space and aging environments, making space reconstruction an urgent and critical issue. **[Method/Process]** Based on the five-element principle of library space requirements, this study analyzes the causes of library space shortages from the perspective of reader attributes, arguing that shortages stem from differential reader demands for library space. Understanding reader attribute characteristics is essential for effective space reconstruction. **[Result/Conclusion]** The

paper proposes targeted approaches for different types of libraries to effectively address space constraints or high vacancy rates in reading areas.

Keywords: stock reader; flow reader; five elements of space; space reconstruction
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With rapid social development, the important role of libraries is gradually being recognized. However, the problems of insufficient reading space and environmental aging are becoming increasingly severe. As S. Hines and K. Crowe noted, library technological development, funding shortages, and growing user demands are affecting existing library physical spaces [1]. Many American libraries face similar challenges and are actively promoting space reconstruction plans. Their theoretical framework largely derives from the four-step methodology proposed by E. Felix at the 2012 American Library Association's Library Value Assessment Conference: persona analysis, service path walkthrough testing, service blueprint design, and prototype testing [2], which has continued to evolve. In recent years, library space research in China has gradually gained theoretical attention, with most studies focusing on theoretical discussions of library space reconstruction.

Many libraries experience space shortages, though the manifestations differ. Some libraries have numerous visitors but severely insufficient usable space, while others have few visitors and serious "idle" space resources. Moreover, the same library experiences varying space utilization across different time periods: certain time slots may be crowded while others suffer from severe seat vacancy. The fundamental cause of library space shortages lies in reader demand differences. Different reader attributes reflect completely different needs for libraries, and these differences manifest in various aspects, with space shortage being merely the most external manifestation. Understanding these differences is crucial for better serving readers. This study analyzes the causes of library space "shortages" from the perspective of reader attributes and explores corresponding solutions.

2. Current Status Analysis of Library Space

Library space encompasses not only physical "space" but also artistic, literary, and social dimensions. For users, library space is both material and spiritual. Libraries provide and create a unique place and atmosphere for people to communicate and share, stimulating reading interest, inspiring wisdom and creativity, and playing an extremely important role in enriching people's spiritual lives [7]. As a typical public product and often a landmark building in a city or region, libraries serve as centers for literature and information resources as well as cultural construction and dissemination. Compared to other commercial teaching venues, bookstores, reading bars, and personal reading leisure spaces, libraries offer larger, more spacious, more comfortable, and more attractive en-

vironments.

C. Fatt identified four elements that make library spaces unmatched by other reading venues: low noise, low crowding, decoration, and cleanliness/comfort [8]. This study argues that "convenience" of access should be added as a fifth element, together forming the five elements of modern library space that are gradually becoming core competitive advantages. However, over time, many libraries have seen their core competitiveness severely weakened. The continuous installation of various intelligent hardware facilities has compressed the library's original physical space. The popularization of self-service borrowing and return machines has significantly increased circulation, leading to growing physical collections that further compress remaining space. Meanwhile, expanding reader groups and increasing visitor numbers make existing spaces appear inadequate.

Due to historical and economic development reasons, many libraries had low space efficiency and unscientific planning from their initial design and construction. With social, economic, cultural, and technological development, phenomena of crowding or underutilized space inevitably emerge, resulting in wasted valuable reading space and reduced user effectiveness. Under these circumstances, space reconstruction becomes imperative.

Taking Hanshan County Library in Anhui Province as an example, the original library built in the early 1980s became a local cultural, information, and resource center that attracted many readers. However, with rapid local economic and cultural development, the old facility's appeal declined significantly, and visitor numbers decreased substantially year by year. According to the library's 2016 annual report [9], total circulation was 48,000 visits, including 47,000 book loans and only 1,000 non-borrowing visits. In a previous study on the relationship between library stock readers and flow readers [10], this study provided an economic positioning: stock readers versus flow readers. Accordingly, the library had 47,000 flow readers and only 1,000 stock readers, accounting for just 2.08% of total visits. With 120 actual reading seats, the utilization rate was not high. Online comments and local influential forums revealed many readers reflecting on the library's reading seat issues, consistent with the statistical data and the author's field research.

In response to the old facility's severely declining appeal, new library construction began in 2015 and was completed in 2018. The new building has 6,000 square meters of floor area with a total investment of approximately 30 million yuan, presetting over 400 reading seats. It includes children's and adult reading rooms, an electronic reading room, borrowing areas, and self-study zones, equipped with intelligent bookshelves, 24-hour self-service machines, e-book workshops, and multiple systems for self-service registration and electronic retrieval. It can meet diverse service needs including book borrowing, digital resource reading, literature technical services, and education/training, meeting national first-class library construction standards. Based on public reader expectations, both flow and stock reader numbers are expected to increase significantly.

3. Analysis of Library Space Reconstruction Approaches

Increasingly, libraries and librarians recognize that the important value of future library space lies in place value and service value [6], with library space being one of the important service resources libraries provide to readers. The essence of modern economics is that demand creates supply. Similarly, for modern libraries oriented toward user needs, user demand for space and space shortages prompt libraries to seek major changes and breakthroughs requiring both qualitative improvement and quantitative increase. For library decision-makers, new construction or expansion are conventional approaches, while space reconstruction through redesign on the original site represents a completely new approach. Table 2 compares the advantages and disadvantages of these three methods.

Affected by various factors, library reconstruction—i.e., the space reconstruction discussed in this paper—requires less time and cost, faces fewer constraints, encounters less resistance in project approval, and offers higher feasibility. For newer libraries, most choose space reconstruction rather than new construction or expansion when space is limited. This approach is more scientific and feasible. Only when libraries are very old and space reconstruction cannot achieve significant breakthroughs is new construction or expansion 不得已 chosen.

The five elements of library space constitute its core competitiveness. If expanded or reconstructed space lacks these characteristics and loses the library's inherent appeal, the additional space becomes meaningless. Therefore, library space reconstruction essentially involves recreating effective space with five-element advantages, rather than simply increasing area, expanding space, or merely decorating old facilities.

4. Relationship Between Reader Attributes and Space Reconstruction

Libraries are knowledge sharing spaces that should also serve as cultural sharing centers for communities, schools, museums, and art galleries, and become innovation platforms for every user [11]. Different readers have different marginal efficiencies in using library platforms, and readers with different attributes have completely different needs for libraries (see Figure 1 [Figure 1: see original paper]). Stock readers prioritize usable space, while flow readers focus more on library resources. However, stock and flow readers are not fixed systems that remain unchanged. These two attributes not only influence and relate to each other but can also transform continuously with changes in user conditions, surrounding environments, and social development.

The differential demands of stock and flow readers for library resources and space directly impact library space reconstruction, which must take reader needs as the most fundamental starting point and design principle.

4.1 Libraries Focused on Stock Readers

In libraries focused on stock readers, readers' primary concern is space utilization, placing higher demands on library space. Such libraries must possess all five elements to meet user needs. These readers are less concerned about the richness and comprehensiveness of collections. Phenomena often occur where collection circulation efficiency is low but space utilization efficiency is high.

Through field research at Shanghai Library, Nanjing Library, Jinling Library, Nanjing University of Technology Yifu Library, and Nanjing Normal University Library, combined with available online data, this study obtained area-to-seat ratios for various libraries (see Table 3) to assist in analyzing the relationship between user attributes and space reconstruction. The area-to-seat ratio is calculated as:

Area-to-seat ratio = Library building area / Number of reading seats

This indicator reflects the average building area occupied per reading seat (space). Generally, a larger ratio indicates more spacious reading space, while a smaller ratio suggests relatively cramped conditions.

Table 3 shows that large libraries like the National Library and Shanghai Library have large area-to-seat ratios, while university libraries have relatively small ratios, meaning university libraries have more reading seats for the same building area—a characteristic determined by different libraries' features and functional positioning. Shanghai Library, with the largest ratio, only has its first-floor west side comprehensive reading room open without registration or staff management, where readers can study with their own books (other reading rooms have staff verifying credentials, and readers' own books are typically not permitted). This indicates that such libraries have significantly fewer stock readers than libraries with lower area-to-seat ratios. Field research found that larger libraries tend to be more spacious and bright, while smaller libraries have more compact reading spaces.

Taking Jinling Library (Jinling) as an example, the library covers 38,641 square meters with a total building area of 25,165 square meters, including 1,400 reading seats and supporting facilities such as lecture halls, multi-function halls, exhibition halls, audio-visual rooms, training rooms, restaurants, tea rooms, and parking lots. During field research, most users appeared to be stock readers. Li Fei noted that users find value in "being seen studying" or "seeing others studying" in libraries because it stimulates their learning behavior [12]. This stimulation makes them prefer attractive library reading spaces for learning. Many users arrive at Jinling in the morning for self-study, eat lunch at the library restaurant, and continue until closing, becoming "full-time library users." For these users, the library's comfortable space and wireless network are the fundamental attractions, not the collection size—some readers haven't borrowed any collection documents for considerable periods. For another portion of flow readers, Jinling's collections are the main attraction, but based on

headcount statistics during the research period, the former group constituted the majority.

For such libraries, space has strong user appeal. They should not simply expand reading space to increase visitors. Instead, they can utilize compact stacks to liberate space occupied by low-circulation collections while preserving the five elements of existing space to create more reading space for stock users and attract new users.

4.2 Libraries Focused on Flow Readers

Libraries focused on flow readers have limited physical space that cannot accommodate many stock readers, or have large spaces lacking the five elements that attract stock readers, resulting in predominantly flow readers. Many older libraries (such as early public libraries like Hanshan County Library or some older school libraries) have reading spaces lacking the five elements due to age, history, and funding constraints, making them unattractive to users and causing stock readers to decline. Conversely, increasingly rich databases and continuously updated physical collections are more attractive to flow users, resulting in increasing visitor numbers but decreasing average time spent in the library—flow readers increase while stock readers decrease.

Table 4 shows data from Nanjing University of Technology Yifu Library's access control system. Overall visitor numbers fluctuate modestly, increasing slightly with school expansion. However, average time spent in the library has declined significantly, leading to gradually rising vacancy rates. The previous situation of needing to reserve seats in advance has become a reality of 20-30% average seat vacancy. For such libraries, space reconstruction is urgent and important. The number of reading seats should not be the pursuit; reducing reading space vacancy rates is the priority. The primary goal of space reconstruction should be increasing in-library numbers and actively adding stock readers.

4.3 Libraries with Fluctuating Reader Attributes

Compared to "double first-class" university libraries, ordinary university libraries show obvious temporal patterns: few readers visit during normal times, resulting in serious seat vacancy and often only one or two readers at a six-person table; during exam seasons, in-library numbers increase dramatically. Many small public libraries and community libraries also belong to this category, with large fluctuations in visitor numbers and continuously transforming reader attributes.

For such libraries, space reconstruction is urgent and crucial. Reading seat quantity should not be the target indicator; reducing vacancy rates is imperative. These libraries' main characteristic is that collection resources have certain circulation while space has compatibility. Space must meet both flow readers' needs and stock readers' essential requirements. First, libraries should create fluid spaces [13] to enable flow readers to better utilize resources while ensuring

stock readers have adequate reading space. Second, as spaces for learning and leisure, such libraries should design flexible spaces that can be adjusted periodically according to user changes to meet both types of readers' needs. When stock readers increase, release some flexible space; when they decrease, reclaim that space for increased flow readers. Finally, modern libraries 致力于 using high technology and comfortable spaces to create unique learning, research, and collaboration environments representing interaction, experience, knowledge, and innovation [14]. Such libraries can create third spaces like maker spaces and interactive spaces to meet these stock readers' needs. For example, Nanjing University of Technology Yifu Library transformed its previously high-vacancy electronic reading room into a Maker Dream Workshop [15], providing university student makers with their own creative space and converting once-vacant space into numerous new stock readers.

5. Conclusions and Reflections

Current theories on library space redesign and reconstruction concepts are relatively well-developed. However, practical implementation still faces unresolved common issues: who reforms (library decision-makers determine reconstruction plans and direction); for whom (analyzing primary reader groups and target user needs); and what to reform (how to design, innovate, decorate, construct, and support). In response, this study proposes corresponding approaches for different library types:

(1) **Relatively small libraries**, such as community libraries. With small building volumes and primarily flow readers, their space reconstruction should aim to expand service radius to cover broader areas and more readers. Due to inherently limited space, even after reconstruction they can hardly achieve five-element advantages. Their strategy should prioritize efficiency while considering function, winning through creativity and design. Increasing visitor numbers should be the primary goal to vigorously boost flow readers.

(2) **Medium-sized libraries**, such as various school and large institutional libraries. Serving primarily young, individualistic, quality-conscious, and intellectually curious readers who are mostly stock readers with high space requirements, these libraries' reconstruction strategy should prioritize space quality improvement, then expand usable space to enhance five-element appeal. The main goal is reducing space vacancy rates, with increasing in-library numbers as the primary reconstruction objective to actively add stock readers.

(3) **Relatively large libraries**, such as provincial and national libraries. With huge building volumes serving readers across all social strata and age groups, these are stock-flow hybrid types. Their reconstruction should improve space utilization efficiency to avoid social resource waste. Due to dispersed and diverse reader groups with vastly different needs, their space

reconstruction is most challenging. Their strategy should apply economic market segmentation principles to segment different readers by needs, then reconstruct spaces according to these differentiated needs to maximize satisfaction of different reader requirements and achieve Pareto optimal space utilization. For such libraries, segmenting reader space demands should be the primary reconstruction goal.

This study's reader attribute analysis serves as a small supplement or reference to existing library space reconstruction theory and practice. Every library needs targeted reconstruction based on its reader attributes to create attractive reading spaces with five elements, reduce reading space vacancy rates, optimize social resource allocation, and promote library development in the new era. How large libraries can apply economic market segmentation principles to space reconstruction to meet diverse reader needs will be the focus of future research.

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