

Research on Exhibition Space Design based on Textile Culture -- Taking the Textile Science and Technology Museum of Wuhan Textile University as an Example

Mi Huang

College of art and design, Wuhan Textile University, Wuhan, China

Abstract. China's textile culture has a long history and profound foundation. With the innovation of modern society, modern textile knowledge system and textile industry system are developing constantly. The establishment of textile culture exhibition hall provides a good opportunity to inherit and carry forward our textile culture. By using the research methods of literature review, design practice, case study, etc., combined with the exhibition space design practice project of Textile Science and Technology Museum of Wuhan Textile University, this paper expounds the design concept and process of the exhibition space in this university in detail, and summarizes the design methods and strategies of exhibition space based on textile cultural characteristics.

Keywords: Exhibition Space Design; Textile Culture; Modern Exhibition Hall; Digital Technology Display.

1. Introduction

Based on the characteristics of textile culture, the exhibition space is a public exhibition organization for textile culture, which has various forms such as museums, science and technology museums and archives. It is a display space for all kinds of textiles through unified planning and various display modes. Besides the functions of exhibition and collection, the textile exhibition hall also needs to have the functions of research, teaching and publicity.

In carrying forward traditional culture, with the change of people's lifestyle, cultural exhibition halls have become an important medium for inheriting and carrying forward traditional culture. The establishment of exhibition space such as Textile Science and Technology Museum, Textile Culture Research Hall and Indoor Textile Exhibition Hall can provide a better platform for the inheritance and development of traditional textile culture.

For domestic universities, the establishment of exhibition halls in domestic universities has many advantages, such as strong professionalism, concentrated crowds, younger audience and flexible development channels. Actively establishing exhibition institutions for textile culture in colleges and universities can not only promote textile culture more effectively, but also serve as a display window with characteristics of colleges and universities, and enhance its influence to a greater extent.

In terms of social impact, the promotion of textile culture in the form of exhibition halls can deepen the people's concept of textile, help arouse the attention of the society to textile, and even have important significance for strengthening the cohesion of textile-related industries at present.

2. Principles of Exhibition Space Design based on Textile Cultural Characteristics

2.1 Clear Theme Positioning

Theme is the central content to be expressed in the pavilion design. In the design of exhibition space, the theme content is presented by displaying the corresponding physical objects and related materials. The key to highlight the theme is that in the exhibition space, from the interior style, scene decoration, infrastructure, guide system, and even service and management system, every link serves the orientation of "theme". Highlighted themes can make the content display clearer.

2.2 Reasonable Spatial Layout

Optimizing the space design of the exhibition hall focuses on the rational space layout. Reasonable layout can enhance the display effect, ensure the order and visitors' sense of experience during the tour. First of all, functional zoning needs to be planned as a whole according to the design orientation and design theme, and then local zoning is carried out according to each theme space. Secondly, each space needs to be partitioned according to the volume and form of the exhibition content. Thirdly, functional zoning should have a sequential relationship, so as to form an orderly spatial organization relationship. Finally, the space should have a primary and secondary relationship, and different volumes of space are interspersed with organizations, creating a rich sense of hierarchy for the exhibition space.

2.3 Smooth Moving Line Organization

In the setting of the pedestrian flow line of the exhibition hall, we should first consider the order of the tour line. Order requires that visitors' routes in and out of the exhibition place should not interfere with each other, so one-way streamline should be adopted in the layout of moving lines. One-way flow line can effectively avoid the intersection of tour routes and repeated tours, which is conducive to crowd evacuation. In the way of organizing the moving line, designers can use logical ways to plan the streamline. For example, in the textile exhibition hall, referring to the historical time of the development of textile culture, or referring to the evolution process of textile tools, can drive people to understand the exhibition content.

2.4 Various Forms of Display

The traditional display mode is mainly display, and display is the most frequently used display mode in the display space. The display can be further divided into hanging display, placing display and clamping display. The emergence of digital exhibition halls will eliminate the limitations of traditional display methods, and further improve the efficiency of information transmission in the exhibition contents. The exhibition hall can give consideration to both traditional and emerging exhibition forms, and apply various digital technologies such as 5G, VR/AR, artificial intelligence and surround screen in the exhibition design, forming a new exhibition hall mode of "internet plus Exhibition", which can enhance visitors' experience and strengthen the popularization of scientific research achievements, cultural knowledge and art.

3. Exhibition Space Design of Textile Science and Technology Museum of Wuhan Textile University

3.1 Project Overview

Textile Science and Technology Museum Project, located in Chongzhen Building (North Building) of Sunshine Campus of wuhan textile University, covers an area of about 1,550 square meters, and its design includes such tasks as functional zoning of exhibition hall, formulation of decorative material scheme and design of local display effect. The exhibition area consists of six exhibition halls: Textile Edge Exhibition Hall, Traditional Textile Exhibition Hall, Modern Textile Exhibition Hall, Big Textile Exhibition Hall, Super Textile Exhibition Hall and Future Textile Exhibition Hall. The overall design takes into account various conditions, and the goal is to create a comprehensive exhibition hall with multiple functions such as teaching and research, exhibition and publicity.

3.2 Design Background and Positioning

Wuhan textile University, founded in 1958, was first called wuhan textile Institute of Technology, and it was an industrial college belonging to the former China Textile Industry Department. It has been running for more than 60 years, offering specialties such as clothing and apparel design, textile engineering, etc. It is one of the universities with textile characteristics in China. In order to display

the textile technology achievements of wuhan textile University and publicize the textile culture that keeps pace with the times, in late 2021, wuhan textile University invested funds to pre-establish its textile science and technology museum.

In this design project, the space design of Textile Science and Technology Museum of wuhan textile University is based on space functionality and science, and the design is centered on the themes of "textile" and "science and technology". The overall design combines modern style with scientific and technological style, using concise geometric design language, with black, white, gray and blue as the main colors, and matching with booth, scene and digital interactive display mode to form a textile culture display space with scientific and technological characteristics.

3.3 Spatial Planning

The Textile Science and Technology Museum covers an area of about 1,550m², and consists of 10 functional areas: front desk, preface hall, seminar room, screening hall, textile "edge" exhibition area, traditional textile exhibition area, modern textile exhibition area, big textile exhibition area, super textile exhibition area and future textile exhibition area.

3.3.1 Functional Area Division

Functionality is the first consideration in space design. The external exhibition area is the core area of the exhibition space. While displaying exhibits and attracting visitors, the exhibition hall also needs to conduct external publicity and research. In the design of the external exhibition area of the Textile Science and Technology Museum, the front desk and the preface hall are set at the entrance of the museum, and the exhibition wall of the preface hall displays the highly summarized theme content, so that visitors can quickly enter the exhibition state (Figure 1); Textile "Edge" Exhibition Hall, Traditional Textile Exhibition Hall, Modern Textile Exhibition Hall, Big Textile Exhibition Hall, Super Textile Exhibition Hall and Future Textile Exhibition Hall, which are the core parts of the exhibition hall, play a role in displaying cultural content; Digital screening hall can not only promote culture, but also have the function of relaxing for visitors.

In addition to the external functions, it is necessary to set up an internal working area in the exhibition design. When the design conditions are met, it is possible to arrange office and meeting places. A special seminar room is set on the right side of the entrance of the Textile Science and Technology Museum. The seminar room has the functions of teaching and research as well as guest reception. It is a multi-functional seminar venue that integrates the functions of meeting, teaching and research guidance and academic exchange with foreign countries, making the work discussion more convenient and efficient (Figure 2).

According to the needs of visitors, the overall design of Textile Science and Technology Museum has rationally divided the functional areas of space around the theme, so that the content is consistent with the overall structural distribution, and each space has its own functional attributes, outstanding features, harmony and unity.



Figure 1. Front Desk and Preface Hall of Textile Science and Technology Museum



Figure 2. Multifunctional seminar room

3.3.2 Spatial Sequence Configuration

There are 6 exhibition halls in the Textile Science and Technology Museum, which are divided according to different textile types and arranged in the order of textile development.

Textile "Edge" exhibition hall has the function of "opening up" for the tour, focusing on school history, outstanding figures in the field of textile, major achievements of the school and award-winning reports. The traditional textile exhibition hall and the modern textile exhibition hall respectively show the development of the global textile industry in different periods of human progress. Among them, the intelligent weaving and spinning technology displayed in the modern textile exhibition hall "transits" the scientific and technological concepts to the following three exhibition areas. The word "big textile", the core of the big textile exhibition hall, refers to the high-end textiles and textile technologies used in many fields, including transportation, agriculture, construction, electronic communication, energy and military industry, aerospace and so on. This exhibition hall is the most distinctive and prominent exhibition hall in the exhibition hall, with a large exhibition content and large volume, and focuses on the application of textiles in aerospace. It was developed by the research team of wuhan textile University. Super Textile Exhibition Hall is a supplement to all the exhibition halls mentioned above. It takes special textile processing as the exhibition content, and introduces three special processes of super textile, such as nonwoven, 3D weaving and composite weaving. Finally, the future textile exhibition hall, as the end of the tour, expresses the prediction and imagination of future textile fields and sublimates the theme.

On the whole planning, the exhibition halls with different volumes and characteristics are arranged logically, so that the overall spatial arrangement is clear and gradual, which will be more in line with visitors' psychology.

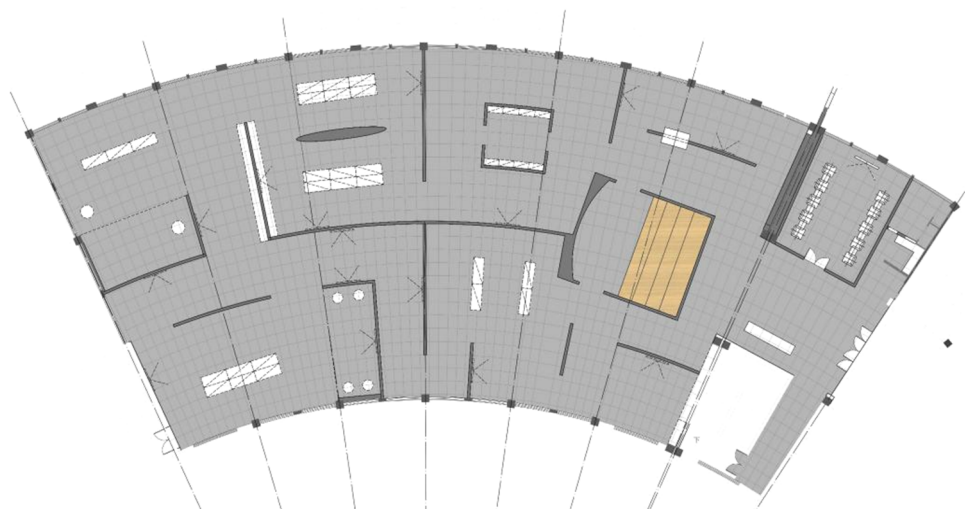


Figure 3. Plan of Textile Science and Technology Museum

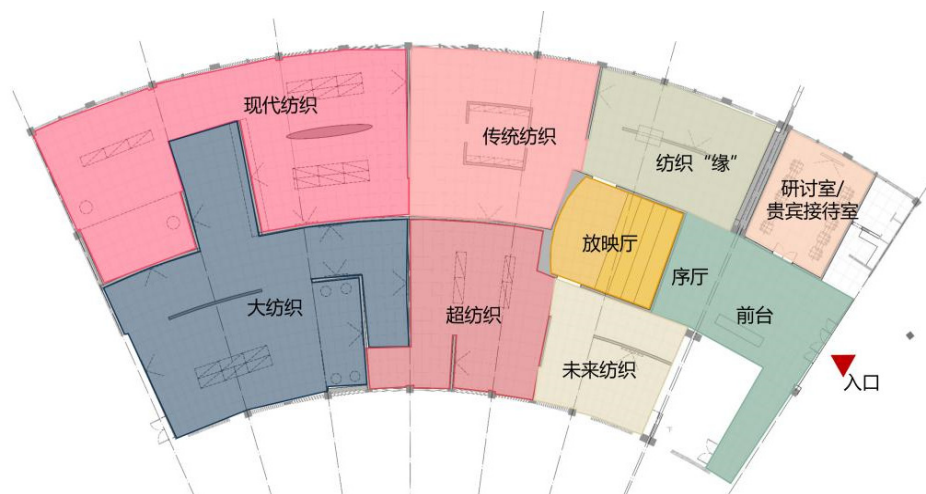


Figure 4. Functional zoning map of Textile Science and Technology Museum

3.3.3 Composition of Plane Form

There are many forms and layout methods of exhibition halls, including central layout, scattered layout, grid layout, wall layout, rain way layout, suspension layout and mixed layout. Generally speaking, there are few cases in which exhibition halls are arranged by a single method alone, and most of them are mainly arranged by one type, with other types of mixed layout.

The textile science and technology museum adopts the mixed layout, mainly the wall-facing layout, also known as the linear layout. The wall-facing layout continuously extends along the peripheral interface of the exhibition space to produce a simple and clear viewing line. In addition, with the central layout method and suspension layout method, the form of the whole plane is rich, interesting and clear.

3.4 Moving Line Setting

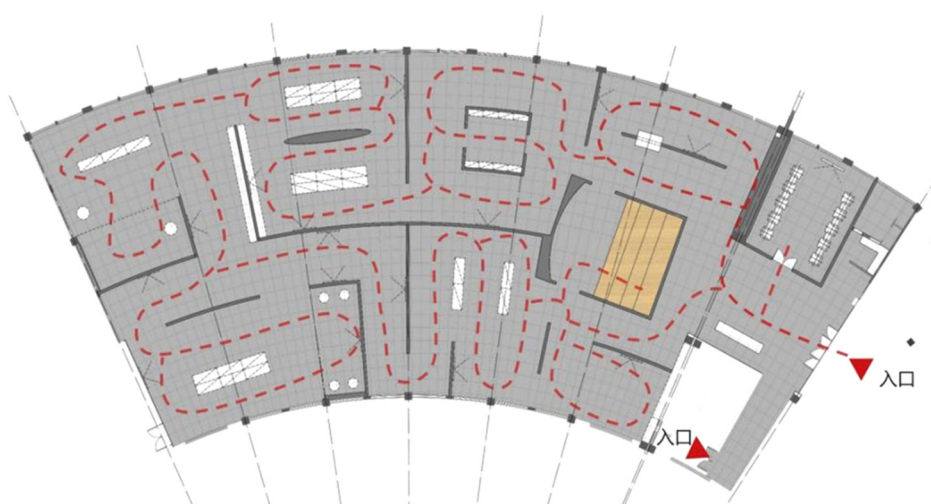


Figure 5. Pedestrian flow diagram of textile science and technology museum

The Textile Science and Technology Museum has two different entrances and exits. The exhibition route adopts off-campus visit to enter and exit from the main entrance of the laboratory building, and the students in the school enter and exit from the laboratory building, so as to achieve the purpose of crowd diversion and reduce the pressure on the flow of people at the entrance. The moving lines in the hall are planned and designed according to the functional zones, and each exhibition hall is connected in series with a complete moving line according to the order of textile development. One-way streamline can ensure the order of the tour process, guide visitors to visit the whole exhibition

hall all the time, and avoid the situation of returning tour and the conflict between visitors. The screening hall near the middle of the exhibition hall is a visiting space, where visitors will gather and have a rest. The cinema is provided with two entrances and exits, thus adding a secondary moving line, so that the crowd can be diverted, and the problem of crowd flow conflicts can be alleviated.

A one-way streamline is the main one, supplemented by a local secondary moving line, and the combination of the two moving lines is used in the exhibition hall, which makes the overall space compact, directional, concise and bright, avoids the repetition and intersection of routes, and guides the audience to visit and browse in an orderly manner, which can more effectively alleviate the pressure of people flow.

3.5 Display Mode

3.5.1 Traditional Display

Exhibition, as a basic form of exhibition, is a traditional form of exhibition with high frequency in modern exhibition halls. The display can be further divided into booth display, wall-hung display, sandwiched display and other forms.

In the space design of Textile Science and Technology Museum, two basic display forms, booth display and wall display, are mainly selected.

The background introduction and text description of the exhibition content are mostly displayed in the form of wall hanging. Take the textile "Edge" exhibition hall as an example. As an exhibition hall for introduction, its main function is to briefly explain the concept of textile in words, and the most direct way to show it is to display it on the wall (Figure 6). In the design of exhibition wall, we can break through the whole rectangular form and make some changes in the shape, height and thickness of exhibition wall to create the richness of space.

Physical exhibits are mainly displayed through booths. In addition to ordinary booths, modern textile exhibition halls have set up several groups of special-shaped booths locally, such as capsule booths and inclined booths with distinctive features. The upper part of the capsule booth is a curved surface made of glass, which creates a transparent and refreshing visual feeling and gives the space a full sense of science and technology (Figure 7). In a word, the booth has different shapes and rich levels, and the use of glass and metal materials can bring more vivid and vivid effects to the stable exhibition hall.

In addition, adopting the movable booth inside the exhibition hall will give greater flexibility to the planning space, and facilitate the iteration of updating the items in the exhibition hall later.

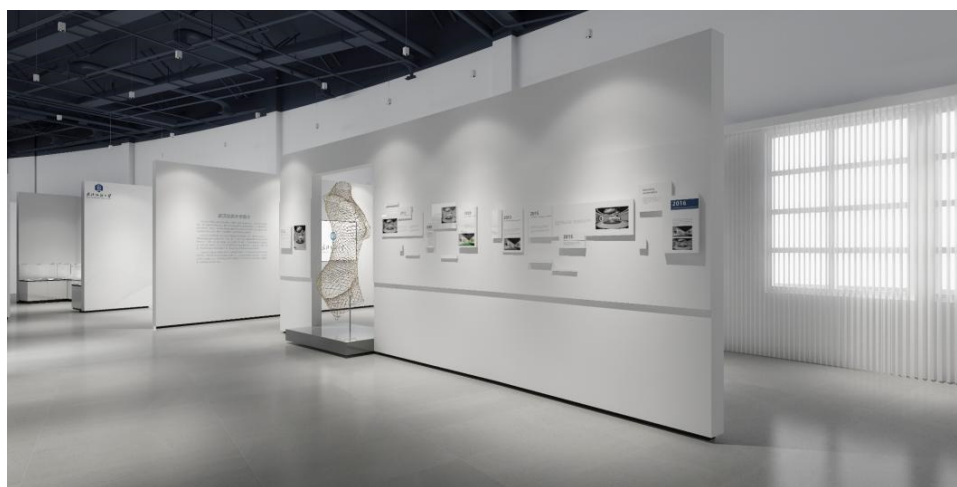


Figure 6. Wall-mounted display of Textile "Edge" Exhibition Hall

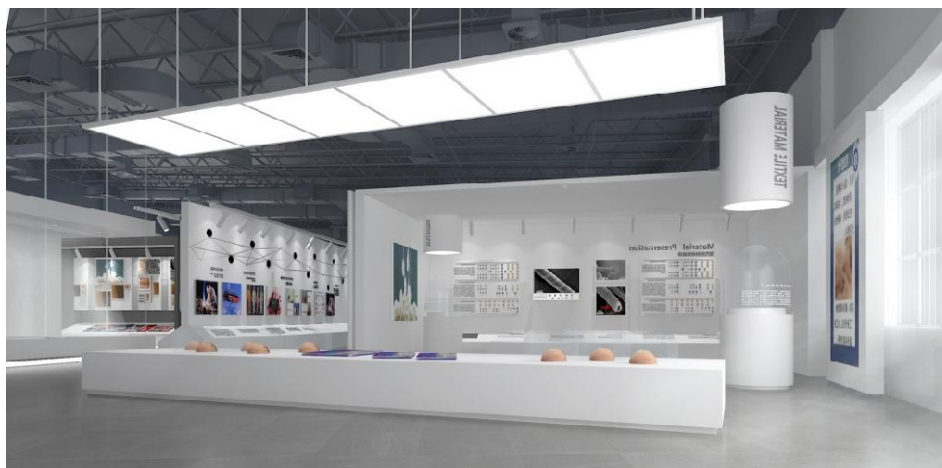


Figure 7. Exhibition booth of Modern Textile Exhibition Hall

3.5.2 Digital Interactive Display

In exhibition design, how to transform the information to be conveyed into vivid exhibition language and arouse the interest of viewers is particularly important. Digital technology refers to the technology that comprehensively processes and manages various media information such as words, data, graphics, images, animations, sounds, etc. through computers, so that users can interact with computers in real time through various senses. Digital technology can combine music, video, animation, text, interaction and other forms with strong expressive force, so it makes up for the shortcomings of traditional display, transforms information into vivid display language, and arouses visitors' interest.

The exhibition design of textile science and technology museum no longer simply adopts the traditional exhibition mode of "products+exhibition boards", but forms a new exhibition mode of "internet plus exhibition". In the digital screening hall of the museum, the ring screen display system is applied, and the screen surrounds the audience, with vivid three-dimensional image content, clear outline and bright colors, which gives the audience a strong visual impact on the overall feeling (Figures 8 and 9); In the large textile exhibition hall, a variety of smart wearable devices, including smart VR glasses, smart gloves, and smart clothing, make the display content more intuitive and vivid, stimulate visitors' visual and auditory senses, and create a novel immersive experience. Besides, the application of electronic display boards, interactive projection, electronic book turning and other technologies in various exhibition areas in the museum can dig out the background and connotation of the exhibits in many ways, so that visitors can have a more complete understanding of the exhibition contents.



Figure 8. Digital multimedia display in the screening hall



Figure 9. Viewing seats in the screening hall

3.5.3 Scene Display

A qualified exhibition space needs to fully display various characteristics such as knowledge, education, authenticity and interest. While the pavilion emphasizes the importance of exhibition design, it also needs to innovate the interest of exhibition language. Different from the two-dimensional display, scene creation refers to the arrangement and restoration of specific scenes and elements in the display space, and the direct restoration of the details of the environment in the three-dimensional space, which gives visitors an immersive experience. Compared with the traditional display, it is more vivid and intuitive.



Figure 10. Scenes of Textile Exhibition Hall

The scene construction in the exhibition space of Textile Science and Technology Museum mainly adopts the method of real scene restoration (Figure 10). The large textile exhibition hall is the most characteristic part of the textile science and technology museum. Therefore, the design chooses the display mode of scene creation to increase the sense of space volume. Compared with other exhibition halls, its space extension is enlarged to highlight the display content. Taking the Great Textile Exhibition Hall as an example, the five-star red flag (imitation) of the "Chang'e V" landing on the moon, developed by the research team of Wuhan textile University, is the main exhibit hanging in the center of the background wall, and the space elements such as the Chang'e V detector and the details of the potholes on the lunar surface in the background wall show the audience a sense of reality and profundity of the universe. On one side of the background wall, a life-size model of spacesuit is

placed to restore the real spacesuit fabric material, helmet texture and equipment details. On the whole scene construction, the design restores the real appearance of the space scene and solidifies a wonderful scene, thus breaking through the boring and monotonous display mode in the past and vividly presenting the display content to the audience. If you want to convey more abstract information to the viewer, you can use exaggeration, analogy and other techniques, with corresponding lighting, music, etc., to create an imaginative and more atmospheric scene for the exhibits.

4. Total Knot

As an exhibition space for publicity, teaching and research, the exhibition hall based on the characteristics of textile culture bears the history of textile culture development, and as an excellent popular science platform for textile culture that keeps pace with the times, it has played a role in promoting the publicity of textile culture among young people and even larger groups.

Based on the practice of the actual project, this study makes a concrete analysis of the functional area division, spatial sequence configuration, plane form composition, moving line setting and other aspects in the exhibition space design project of Textile Science and Technology Museum of wuhan textile University, and studies the exhibition space design theory, such as: focusing on the continuity of exhibition space, the functionality of internal space and external space, and the unity of exhibition content and exhibition environment in terms of style orientation, functional area division and spatial sequence configuration. Diversified exhibition forms, etc., and discusses the principles, methods and implementation paths of innovative application of textile exhibition space design, which provides a certain methodological framework for related types of design.

Finally, with the rapid development of emerging digital technology, the combination of modern digital media, phantom imaging technology, panoramic painting, interactive system and other emerging technologies with traditional exhibition methods makes the exhibition hall design more flexible, highlights its own exhibition features, and makes the comprehensive exhibition space integrating publicity, teaching and research, and foreign exchange a new trend, which provides a new development idea for exhibition space design and contributes to the inheritance and dissemination of textile culture.

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