STRANDS OF INVOLVEMENT: COMPARATIVE STUDY ON MUSEUM COSTUME EXHIBITIONS AND THEIR IMPACT ON VISITOR ENGAGEMENT

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Abstract:

Chinese museums have undergone significant changes in the past century, with an increasing focus on audience engagement and diversified displays. The COVID-19 pandemic, in particular, has led to the creative transformation of traditional exhibitions through the Museum Online Exhibition Platform, which has enabled major museums to launch "cloud exhibitions." As a result, the State Administration of Cultural Heritage has proposed incorporating digital construction into the "new infrastructure" to strengthen digital displays and innovative means of communication and inheritance. The merging of virtual and traditional displays has resulted in diverse forms of exhibitions, which affect the audience's physical and psychological fields of interaction with the exhibits. This article explores the audience's attitudes towards virtual and physical displays through experiments that identify the design principles of museum costume displays. The study aims to contribute to the development of design principles for museum exhibitions, which take into account the changing needs of audiences and the merging of virtual and traditional displays.

Keywords: Chinese museums, audience engagement, diversified displays, virtual displays, physical displays, design principles, museum exhibitions.

1. Introduction

Over the course of a century, Chinese museums have evolved from mere spaces for collections to learning centers centered around the audience. Visitors are now considered the lifeblood of museums, and a single, static exhibition form is no longer sufficient to meet their experiential needs. There is an increasing demand for diversified displays in museums to keep up with the changing times.

In January 2020, amid the COVID-19 pandemic, the State Administration of Cultural Heritage launched the "Museum Online Exhibition Platform," which saw major museums launch "cloud exhibitions." This marked a significant event as museums creatively transformed traditional exhibitions in the era of "Internet Plus," providing a new form of museum service during a special period. Subsequently, in November 2020, the State Administration of Cultural Heritage proposed to incorporate the digital construction of museums into the "new infrastructure" and strengthen digital displays, in-depth excavation of cultural knowledge, and innovative means of communication and inheritance. With the merging of virtual and traditional displays, museums in the new era have created diverse forms of exhibitions.

Exhibition forms play a significant role in shaping the relationship between the audience and the exhibits in museums. The exhibits themselves are perceptual objects for the audience, and the process of understanding them is a cognitive activity that involves both rationality and sensibility. This means that there are both physical and psychological aspects to the audience's interaction with the exhibits. The physical field refers to the exhibits that are being perceived, while the psychological field refers to

the audience's perception of these exhibits. Exhibits actively transmit their visual styles to the audience, and the audience has certain selectivity when it comes to the information conveyed by the exhibits. Different display forms can also affect the audience's visual choices of exhibits. To explore the audience's attitudes towards virtual and physical displays, this article conducts experiments to identify the design principles of museum costume displays.

2. Museum Costume Display

The audience's perceptual objects in museums include both physical exhibits displayed in museums and virtual exhibits. As a result, museum exhibitions can be divided into physical exhibitions and virtual exhibitions. The range of costume information presented by physical and virtual exhibits of clothing differs due to their different display forms.

2.1 Physical Costume Display

Museum costume displays can be divided into three types of physical exhibits: flat platform displays (Figure 1), hanging displays supported by stands (Figure 2), and three-dimensional displays with mannequins (Figure 3). When viewing the costume exhibit displayed on a flat platform, the visual organ can only obtain information from the front of the exhibit. Since human eyes cannot see through the exhibit, the style on the back of the exhibit is hindered during the information transmission process. Hanging displays can show the external shape of the entire exhibit to the audience. Mannequin displays not only show the shape of the costume exhibit but also highlight the visual effect of the costume when worn. Therefore, different categories of textiles can choose suitable display forms based on their characteristics of information transmission.

Figure 1. Flat platform displays   Figure 2. Hanging displays   Figure 3. Three-dimensional supported by stands   displays with mannequins

2.2 Virtual Costume Display

Static images in flat displays (Figure 4), dynamic videos in situational displays (Figure 5), and immersive displays with 3D models (Figure 6) are the three main virtual display forms of museum costumes. Static image displays can present the different sides of the costume, but some museum equipment cannot enlarge the image, resulting in a lack of detailed display. The dynamic video displays can vividly present the costume exhibit with the assistance of text or narration. The 3D model display, when combined with external VR glasses, can immerse the audience in the scene. This not only highlights the costume itself but also conveys the social environment and historical culture behind it to the audience. These three types of virtual display forms establish different levels of interaction with the audience.

Figure 4. Static images in flat display situational display

Figure 5. Dynamic videos in 3D models
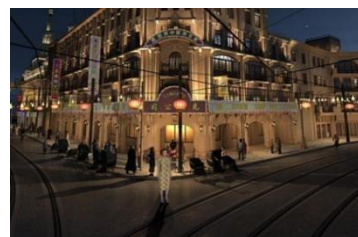

Figure 6. Immersive displays with

3. Visual Style of Costume Display

Formato-Figura" (figure-ground) is a relationship between "shape" and "background" in Gestalt psychology. The visual style in museum displays refers to the relationship between "exhibits" and "environment". Each visual style represents a pattern of forces, which exist both in the psychological and physical domains. Here, we are discussing the visual style of costume displays that exist in the physical domain.

Every costume exhibit in a museum represents some kind of information it carries. However, the content contained in each costume exhibit goes beyond its external representation. Displaying the exhibit in a specific scene is a way to reproduce the expression that happened in a specific time and space through a medium. Museum scene display can also be called narrative display, which can visualize the information that goes beyond the exhibit itself. For example, traditional physical displays can provide the audience with the most basic visual pattern through the materials, shapes, colors, and other features presented in the exhibit. However, the representation of the underlying information, such as historical culture and social customs, requires the scene to assist in conveying the exhibit's information. The virtual display's scene display is essentially the same as the physical display's nature. Therefore, costume exhibits can be divided into scene displays and non-scene displays. The visual patterns of the two also differ, and their narrative ability for displaying content also differs.

3.1 Visual Style of Scene Display

Visual style in scene-based static physical exhibits and dynamic virtual exhibits contains both "costume exhibits" and "scenes." Elements such as color, pattern, fabric, and style are the information carried by the costume exhibits presented to the audience in physical exhibits. The scenes in physical exhibits often depict the environment in which the exhibit was used or created. For example, the Chinese Silk Museum created a tailor shop (Figure 7) to display the Republican-era cheongsam, with sewing machines, tape measures, fabrics, and mannequins as auxiliary tools to narrate the production process to the audience. Clothing, virtual characters, virtual scenes, subtitles, and other information are the main visual styles of scene-based virtual exhibitions. The scope presented in virtual exhibitions is often wider than that of physical exhibitions. Compared to the limited space of museums, digital space can create scenes that extend infinitely. For example, the Shanghai Textile and Costume Museum has built a virtual system for qipao exhibitions (Figure 8). The system uses 3D modeling to reproduce the four major department stores on Nanjing Road during the Republic of China era - Sincere, Wing On, New World, and Da Xin - and restore the scene of women wearing qipao strolling between the department stores.
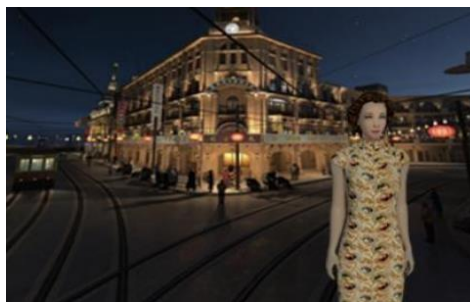
Figure 7. Physical Scene Display

Figure 8. Virtual Scene Display

3.2 Visual Style of Non-Scene Display
Non-scenic display refers to museum exhibits presented alone, without any auxiliary scenes. This is the most common form of display in museums and is currently the mainstream means of displaying clothing. Non-scenic display can be divided into static and dynamic displays. The visual style of static clothing exhibits is the connection between "clothing exhibits" and "glass cabinets" (Figure 9), while the visual style of dynamic virtual displays is the connection between "virtual exhibits" and "display screen borders" (Figure 10). In the physical display, the glass cabinet serves as the background, and the contrast in shape and color between the cabinet and the clothing exhibit has little impact on the viewer's perception of the exhibit's appearance. Viewers can learn about the clothing exhibit's information, such as patterns, colors, fabrics, and styles. The nameplate next to the exhibit and focused lighting help to expand the information about the clothing exhibit. Dynamic display conveys the exhibit's information to viewers through electronic media, and the content within the screen can cover the visual style of clothing exhibits. (Table 1)

Figure 9. Static display of clothing (real objects) Figure 10. Clothing dynamic display (virtual)

In the field of exhibition design, scenographic display is a narrative approach to presenting exhibits to the audience. It constructs a story about the exhibits and uses narrative methods to interpret the life context of the exhibits and present the interactive relationship between "people-exhibits" to the audience. A good story can not only carry information about the exhibits and evoke the audience's emotions in the visual, dynamic, and spatial aspects but also play a role in telling the story of the interaction between the audience and the exhibits.

In summary, compared with the visual styles of the four types of exhibitions, the understanding of scene-based exhibitions is stronger than that of single-item glass case displays. Static scene-based exhibitions are a one-way interaction between the audience and the exhibits, while virtual dynamic scene-based exhibitions can be designed to allow for interaction between the audience and other

characters or environments in the scene. In comparison, static scene-based exhibitions are a more disconnected display form, with a weaker relationship between exhibits and audiences; the interactive experience brought by dynamic scene-based exhibitions is a two-way interaction between exhibits and audiences, which is an immersive display form that is integrated as a whole. Audiences have a stronger interest and entertainment value in exhibits, forming a good relationship between exhibits and audiences.

4. Differences in Audience Interaction Experience

Audiences are the service targets of museums. Nowadays, museums are gradually adopting a "people-oriented" service philosophy, focusing on the visitor experience and emphasizing that museums serve for audiences and society. Understanding visitor behavior is the key to museums better serving audiences.

Sensory perception is a cognitive tool for humans to understand the world. This means that vision is a tool that actively leads people to explore. Vision is also an extremely proactive form of sensory perception. Based on this form of perception, the visitor's behavior during a museum visit is a process of receiving, storing, and processing information about the exhibits. It is also the visitor's emotional and cognitive response to the appearance and historical information contained in the exhibits. In this process, the interaction between the visitor and the exhibit can be evaluated from the perspective of emotion and cognition to determine the quality of the museum display. From a subjective psychological perspective, the emotional experience of visitors towards the clothing display is one of the criteria for evaluating the quality of interactive experience. From a rational perspective of value cognition, the interpretation of clothing and the visitor's understanding of the exhibits are also criteria for evaluating the interactive experience of the museum. This study explores the differences in the interactive experience of visitors between physical and virtual displays of the Shanghai Textile and Costume Museum.

4.1 Evaluation of Interactive Experience

In the context of interactive experience, the evaluation of museum fashion exhibitions is composed of emotional and cognitive interactions. Emotional interaction in fashion exhibitions refers to the active perception and exploration of the exhibition by visitors during their visit, as well as their emotional response to the exhibits. During the process of visiting fashion exhibits, all the information perceived by the eyes is transmitted to the brain, which leads to the audience's relevant emotions and feelings. Cognitive interaction refers to the perceptual reaction of visitors to fashion exhibits and the memory activities of the exhibits.

The experiment obtained six factors that affect interactive experience through interviews with visitors: "interaction between visitors and clothing exhibits", "immersive experience of visitors", "happiness of visitors' learning", "richness of clothing information conveyed", "vividness of clothing exhibits presentation", and "visual impact of clothing exhibit information". These positively evaluated indicators are the basic elements for testing visitors' interactive experience. Each item used the Likert scale to represent visitors' attitudes and evaluation results of physical and virtual clothing exhibits in museums, with answers ranging from "strongly disagree" (1 point) to "strongly agree" (5 points) to form the scoring form.

4.2 Data Collection and Analysis

The experiment conducted a questionnaire survey on the interaction experience of visitors with the physical and virtual displays at the Shanghai Textile and Costume Museum. The survey was distributed to a group of non-professional visitors to the museum. A total of 153 questionnaires were distributed for both virtual and physical displays, of which 140 were valid, resulting in a valid response rate of 91.5%. After collecting the questionnaires, the reliability and validity of the data were tested. The sample reliability analysis showed that the Cronbach's alpha coefficient for the interaction experience was 0.847, indicating good internal consistency. The validity analysis showed that the KMO statistic was 0.866 and the Bartlett's sphericity test was close to a chi-square value of 994.587 (df=66, sig=0.000).

4.3 Analysis of Interaction Experience Differences

Based on the T-test results of the interactive experience (Table 1), the differences in the various items between the two exhibition forms have reached a significant level. Therefore, it can be concluded that the audience perceives the interaction of physical displays of clothing to be weaker compared to virtual displays. Immersive virtual displays allow the audience to stay longer in the virtual environment where the exhibit is located, thus achieving physiological and psychological interaction with the audience in emotional and cognitive activities. Secondly, the virtual environment restores the living scene of the era in which the exhibit was located, creating a feeling of being present for the audience while viewing the exhibit. Virtual displays with context can also give the audience a sense of psychological satisfaction and happiness in perceptual activities. Furthermore, the vivid perceptual object of virtual displays of clothing effectively assists the audience in identifying the exhibit. The scene is also the "perceptual supplement" of clothing exhibits, making up for the historical customs behind the clothing and giving the audience more information. Compared with virtual displays, physical displays of clothing exhibit weaker interaction. The experiment shows that the audience believes that the display cabinet design of most museums lacks warmth, and factors such as light reflection and distant exhibits weaken the audience's experience and their liking for it.

Table 1. Interactive experience item T-test

Average Value			Standard Deviation		Degrees	F	P
	Virtual	Physical	Virtual	Physical			
Q1	2.625	1.950	1.296	1.052	251	16.461	0.000
Q2	2.862	1.921	1.322	1.102	251	12.809	0.000
Q3	3.000	2.545	1.261	0.819	251	9.762	0.002
Q4	2.836	2.396	1.289	0.861	251	20.413	0.000
Q5	2.901	2.238	1.254	0.723	251	27.124	0.000
Q6	2.901	2.337	1.291	0.930	251	14.699	0.000

5. Design Principles of Museum Costume Display

Under the interactive experience, the audience's emotional and cognitive evaluation of virtual display is higher than that of physical display. Unlike physical clothing display, virtual display of clothing has features such as "effective communication of exhibit information", "good interaction between exhibit and audience", and "superrealism of exhibit and its scene". Based on its performance characteristics, designers need to strengthen the sense of reality of exhibits in virtual display design, optimize the

interaction relationship between the audience and exhibits, and positively influence the audience's perceptual activities with its emotional and cognitive features. For physical display design, designers need to take "interaction" as an important principle of design, weaken the distance between exhibit and audience, and thus satisfy the audience's emotional and cognitive needs. Clothing display design should start from an emotional perspective, creating a good interactive experience between "people and exhibits" for the audience in a real or virtual display environment. It should also follow the methods and principles that focus on the audience, taking into account the audience's emotional satisfaction.

As a space for the dissemination of knowledge, museums require designers to consider the effective communication of exhibit information in fashion display design. In the process of showcasing collections to visitors, interactive exhibit design can supplement the lack of understanding of visual information and assist visitors in comprehending knowledge. Visitors accept certain information through visual contact with exhibits and then use their own experiences to verify the conveyed information, thereby deciding whether to accept the content conveyed by the exhibits. This also demonstrates that active selection is one of the basic visual features. Visitors' visual selection of exhibit information is invisibly influenced by the interactive experience. Therefore, designers need to highlight the exhibits and improve visitors' understanding of them in complex scenes for virtual fashion display design. For physical exhibit design, exhibit information should be emphasized through lighting, exhibit labels, and other factors to enhance visitors' visual interaction with exhibits, thereby deepening their understanding of them. This is how interactive fashion exhibit design brings visitors and exhibits closer together in terms of emotion and cognition, allowing exhibits to emit warmth and form an emotional and knowledgeable display format.

6. Conclusion

Museums have undergone significant changes in their guiding principles, shifting from a focus on "collections as the core" to a "people-oriented" approach. As a branch of museum exhibits, clothing is both rigid and flexible in its display. Consequently, the display methods of clothing exhibits differ from those of other artifacts, and audiences respond differently to them. Experimental studies have shown that audiences prefer the immersive, interactive, and imaginative characteristics of virtual clothing displays. The virtual reconstruction of a Republican-era living environment, for example, made cheongsam displays more vivid and picturesque, better showcasing the characteristics of the cheongsam. Although virtual displays may not be as realistic as physical ones, improvements can be made in technology and other areas in the future. In virtual display design, the authenticity of the exhibit should also be emphasized with good interactive behavior. In physical clothing exhibit design, glass cases create a sense of distance between the audience and the exhibit, and designers should strengthen the interaction between the audience and the exhibit in terms of emotion and cognition. Therefore, virtual and physical clothing displays based on interactive experiences differ, and designers can target specific visual features of different displays to create a fusion of virtual and physical displays that establishes an emotionally engaging interactive relationship between the audience and the exhibit, satisfying their desire for a warm and engaging exhibit.

Acknowledgments

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