Analysis on Interactive Design of Contemporary Museum Display

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Abstract—Under the background of the current digital age, interactive design is a hot topic in museum display design. At present, interaction design cases emerge one after another and show some distinctive features. In this paper, the characteristics and practical trends of museum interactive display design are analyzed and summarized from the three aspects of fuzzy expression, narrative thinking and interactive experience combined with representative excellent design cases. Finally, the positive significance and limitations of museum interactive design are discussed, aiming to provide reference for the continuous research and exploration in this field.

Keywords—Digital Age; Museum Display; Interactive Design; Positive Significance; Limitations

I. CURRENT SITUATION OF INTERACTIVE DESIGN IN MUSEUM DISPLAY

Interactive design in museum exhibition originates from the rapid development of science and technology in the digital age, changes in people's cognitive style and mode of thinking, and more importantly, the importance attached to digital education by all countries in the world. UNESCO's 2011 report on education, Developing an Innovation Ecosystem for Education, pointed out that digital technology "provides access to information, communication networks and new ways to present learning" [1]. In the Ten-Year Development Plan for Education Informatization (2011-2020), China explicitly proposes to implement the "2020 Action Plan for China's Digital Education" to focus on solving major problems in the overall, basic and common fields of national education informatization, and to promote new education methods that use information technologies such as computers, communications and networks to carry out educational activities. The United States, Britain and Japan have also implemented a series of measures in the reform of educational informatization. Conforming to this development trend, as a public welfare popular science education institution with exhibition education as its main function, various interactive exhibition design works of museums are constantly emerging.

Interactive design is a hot topic in museum display design today. At present, museum interactive display design focuses on the interest and participation of display. It uses rich media resources and interactive means to enhance the public's visual, auditory, tactile and other aspects of stimulation. It skillfully guides visitors to the theme spirit of exhibits. The display content is rich and the forms of expression are flexible and changeable. However, it is obviously unable to meet the needs of the public to visit only through form changes, rich media and technical piling. So how to meet the public's visiting needs and what are the common features of interactive design in museum exhibition? This paper analyzes and summarizes the performance characteristics of museum display interaction design based on excellent cases, and discusses its design significance.

II. THE PERFORMANCE CHARACTERISTICS OF INTERACTIVE DESIGN FOR MUSEUM DISPLAY

A. Fuzzy Expression of Interactive Design for Museum Display

Fuzziness was first put forward in the category of mathematics and then gradually introduced into the field of aesthetics. Fuzziness aims to show the beauty of fuzziness that permeates and transforms each other and presents a state of intersection. Digital technology has brought new ways of communication and communication to human society. The focus of design has gradually shifted from tangible elements to invisible "human-space-display" interrelation. The boundaries between different elements are fuzzy and affect each other, forming a systematic whole. That is, the interactive design of museum display shows fuzziness. This feature is mainly reflected in the following aspects:

(1) The identity of designers and visitors is vague. The designer solicits the opinions of the visitors, and guides the visitors to participate in the exhibition design creation, and even can change the exhibition form. The visitors perform the functions of the designer to a certain extent.

(2) The display function space is fuzzy. In the past, exhibits were placed in exhibition halls with clear boundaries with other spaces. Now any area may be a display space, permeating with other spaces (public space, service space, etc.) in an effort to create a comfortable exhibition environment. This kind of fuzzy functional space strengthens the visitors' experience of viewing the exhibition and is highly affirmed.

(3) The spatial form is vague. All kinds of digital media equipment form media walls by combining partitions, floors, walls and other interfaces. The created new space overlaps and interleaves with the traditional interface, and is continuously generated along with the transformation of visitors' visiting routines, creating a kind of void and elusive psychedelic space, giving people a space experience of alternation of actual and actual situations. For example, the BMW Museum in Munich

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is separated by several wedge-shaped ramps, which are connected by flyovers of different heights. Viewers can watch BMW models from various angles on the flyover. The multimedia projection on the wall surface produces refraction and deformation, which increases the sense of space extension. In combination with sound and image, the virtual space and the real space penetrate and transform each other, and the whole space presents the fuzzy beauty in the cross state, allowing the audience to experience the brand-new presentation and interpretation of BMW brand (Fig.1).

Figure 1 BMW Museum in Munich

(4) The interpersonal relationship between visitors and visitors is vague. The defamiliarization of interpersonal relations in modern society has been an established fact. However, in public space, people must establish relationships with others in order to cultivate themselves. During the visit, the audience can communicate with interpreters, companions and even strangers, which can meet the needs of individual social communication, deepen the audience's understanding of the exhibits and realize knowledge sharing [2]. Display interaction design can stimulate the interest of visitors and the interaction between visitors. The fuzzy experience of interpersonal relationship can meet the emotional needs of people to some extent. For example, the revolving mirror gate of Sichuan Jianchuan Cultural Revolution Mirror Museum, has formed a maze of nightmarish entertainment spaces. The constant rotation of the mirror gate by visitors creates a changeable illusory space, which affects other visitors' judgment of the space and subsequent behaviors, arouses people's interest and enthusiasm, and deepens their cognition and understanding of the exhibition. (Fig.2)

Figure 2 Sichuan Jianchuan Cultural Revolution Mirror

Fig. 1. BMW Museum in Munich

B. Narrative Ideas of Interactive Design for Museum Display

Narratology first appeared in the study of literary narrative works, and then gradually applied to the field of design. Narrative from a design perspective is a process in which designers use design works as a medium connecting the inner world and the outer world of human beings, and use space, multimedia and other elements to show, describe or design in the way of telling or describing stories, so as to enable visitors to perceive the theme of the exhibition and its deeper meaning, so as to better convey the value of the exhibits. Benoit mentioned in his article Museum Exhibition: Past and Future: A story can connect and link all the photos or all the felt exhibition factors, which is much more powerful than a simple theme covering all the exhibits. [3]" Therefore, displaying narrative ideas of interactive design can enable viewers to obtain richer experiences.

Shanghai Museum of Glass is a comprehensive museum with the theme of "Glass" that integrates sightseeing, learning, artistic display and experience [4]. The exhibition consists of several juxtaposed workshops, which distribute the scientific characteristics of glass materials, the history of glass, the application of glass, the art of glass and other contents in different architectural spaces by telling the story of "Glass". Each theme space is laid out with story clues, and various narrative methods are used to interweave and supplement each other. The audience can selectively integrate into the "story" of the glass. For example, in the history part of glass, time is taken as the narrative axis, inclined planes and parallelogram display cabinets are adopted to show the physical characteristics of glass, and the development history of Chinese and western glass is arranged on both sides of the exhibition space, which corresponds to each other and produces a strong contrast relationship. This narrative design method enables visitors to not only mobilize various senses of visitors through roaming in the narrative system, but also let them know relevant glass knowledge in the form of real experience (Fig.3).
In the above-mentioned exhibition, the narrative theme preset by the mechanical device is developed step by step with the operation of the visitors, and the display information at all levels is transmitted in an orderly manner, accurate, orderly and profound. Apart from rich interactive experiences and interesting stories, this interactive display has one of the most prominent features: inspiring visitors. Guide the visitors to put forward the idea of understanding the theme and actively seek a better learning mode, so that visitors can acquire new knowledge in exploration and discovery.

C. Interactive Design of Interactive Experience in Museum Display

The most prominent feature of museum display interactive design is interactive experience, which mainly focuses on the experience needs of visitors. Interactive experience provides visitors with an active, meaningful and personalized process and produces a good feeling in their consciousness. Therefore, interactive experience has dual characteristics of directness and significance. The feeling of the interactive experience process is not single but multiple-vision, hearing, touch, smell and even taste, as well as the comprehensive feeling generated by human muscles, joints, bones and internal organs in the experience process. Therefore, interactive experience is of great significance to the dissemination of museum display information.

At present, most display interaction designs enhance interaction experience by stimulating visual, tactile, auditory and other sensory stimuli. For example, at one end of the "Courtyard with Falling Leaves" in Jüdisches Museum Berlin, the space is narrow and high, surrounded by cold concrete walls. The courtyard was covered with cast iron components. A closer look revealed that the iron components on the ground were all skull faces. Outdoor light was projected onto the components through the top of the courtyard, reflecting dark and similar faces. Visitors walked on the components and made a collision sound. The metal collision sound echoed in the narrow space, as if countless lives were writhing and struggling, hitting the hearts of the walkers, reminding people of all kinds of sufferings experienced by Jews. Designers create disturbing feelings through the combination of vision, hearing, touch and visitors. In the same space, different visitors trigger their own vision, touch and hearing during their travel and get different experiences (Fig.4) [5].

In the digital age, besides adding various sensory stimulation methods to the interactive experience, visitors can also be integrated into the virtual environment by using digital technology through intelligent facilities such as glasses and handheld devices. The control methods of visitors include mouse, screen, language, gestures and expressions, etc., which are like wandering and appreciating in real physical space. In the dinosaur archaeology exhibition of the American Museum of Natural History, visitors can roam, move, touch and search in the virtual scene space through interactive devices such as helmet-mounted displays and data gloves. Images in the virtual environment also change in real time, so that they can actively respond to the actions of visitors, respond to visitors from the other end of the computer, and also hear three-dimensional simulation sounds. Visitors can see with their own eyes the process of dinosaur excavation and experience the excavation of dinosaur fossils. In the process of watching, the viewer integrates immersion experience and interaction, and the exhibition provides a brand-new perspective for the viewer to understand the latest research results of dinosaur archaeology.

In addition, interactive design in the exhibition has many characteristics such as knowledge, safety, interest, durability and so on according to the emotional needs and behavior habits of visitors, which can effectively spread the exhibition information. At present, the digital interactive display experience is also in a dynamic state in various forms, but diversification, miniaturization and portability are the future development directions [6].
III. THE SIGNIFICANCE OF INTERACTIVE DESIGN IN MUSEUM DISPLAY

In the interactive design of museum exhibition, visitors can watch and experience according to their own wishes and needs, stimulate their wisdom and creativity, bring rich fun and infinite vitality to the space, visitors also feel novelty for the space changes caused by their own activities, and arouse people's stronger interest and enthusiasm to explore all possibilities in the space. In this process, it is also a process of self-awareness satisfaction and realization. Architect Anton said: "Only by experiencing the space, walking through the space and watching them joyfully, can you realize their inner qualities. [7]" Space cannot be perfectly expressed in any form or expression method, and can only be perceived through direct experience. Interactive design of museum exhibition can enrich the meaning of space, deepen emotional experience and spatial cognition. Visitors further experience and feel the space in the space, and the experience is more real and profound.

Some new concepts and methods presented by interactive design of museum exhibition subvert the traditional design concept and design methods, and play a positive role in the development of contemporary museum design. They are becoming more and freer in form and bring unexpected novelty to people. However, they rely too much on technology, pursue form one-sidedly, emphasize the interest of works too much, and interact for "interaction". In addition, the application of many digital technologies makes the design replicable. Although it is conducive to the dissemination and learning of experience, it is also easy to be imitated, pieced together or even copied indiscriminately, making the design works appear impetuous and impractical.

IV. CONCLUSION

The characteristics of current museum interactive design works include: fuzziness between designers and visitors, fuzziness of spatial function, fuzziness of spatial form, fuzziness between visitors and visitors, and integration of narrative expression into design ideas. Interactive experience makes the exhibition viewing process more comprehensive and profound. At the same time, we should rationally identify, analyze and reasonably apply the trend of interactive design. With the support of technology and media, starting from the function and significance of design, we should create a new and vivid interactive design for museum exhibition that conforms to the space theme, has meaning, has purpose and is novel and vivid.

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