Research and Application of Emotion-Based Digital Museum Interaction Design

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Abstract: *With the rapid advancement of the era, people's lives have become increasingly rich and exciting, leading to corresponding changes in the way museums are visited, making digital museums highly favored by the public. Digital museums rely on digital technology to process exhibition information, transforming complex textual information into images or audiovisual content, thereby enhancing the attractiveness of museums. Currently, technologies such as holographic projection and virtual reality (VR) have enriched visitors' sensory experiences, to the extent that emotional experiences have gained increased attention in digital museums. In view of this, this paper aims to discuss the significance of emotional experiences in digital museum interaction design, and explore the impact of emotional experiences on digital museum interactions. It also investigates the research and application of emotion-based digital museum interaction design, with the hope of promoting the development of digital museums.*

Keywords: *Emotional experience, digital, museum, interaction design*

1. Introduction

Museums have emerged due to human consciousness of collecting, gradually evolving into non-profit institutions serving society with significant values in cultural heritage research, preservation, and social education. As carriers of human wisdom and civilization, museums have adapted their exhibition methods in response to modern advancements, particularly in recent years with the introduction of digital technology, leading museums onto the path of digitization. Digital museums prioritize visitor experiences, with all activities centered around meeting the needs of visitors. This has resulted in an increased focus on emotional experiences as digital museums progress. This paper explores the research and application of emotion-based digital museum interaction design, serving as a reference and resource for fellow professionals.

2. Overview of Emotional Experience and Digital Museum Interaction

2.1 Emotional Experience

2.1.1 Main Content

"Aesthetics Introduction" points out that emotion is a special manifestation of human beings' perception of objective things, and it is also a strong inner response of human beings to the presence or absence of objective things and their own needs. Emotion encompasses perception, memory, thinking, and many other aspects, which can be seen as a process of human understanding of objective things. However, emotions and feelings have significant differences from the process of understanding things. They are no longer a mere manifestation of objective things themselves but rather a presentation of a certain relationship between objective objects and the subject. Therefore, they are often referred to as attitudes. Specifically, it is a subjective attitude of affirmation or negation towards objective things, closely related to activities and needs of human participation. Different relationships between objective things and the subject will generate different emotions, leading the subject to choose different activities. This is a dynamic process of continuously satisfying the needs of the subject. In the process of experiential activities, positive emotional experiences are referred to as experiential pleasure, which brings spiritual pleasure to individuals and manifests as positive emotional expressions such as happiness and joy[1].

Based on "Emotion Design," emotional experiences primarily consist of three levels: instinct,

behavior, and reflection. Instinct is the foundation formed through the appearance and use of products, emphasizing the first impression the product gives to users. Specifically, during the design of digital museum interaction, designers use various material media to stimulate the senses of individuals and evoke corresponding emotional responses[2].This forms the first impression of visitors towards the interactive products in digital museums. Behavior refers to the behavioral interactions that occur during the use of products in emotional experiences. Reflection is the interaction between the product and the user's emotions, memories, and other mental aspects, which are influenced by factors such as the individual's understanding, experiences, and living environment. The individual's perception of things depends on their level of reflection, and their emotional experiences and judgment determine their acceptance of things and behaviors. From the above, it can be observed that emotional experiences promote the development of digital museums and have profound social and educational significance[3].

2.1.2 Main Forms

Currently digital museums have incorporated interactive forms that evoke emotional experiences, such as interactivity and entertainment, into their daily exhibitions. During offline digital museum exhibitions, participants can deeply experience the essence conveyed by the museum's exhibitions through the rendering of the venue atmosphere and the interpersonal interaction of digital multimedia devices. This experiential approach promotes the dissemination of information to a certain extent. Moreover, the designers of digital museums can continuously create impactful designs for the spaces visited by users, while also incorporating entertainment and games into the interactive process based on an understanding of users' exhibition needs[4].This generates positive and enjoyable emotional experiences, making users' visits more exciting and enriching. Of course, emotional experiences exist not only in the physical space dimension but also in the virtual space where users' minds are located. Digital museums can enhance visitors' emotional experiences through interactive physical venues and provide more emotional experiences through online apps. Human emotions are mainly classified into four categories: joy, anger, grief, and pleasure, but the forms of emotional expression are diverse. Depending on the content exhibited in digital museums, the forms of emotional experiences vary significantly. In digital museums, historical and cultural exhibitions primarily include historical changes, environmental reconstructions, story retellings, comprehensive displays of cultural relics, AR artifact showcases, and more[5].Artistic and literary exhibitions involve reviving artworks, interacting with AI-simulated artists, creative reinterpretations of artworks, and story progression triggered by user interaction. Natural science exhibitions mainly focus on simulations, environmental recreations, audiovisual multisensory experiences, AR, and VR interactive games. Taking historical and cultural exhibitions and aesthetic art exhibitions as examples, the forms of emotional experiences in both categories are closely related. Historical and cultural exhibitions cover a wide range of exhibits, including many artistic and aesthetic artifacts, providing visitors with rich emotional experiences.

2.2 Digital Museum Interaction Design

2.2.1 Current Development

Digital museums are "masterpieces" created in the context of the continuous advancement of the era and differ greatly from traditional museums. Traditional museums in the past often relied on physical exhibitions, which were subject to various objective factors such as specific exhibition times and locations, spatial constraints, and the number of exhibited artifacts. Digital museums have established virtual online channels based on this foundation. During digital museum exhibitions, physical digital museums employ various multimedia technologies to provide visitors with a brand-new sensory experience. Online virtual museums break free from the limitations of physical museums and primarily utilize apps on smart devices for exhibitions. Visitors can not only view three-dimensional displays of artifacts online but also engage in immersive exploration of exhibition halls, selecting and exploring content based on personal interests, thereby improving the efficiency of visitors in obtaining museum exhibition information. Thus, digital museums are characterized by openness, interactivity, and virtuality[6].

2.2.2 Classification and Features

With the rapid development of digital technology in the new era, smart devices have become ubiquitous, and the exhibition forms of digital museums have undergone corresponding changes. The interactive terminals of digital museums are no longer limited to large-scale new media interactive devices but also include smart devices. Visitors can now explore museums using smart devices, transforming the way they visit from on-site to virtual. This transformation helps address the issue of

visitors unable to visit physical museums due to special circumstances. Through the exploration of digital museum interaction terminals and the changes in visitor experiences, it is evident that digital museums can be mainly classified into two types: offline physical museums and online virtual museums. Offline physical digital museums primarily utilize large-scale new media interactive devices, with well-organized exhibits displayed in a real environment. The exhibition space provides visitors with various sensory stimulation and experiences. Online virtual digital museums mainly rely on smart device apps for three-dimensional artifact displays, featuring virtuality. Their exhibitions are not limited by time and space, allowing for rapid dissemination of exhibition-related information.

3.   Impact of Emotional Experience on Digital Museum Interaction

In the context of rapid development in modern society, people visiting digital museums pay increasing attention to their personal experiential needs. They emphasize the experience of psychological emotions based on their physiological sensory needs, which leads to profound thoughts, emotions, and memories through comprehensive information acquisition. Through an in-depth analysis of information dissemination efficiency, digital museums provide visitors with a dual experience of physiological and psychological interactions, which is beneficial for social education and cultural heritage. Emotional experience leads to corresponding changes in digital museum interaction.

3.1   Enhancing Visitors' Engagement

Emotional experience can enhance visitors' engagement. In the exhibition process, digital museums emphasize active participation from visitors. Through instinctual emotional design, they continuously capture the attention of visitors, such as creating a mysterious atmosphere in the exhibition space and presenting a clean and visually appealing display interface. Additionally, digital museums incorporate modern technologies into digital interactive products, providing visitors with new experiences. For example, virtual reality, holographic projection, and other technologies create a sense of novelty, naturally evoking positive emotions in visitors. This effectively triggers visitors' emotions, increases their engagement, and encourages them to proactively explore more about the digital museum exhibition, deriving pleasure from experiencing something new.

3.2   Influencing Cognitive Levels

Emotional experience is closely related to human cognition, directly impacting perception and its depth. In the field of cognition, individuals have selective reception of information. Generally, people choose things that they are interested in or have high expectations for. Digital museums, based on this cognitive process, place significant emphasis on visitors' emotional experiences. Through emotional expressions such as subtlety, calmness, sorrow, and others, they enhance visitors' cognitive levels of the museum's exhibition content. Moreover, from the perspective of information theory, emotions facilitate the integration of information in digital museums. With a higher degree of organization within the information system, a greater amount of content can be provided. In the digital museum system, emotions to some extent enhance the efficiency of information transmission, creating a cohesive force that reorganizes dispersed information around emotions. This effectively activates the internal energy of information, allowing for more efficient integration and facilitating visitors' understanding.

4.   Key Aspects of Emotional Experience-Based Digital Museum Interaction

Design By relying on user profiles and user journey maps, a deeper understanding of the behaviors and related emotional experiences of most visitors to digital museums can be obtained, laying a solid foundation for subsequent interactive design of digital museums. During the process of understanding user profiles and user journey maps, the following key aspects of emotional experience-based digital museum interaction design can be identified.

4.1   Emphasizing Diversity

Emotional experience-based digital museum interaction design focuses on diversity, which is manifested in the variety of interactive forms, providing visitors with richer paths to engage with the museum. For example, panoramic browsers allow users to fulfill their desire to visit museums worldwide from the comfort of their homes, without limitations of time and space. Leveraging

panoramic browsers, visitors can explore digital museums without any search restrictions and even browse and download related images. Of course, panoramic browsers are just one element of the diversified interactive experiences of digital museums, primarily aiming to attract more users' interests and increase their engagement.

4.2 Emphasizing Personalization

Emotional experience-based digital museum interaction design emphasizes personalization, which is manifested in internet technologies and big data analysis. Digital museums should rely on the internet and big data to accurately analyze users' interests and preferences based on their viewing and sharing activities, and deliver relevant content through data matching. Therefore, digital museum staff can identify the content that target users are most interested in through data analysis and launch corresponding interactive methods. This provides visitors with more enriched emotional experiences, making them feel valued and attended to, further satisfying their psychological needs for recognition and attention.

4.3 Introducing Appropriate Games

Emotional experience-based digital museum interaction design should introduce appropriate games. Games are auxiliary tools for promoting human learning and education, including single-player, two-player, and multiplayer competitive games. Single-player or two-player entertainment games do not impose too much pressure on players and can serve as a leisure activity during free time, while competitive games require players to continuously improve their personal levels. In digital museums, the design of game interaction features in the app should allow for both single-player and multiplayer competitive games. This not only enriches visitors' exhibition experiences but also brings them more joy. It is worth mentioning that different interactive games should be designed for visitors of different ages. For example, younger children can have puzzle games or coloring books as single-player leisure games.

4.4 Fostering Socialization

Emotional experience-based digital museum interaction design should foster socialization. With the rapid development of the internet in recent years, various social platforms such as forums and online communities have emerged, revolutionizing people's modes of communication. Digital museums have followed suit by establishing official accounts on various networking platforms, periodically releasing exhibition information, and engaging in harmonious and friendly communication with online users. This creates a new interactive mode where museum information shifts from one-way output to two-way interaction. It improves the efficiency and quality of information dissemination in digital museums, accelerates their development, enhances their influence in people's minds, and stimulates interest in offline visits and online searches.

5. Practical Research on Emotional Experience-Based Digital Museum Interaction Design

In the process of emotional experience-based digital museum interaction design, digital museums should conduct in-depth analysis from multiple perspectives and design appropriate interactive apps to enhance users' emotional experience with digital museums. The target audience for app design should be divided into two groups: teenagers aged 10 to 18 and young adults aged 18 to 40. Digital museums should stimulate users' participation and evoke positive emotions through gamified interaction, enriching the emotional experience of these two groups during their engagement with digital museums. This promotes the dissemination and inheritance of historical and cultural aspects of digital museums in modern society. Therefore, the digital museum interactive app designed based on the target groups should have four key characteristics.

5.1 Four Key Characteristics of Interactive Apps

Firstly, online visitation should be realized. Museum staff should digitize and scan all products of the digital museum, build a comprehensive information data platform, and store the information of all museum collections within it. The staff should then digitize the images and texts of the products to be fully presented in the digital museum interactive app. Secondly, fun interaction should be realized. The

app should divide different modules based on the exhibition content and design distinctive gamified interactive methods within each module to stimulate users' interest in exploring the collections. Thirdly, social sharing should be realized. The digital museum interactive app should include a community module where relevant information about exhibitions and events can be posted. Users can create accounts in the app to share their observations and experiences from visiting the museum, bringing the digital museum closer to the public and facilitating the inheritance and dissemination of cultural heritage left by predecessors.

5.2 *Enriching the Functionality of Interactive Apps*

When designing the digital museum interactive app, the functionality should be enriched based on the target audience's needs, considering gamified interaction, diverse experiential modes, and a communication platform. Specifically, the digital museum should make the text, image, and audiovisual experiences more diverse, incorporate game-like interactive elements into the introduction of exhibits to enhance visitors' memory of the products and related content. At the same time, the digital museum should provide a platform for users to share and communicate. Through these functional designs, the digital museum app can fully satisfy users' instinctive, behavioral, and reflective needs in emotional experience, allowing users to comprehensively understand the information conveyed by the museum under sensory guidance. After determining the app's functionality, a well-structured information architecture should be established to provide a user-friendly experience for visitors. During the design process, the information architecture should adhere to the three principles of priority, consistency, and critical points. Priority refers to controlling the main functions and content displayed in the interactive app, consistency aims to minimize user confusion during interaction, and critical points emphasize reducing the learning curve for using the product and highlighting its key features, ensuring the quality of the design of the museum's interactive app.

6.   Conclusion

In conclusion, with the rapid advancement of society, the current era has fully embraced the digital path, leading to significant changes in people's lifestyles and indirectly paving the way for the development of traditional museums in a new direction. To keep up with the progress of the times and venture into new territories, museums need to introduce digital technology and satisfy users' emotional experiences in their interaction designs, thereby enhancing the efficiency of information dissemination in digital museums. Indeed, emotional experiences are closely intertwined with digital museum interactions. By enriching the ways in which digital museum interactions are designed, users' emotional experiences can be satisfied, leading to increased enthusiasm and interest in visiting. Therefore, in digital museum interaction design, it is important to emphasize diversification, personalization, socialization, and the incorporation of suitable games. Additionally, digital museums should leverage digital technology to design interactive apps that facilitate online communication and bridge the gap between museums and users, thereby promoting the further development of digital museums.

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