

Immersive Experience and Cultural Inheritance: Museum Exhibition Design Based on Metaverse Technology

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Abstract: Based on the current status of museum operations and exhibition display schemes, this paper constructs museum exhibition methods and design proposals utilizing metaverse technology through its innovation and optimization. Further discussions are conducted on the characteristics of metaverse technology and its application strategies, providing novel possibilities for the promotion and content dissemination of museum products.

Keywords: Metaverse technology; Immersive experience; Exhibition design; Operational system

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1. Introduction

Currently, museums in various regions are transitioning from traditional business models to digital services, integrating advanced scientific and technological means into their service offerings, with metaverse technology as a representative. This paper explores strategies for applying metaverse technology in museum exhibition content, daily operation plans, and management directions to ensure stable museum operations.

2. Characteristics of metaverse technology

The initial concept of the metaverse originated from abstract science fiction universes and virtual interactive entertainment scenarios. Compared to traditional spatial scenarios, the metaverse-based space better satisfies users' needs for various mechanisms. In terms of connotation and definition, the metaverse differs slightly from current research directions. For instance, in the literary field, the metaverse primarily refers to transforming individual users into digital avatars via real devices and virtual networks, enabling communication between users. From an internet perspective, the metaverse is not merely a communication

technology or interactive platform. It can also evolve into an automated and intelligent operational system with infinite possibilities. Some scholars view the metaverse as the third-generation communication environment based on the internet, enabling not only virtual interactions but also interactions between virtuality and reality, thereby influencing people's daily lives, work, and learning.

In examining the intrinsic nature of metaverse technology, experts note that it is not limited to a single technology but rather represents the core concept of the metaverse technology structure and application system. This includes artificial intelligence, 5G, big data, virtual reality (VR), augmented reality (AR), and other technologies, which can be broadly classified into three types based on their practical applications and fundamental attributes.

Firstly, technologies that expand the real environment, utilizing virtual platforms or augmented reality to achieve technological application effects. Secondly, digital twin technology which maps real-time changes from the physical world to virtual environments, enabling virtual-real interactions. Thirdly, blockchain technology, commonly applied in the construction and optimization of economic structural systems.

Compared to traditional technologies, the metaverse offers distinct advantages and complex characteristics that require comprehensive analysis and research from multiple perspectives.

3. Application strategies of metaverse technology

3.1. Optimizing exhibition methods

Traditional museum exhibitions primarily focus on physical objects, supported by explanatory text, videos, images, and audio. Metaverse technology not only enables virtual exhibit displays but also enriches digital exhibition forms and states through high-definition data. Thus, it emerges as a new exhibition format alongside physical objects.

Utilizing high-precision hardware devices such as 3D scanners, non-contact scanners, and computed tomography (CT) scanners, museums can capture and enlarge details that are not visible to the naked eye, enhancing the viewing and research experience for users. Additionally, metaverse technology optimizes and enhances the perception data of exhibits, enabling various display possibilities like virtual exhibitions and online exhibitions. Combining metaverse technology with physical exhibits creates more exhibition possibilities, such as integrating holographic projections and VR technology for exhibit displays, deepening user impression while protecting the exhibits.

3.2. Scene construction

In the internet development process, scenes primarily arise from the integration of mobile terminal devices, social platforms, big data technology, hardware sensors, and positioning systems. The metaverse further optimizes and expands upon these foundations, encompassing not only the basic platforms of various spaces but also the soft elements of user experience. For museums, reconstructing exhibits and historical scenes is a crucial channel for displaying culture. The emergence of the metaverse provides users with new avenues and possibilities for museum visitation.

Currently, most museums rely on physical exhibition hall screens for virtual scene displays, utilizing technologies like holographic projections or photographs for digital exhibition. While these methods effectively showcase museum culture, they remain disconnected from users' behaviors, serving as mere

digital transformations of physical exhibitions. With metaverse technology, however, museums can integrate users' real-time reactions and visitation states into the virtual exhibition environment. By utilizing extended reality technology, museums can create a virtually and realistically fused environment in the exhibition hall, providing users with a more immersive and realistic viewing experience.

3.3. Forging a new form of venues

3.3.1. Systematic approach

Metaverse technology is a comprehensive technical means that combines modern information and virtual platforms. Essentially, this technology is not merely a reference to a specific technique but rather an amalgamation of modern technological structures. Therefore, when constructing the metaverse, relying solely on a single or specialized technology cannot truly realize its establishment.

In the daily operations of museums, the application of metaverse technology is widespread. Whether it's data collection or exhibition planning, this technology can permeate various processes, forming a fully covered application structure system. Additionally, utilizing the metaverse's virtual-real space exchange, lighting, and projection effects not only provides users with a more authentic and immersive atmosphere but also enhances the technological sensibility of museum exhibitions. This ensures that the displayed content and exhibits become more attractive and interactive, altering users' negative impressions of museums and cultivating a positive, vibrant, and intelligent new museum facade.

Integrating metaverse technology with museums also ensures the original behind-the-scenes cultural and museum work is presented to users. This opens a connecting channel for users to understand the stories behind the museum's exhibition content, deepening their impression of the exhibitions while showcasing the practical effects of scientific and technological means on museums and cultural inheritance.

3.3.2. Personalization

Essentially, museums are the primary service institutions for public culture, with users being the core of their work. To ensure stable and continuous operation in the long-term development of museums, they must establish more equitable relationships with users. Applying metaverse technology in museum exhibition links can accelerate the connection between users and museums, providing more systematic and intelligent viewing services.

Furthermore, metaverse technology, utilizing user perception systems, big data systems, and artificial intelligence technology, can offer more personalized viewing content to users. Through virtual artificial intelligence, users can customize their viewing routes and receive personalized explanations of cultural relics and exhibits. This enhances users' acceptance of the exhibits and museum display content, actively transforming the traditional passive information reception mode during museum exhibitions.

Metaverse technology also enables users to participate in optimizing and improving museum content based on their interests, shifting their role from viewers to creators. This elevates users' enthusiasm and passion for exploring museum culture.

4. Conclusion

In summary, compared to traditional management techniques, the integration of metaverse technology with museums exhibits distinct advantages and characteristics in the display of museum artifacts and cultural

dissemination. The core reason is that this technology effectively establishes a virtual space, offering users more personalized and intelligent viewing services. It fully leverages the social and educational functions of museums. Based on the current application status of metaverse technology, museums across various regions in China primarily focus on metaverse technology in their digital dissemination and innovative paths. They aim to create a cloud exhibition platform that aligns with the museum’s operational model, realizing digitalized operations of collections and modern management paradigms.

Disclosure statement

The author declares no conflict of interest.

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