

# Application Research on Integrating Digital Garden Culture into Exhibition Space Design of Science and Technology Museum

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**Abstract:** Explore how technology museums can integrate interactive garden culture to promote sustainability and environmental protection. Pay special attention to how virtual reality technology integrates with garden culture to create a unique exhibition experience that interacts with nature. In addition, conduct in-depth research on how interactive garden culture can enhance the participation and learning experience of museum visitors. One of the focuses of research is how to enhance the effectiveness of interactive garden culture through multi-sensory experiences and emotional interactions in museum exhibitions. Finally, we will explore how digital gardens can promote cultural interaction and participatory design to enrich the content and experience of museum exhibitions.

## 1 Introduction

With the continuous progress of technology and the rapid development of society, museums are no longer traditional exhibition halls, but have gradually evolved into cultural spaces with interactive and digital characteristics. The exhibition space design of technology museums has become a field full of innovation and challenges. Therefore, the integration and application of digital garden culture has become a highly researched and concerned topic. The concept of digital garden culture provides new ideas for solving this problem. A digital garden is a personalized and interactive virtual space where viewers can freely explore, create, interact, and organize and connect information and knowledge through digital tools. This personalized and interactive feature aligns with the purpose of the Science and Technology Museum, making knowledge dissemination more vivid and interesting.

## 2 The integration of digital garden culture and technology museums

### 2.1 The Essence of Digital Garden

Digital garden is an information and knowledge oriented garden based on network digital tools. Its essence lies in individuals or groups creating a personalized and unique virtual space through collection, organization, creation, and interconnection with tags or links. Its integration with the museum is shown in Table 1. This virtual garden can have different openness, whether it is open for people from around the world to visit and share, or it can be a personal domain that only the creator of the garden can access. The process of building a digital garden includes several key steps, starting with sowing seeds and selecting high-quality information and ideas as the initial seeds. Then there is care, continuous supplementation, and development of these seeds, establishing the correlation and integrity between information in order to better express ideas and viewpoints. In the end, digital gardens will bloom and bear fruit under the careful care of their creators, creating new ideas and works, and sharing them with others<sup>[1]</sup>.

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**Table 1** Case Analysis of Integrating Digital Garden Culture into Science and Technology Museums

name	Description and analysis
The British Museum 'Human Digital Garden'	The "Human Digital Garden" at the British Museum is a digital exhibition space that allows viewers to access multimedia content, including videos, audio, images, and interactive elements, through smart devices such as smartphones or tablets. Viewers can choose different themes based on their interests and explore museum collections. This digital garden provides visitors with a personalized visiting experience and enhances their interactivity.
The "Virtual Garden" of the Metropolitan Museum of Art in the United States	The "Virtual Garden" of the Metropolitan Museum of Art is an online virtual exhibition that presents the museum's artworks and collections through high-definition images and 3D technology. Viewers can freely roam in the virtual environment, zoom in on details, and understand the history and story behind the artwork. This virtual garden expands the museum's access range, allowing global audiences to appreciate the museum's treasures while providing an opportunity to gain a deeper understanding of art.
China National Museum "Yunyou Museum"	The "Yunyou Museum" of the National Museum of China is a digital platform that allows visitors to visit the museum's exhibitions and collections online through online and mobile applications. The platform provides multilingual support and interactive elements, allowing viewers to gain a deeper understanding of Chinese history and culture. The "Yunyou Museum" provides a new way for museums to spread knowledge and exchange culture, allowing visitors to visit and learn remotely.

## 2.2 Current Situation and Challenges of Science and Technology Museums

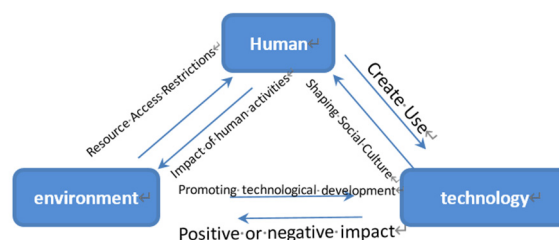
Firstly, the exhibition content of technology museums needs to keep up with the times, as the field of technology continues to develop, and the displayed content needs to maintain the latest and attractive. This means that museums need to constantly update and improve their exhibits to reflect the latest technological achievements. Secondly, technology museums need to address the challenges of audience diversity and needs. Viewers come from different age groups, cultural backgrounds, and fields of interest, therefore, museums' exhibitions and educational activities need to have sufficient diversity and inclusiveness to meet the needs of different audiences. This also means that museums need to constantly innovate to provide a variety of exhibitions and interactive experiences. Finally, technology museums also need to address the challenges posed by digitization and virtualization technologies. With the development of digital technology, audiences are increasingly accustomed to obtaining information and interaction through virtual reality, augmented reality, and online platforms. Therefore, technology museums need to integrate these technologies into exhibitions and education to maintain attractiveness and competitiveness<sup>[2]</sup>.

## 3 The Interaction between Virtual Reality Technology and Digital Garden Culture

### 3.1 Application of Virtual Reality Technology in Science and Technology Museums

Firstly, virtual reality technology can provide a highly immersive experience, making visitors feel as if they are in a completely different environment. By wearing virtual reality headsets, visitors can wander through historical time, space, or fictional worlds, interact with exhibits, and feel a sense of being present. This interactivity and immersion greatly enrich the experience

of visitors, enabling them to have a deeper understanding and memory of the museum's content. Secondly, virtual reality technology can expand the exhibition space of museums. Many museums have limited space and cannot accommodate a large number of exhibits, but virtual reality technology can present more exhibits to the audience through digital reconstruction and virtual display. This means that museums can expand their collection range, showcase more precious cultural relics and artworks, while also reducing the limitations of physical space and providing more choices for the audience. Finally, virtual reality technology can also increase educational value. Museums can use virtual reality to create interactive educational projects, enabling students and visitors to delve deeper into knowledge in fields such as science, history, or culture. This educational application helps to increase the audience's interest and participation in learning, making museums the center of knowledge dissemination<sup>[3]</sup>. In summary, the correlation between virtual technology and people and the environment is shown in Figure 1.



**Figure 1** Schematic diagram of the relationship between people, environment, and technology

### 3.2 Design and Experience of Virtual Digital Garden

The design and experience of virtual digital gardens represent the clever integration of digital garden culture and virtual reality technology. In this concept, users can leverage online digital tools and virtual reality technology to create a unique and personalized digital

information and knowledge-based garden. This virtual digital garden is an immersive digital environment where users can quickly immerse themselves in a completely new digital world through virtual reality headwear devices such as virtual reality helmets<sup>[4]</sup>.

In the design of a virtual digital garden, users can sow and cultivate like in a real garden, but all of this happens in a virtual environment. They can collect, organize, create, and connect various digital information nodes, and organize and manage these contents through tags, links, or intuitive virtual gestures. The experience of a virtual digital garden is highly interactive, allowing users to freely walk in the virtual space, view and modify information, interact with other virtual visitors, or share their digital garden with others<sup>[5]</sup>.

## **4 Improvement of engagement and learning experience**

### **4.1 Participation in Interactive Digital Garden Culture**

Firstly, users can freely browse and navigate the digital garden to meet their personal interests and needs. They can choose to explore specific topics or content without being limited by fixed information flows. This autonomy stimulates users' initiative, making them more willing to delve deeper into and participate in the content of the digital garden. Secondly, interactive elements such as touch screens, gesture recognition, and virtual reality technology enable users to interact with the digital garden in a more intuitive and immersive manner. They can touch icons or virtual objects on the screen to explore more information, or use gestures for navigation and operation. This interactivity stimulates users' curiosity and desire to explore, allowing them to deeply integrate into the experience of digital gardens. Finally, interactive digital gardens can be personalized and customized based on user feedback and behavior. The system can collect user interaction data, understand their interests and preferences, and provide relevant suggestions and content recommendations based on this information. This personalized interaction enhances users' sense of participation, making them feel that the digital garden truly adapts to their needs, thereby improving the learning and exploration experience<sup>[6]</sup>.

### **4.2 Learning Experience for Museum Visitors**

Firstly, visitors can gain a deeper understanding of the museum's collections and exhibits through the digital garden. They can interact with exhibits through touch screens, virtual reality glasses, or other interactive devices to obtain more information and stories behind them. This interactivity makes learning no longer a passive acceptance, but an active participatory process. Secondly, digital gardens can provide museums with diverse learning resources. Visitors can obtain information through digital displays, virtual reality, and multimedia presentations, which are far more diverse

than traditional text and tags. This diversity helps to attract different types of learners, meeting their different learning needs and subject interests. Finally, digital gardens provide opportunities for personalized learning. By collecting interactive data and feedback from visitors, digital gardens can customize learning experiences based on each visitor's interests and learning habits. This means that different visitors can explore the content of the museum based on their own needs and goals, thereby improving the effectiveness and satisfaction of learning<sup>[7]</sup>.

## **5 Cultural Interaction in Digital Gardens**

### **5.1 Concept and advantages of cultural interaction**

Cultural interaction emphasizes that digital gardens are not only the display of information and the transmission of knowledge, but also a platform for cultural exchange and interaction. Cultural interaction encompasses interactions between visitors, between visitors and museums, and between visitors and digital gardens. Through digital tools, visitors can actively participate in the garden and share their cultural perspectives, perspectives, and experiences. This interaction helps to promote communication and understanding between different cultures, break down cultural barriers, and enhance respect and appreciation for cultural diversity<sup>[8]</sup>.

The advantage of cultural interaction lies in its ability to enrich the content and experience of digital gardens. Different cultural perspectives and stories can be integrated into gardens, making them more diverse and inclusive. This interaction can also provide visitors with a more attractive participation experience, making them feel respected for their cultural identity and deeply connected to other cultures. In addition, cultural interaction helps museums achieve their cultural heritage and educational mission, conveying cultural knowledge to a wider audience, and promoting the dissemination and development of culture<sup>[9]</sup>.

### **5.2 Practice of Participatory Design**

In digital gardens, participatory design is a practical approach aimed at promoting cultural interaction and visitor engagement. This method treats visitors as co-creators of the garden, empowering them to participate in design and content creation. Through digital tools, visitors can share their cultural stories, perspectives, and insights, integrating them into a digital garden, thereby making the garden more diverse and inclusive. Participatory design encourages cross-cultural interaction, allowing visitors from different backgrounds and cultures to establish connections and understanding.

The advantage of this practice is that it can deeply integrate diverse cultures, integrate the contributions of different cultures into digital gardens, enrich the content of the garden, and make it more educational and cultural. Participatory design can also improve visitor satisfaction and engagement, as they feel their voice is heard and

valued. In addition, this practice helps to maintain the vitality of digital gardens, as the content can be constantly updated and evolved to reflect constantly changing cultural and social dynamics<sup>[10]</sup>.

## 6 Conclusions

In summary, integrating digital garden culture into the exhibition space design of technology museums can not only enhance audience participation, learning experience, and cultural interaction, but also bring new ideas and practical methods for innovation and development in the field of museums. With the continuous development of digital technology, the integration of digital garden culture and technology museums will showcase broader prospects and possibilities in the future, making greater contributions to cultural education and knowledge dissemination.

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