

# The Influence of Modern Information Technology on the Future of Museums

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**Abstract**—With the rapid development of China's national economy in contemporary society, traditional museum exhibitions are gradually unable to meet the growing spiritual and cultural needs of the public. Therefore, contemporary museums must find new ways to promote their own development. Through the introduction of the museum's current development results of digitization of museum and digital museum, the text introduces the problems and solutions in the development of the museum, and then discusses the future development trend of the museum.

**Keywords**—modern information technology; digitization; digital museum; smart museum

## I. INTRODUCTION

The current development of information technology has brought about tremendous changes in all aspects of modern social life. As the main driving force and an important part of the development of China's socialist scientific and cultural undertakings, the museum shoulders the important historical mission of serving the society and serving the public. It is necessary to take the initiative to assume the historical responsibility of carrying out patriotic education and socialist education for the people, improving the ideological and cultural quality and spiritual cultural accomplishment of the public, and improving the scientific and cultural level of the whole nation. At present, China's museums are actively adapting to historical development trends and combining modern information technology to seek their own transformation and development. This article discusses the current achievements in the transformation and development of museums and the existing problems.

## II. INTRODUCTION TO THE DEVELOPMENT OF DIGITAL CONSTRUCTION OF MUSEUMS

The existing museum is based on a physical museum and has realized the construction of digitization of museums and digital museums through modern information technology and digital technology. The digitization of museums refers to the use of photographs, images, and three-dimensional laser scanning techniques based on physical museums to display museum collections and exhibitions in digital form.

Compared with the digital museum, digitization of museums focuses on the protection and research of cultural heritage. It records the state of cultural relics' excavation,

cleaning and display in real time through photographic records and three-dimensional scanning. It better displays cultural relics and conveys the rich connotation of cultural relics. Today's museums have achieved certain results in the digitization of museums, such as the establishment of digital repositories of cultural relics, the use of digital means to collect, identify, preserve and manage collection information. As a complete information system, the mission and goal of the museum is to provide information services, improve service quality, and better play the role of museum social services. The digitalization of museums can reduce the damage and destruction caused by cultural relics in the traditional exhibition environment, and digital construction can not only scientifically organize all kinds of collection materials, but also use advanced digital means to permanently preserve and update them. [1] The application of digitization has a certain effect on the museum's dissemination characteristics, expanding the scope of communication, and enhancing the willingness of the public to visit.

The digital museum is another important achievement and expression form of the development of contemporary museums. It is the extension and expansion of the network form of the physical museum. It mainly realizes the roaming and interaction of tourists in the virtual environment through 360-degree panoramic roaming technology and virtual reality technology, and provides digital technology products to the public service for the museum exhibition, which has certain immersion and realism.

At present, most museums use 360-degree panoramic roaming technology for digital construction. 360-degree panoramic roaming is a real-life virtual reality technology based on panoramic images [2]. The 360-degree panoramic roaming technology has the following advantages in application: First, compared with high-difficult virtual technologies such as virtual reality and three-dimensional modeling, 360-degree panoramic technology has lower cost and requires less manpower, financial resources, and time cost, which is more conducive to the promotion and use of museums. Second, the high definition, 360-degree panorama is mainly through the hyperlink between several high-definition images to establish a virtual environment for users to manipulate and observe, and can achieve multiple magnification of the image, increasing the amount of access to detail information. Third, the degree of reduction is high, and the 360-degree panoramic technology is based on the captured image, which avoids the error that may be caused in the artificial modeling rendering,

and achieves a 100% reduction of the scene. Fourth, the amount of data is small, and the 360-degree panorama uses Flash technology as the playback platform. It can be browsed and viewed without downloading other plug-ins, and the loading time is relatively short, which is conducive to expanding the influence and spread of the digitalization of the museum.

The Palace Museum, The Oriental Metropolitan Museum, the Shaanxi History Museum, and the Guangdong Province museum all achieved outstanding results in 360-degree panoramic display applications. The Palace Museum launched the "Panoramic of the Palace Museum". Visitors can accompany the "Chimes" in the "Thinking of the Palace Museum", one of the trilogies of the pure music album "The Palace Museum", which is composed of chimes, with a fast rhythm and a bright style. The "Panoramic of the Palace Museum" covers all the open areas of the Palace Museum. At the beginning, it is the magnificent Taihe Palace. With the slow movement of the angle of view, visitors can choose the palace of their own interest to visit, and some of the palaces also have icons of cultural relics. Visitors can get a 360-degree panoramic picture of the cultural relics by clicking, and can view the cultural relics from various angles and get detailed information about them. The "Panoramic of the Palace Museum" is beautifully produced and full of content, with a great sense of experience and use. In the future, the "Panoramic of the Palace Museum" also plans to showcase the diversity of the Palace Museum by recording the Palace Museum in different seasons, different weather and different times. The Oriental Metropolitan Museum chose to launch a "virtual museum" tour on its official WeChat public platform. Visitors can use the official WeChat public number of The Oriental Metropolitan Museum to click on the "Virtual Xiaoliu" in the "Virtual Tour" menu, and a virtual "the Oriental Metropolitan Museum" will be presented to the visitors. "Virtual Xiaoliu" covers more than 6,000 square meters of exhibition space and public space of the Oriental Metropolitan Museum. Here, visitors are free to visit the museum and set their own visits and visits with a high degree of freedom. At present, only 200 pieces of cultural relics in "Virtual Xiaoliu" are "displayed" in the museum in digital form through technical processing. Visitors can freely view cultural relics from different angles, and learn about the categories, sizes, ages, and land points of cultural relics.

Virtual reality technology is a new way for people to visualize and interact with complex data through computers [3]. The interactivity of virtual reality has changed the relationship between museums and people from one-way transmission to two-way interaction. Visitors have changed from passively receiving information to actively acquiring information, and their initiative and enthusiasm have been improved. Virtual reality technology presents the collection of information and other information in museums in digital form. Through the application of virtual reality, the museum's network display and knowledge dissemination are developed and serviced, and time and space are extended and expanded. Virtual reality technology has changed the single display technology, and the knowledge absorption effect is enhanced through interactive experience, and the cultural carrier can maximize its value. [4]

Compared with 360-degree panoramic technology, virtual reality technology is more suitable for constructing non-existent scenes or items and restoring history because of its high manpower, financial resources and time cost. For example, the "Virtual Palace Museum" project launched by the Forbidden City is the first virtual world in China to display important historical and cultural attractions on the Internet. It is of great significance to the application of virtual reality technology in contemporary museums. The "Virtual Palace Museum" contains all the open areas of the Palace Museum at the time, simulating the Palace Museum's palace buildings, artifacts and even characters through 3D scanning and 3D modeling techniques. When entering the virtual world, visitors can customize their own characters and backgrounds as well as choose their own way of visiting and tour routes. In order to restore the scene at the time, the visitors will have the greatest sense of realism and immersion. During the design and production of the "The Palace Museum", technicians will work with experts in related fields and record the real movements of the actors through dynamic capture technology. And through the three-dimensional modeling, some royal life scenes are reproduced. Visitors can enhance the fun, experience and immersion of the tour by interacting with people or other visitors. Tsinghua Gvitech Digital Display Technology Co. LTD has released a new project called "Reproduction Old Summer Palace". The public can enjoy virtual tours of the Old Summer Palace through images and 3D videos posted on the "Reproduction Old Summer Palace" website. The "Reproduction Old Summer Palace" project covers the panoramic restoration of 55 space-time units in 22 scenic spots of Old Summer Palace and Changchun Garden. This not only shows the space concept of Old Summer Palace, but also shows the concept of time. Through the digital technology, the glory of the Old Summer Palace has been reproduced.

Although the current development trend of virtual reality technology is better, the equipment still has certain technical defects in frame rate delay, battery life and other aspects, and the development of tactile perception is not perfect. The ideal virtual reality technology should have all the sensing functions that human beings have, but at present the domestic virtual reality technology is limited to visual perception, so that users can't fully immerse themselves. In addition, the price of virtual reality equipment is too high, the industry is eager to seek development, the country has not yet established a unified management standard, and the problems that are common in many emerging industries have limited the application of virtual reality technology in the field of museums. However, the development of the virtual reality industry in time will be a major innovation in the museum field and will play an extremely important role in promoting the construction of digital museums.

### III. PROBLEMS IN THE CONSTRUCTION OF THE DIGITIZATION OF MUSEUMS

Although the digitalization of museums and digital museums are developing at a gratifying pace, they still have many problems in their development. As a non-profit organization that serves the society and its development and is open to the public, the museum's construction funds mainly

depend on the government's financial support. Therefore, some museums are unable to invest a large amount of money in digital construction and their own development enthusiasm is low, resulting in their digital construction in the form, lack of innovation in ways, and no combination with their own characteristics. The panoramic video produced by the museum is vague, rough in production, single in content, and immersive, and it is impossible to maximize the public function of cultural communication. [5] In addition, the physical museum did not combine the collection with digital technology in the exhibition. The relative fragmentation between digital construction and physical museums is also a problem in the current development of museums. The most important feature of digital construction is immersion and interactivity, focusing on the interactive experience of visitors. The original form, which is mainly based on collections and supplemented by personnel explanations, makes the museum lack of interaction with people. The museum outputs information in one direction and visitors are not involved and independent. The display mode is fixed, the information display mode is monotonous, and the professionalism is too strong, creating a dull and depressed learning environment, which is not conducive to the function of museum social education.

The government should further increase the special investment in the construction of museum information, increase the support for the digital construction of museums, and formulate unified standards for the digital construction of museums. The museum itself must also recognize the positive role of digital construction in the development of museums, mobilize the enthusiasm of its own construction, vigorously introduce relevant technical talents, constantly improve the construction of digital museums, and optimize the functions of upgrading systems. While paying attention to the construction of digital museums, the museum should also use digital technology more in the process of exhibition, enhance the interactive nature of the exhibition, and enhance the interest of the public through the way of teaching and learning. The fundamental purpose of museum digitalization and digital museum construction is to serve physical museums. Physical museums should be good at improving the quality of exhibitions, increasing the interest of exhibitions, innovating exhibition forms and displaying content, and better playing the role of museum social education through attraction and communication of digitization.

#### IV. MODERN INFORMATION TECHNOLOGY AND THE FUTURE DEVELOPMENT TREND OF MUSEUMS

In February 2017, in the "13th Five-Year Plan", the "13th Five-Year Plan for the Development of National Cultural Relics", which was presided over by the State Administration of Cultural Heritage, officially proposed to start the construction of the smart museum project, to "use modern information technology such as the Internet of Things, big data, cloud computing, mobile internet, etc., to develop the smart museum technology support system, knowledge organization and 'five senses' virtual experience technology, to build a smart museum cloud data center, a public service support platform and a business management support platform to form a standard, security and technical support system for the smart

museum. Thus, the smart museum has become a new trend, new direction and new goal for the development of contemporary museums.

Compared with traditional museum exhibitions and educational forms, the smart museum has certain breakthroughs and innovations in museum management, education, exhibitions and services. In terms of management, the smart museum links the various functions of the museum. Through centralized management of the overall operation services, the museum's working methods will be transformed, and the internal work of the museum will be better carried out through unified command and coordination management of various departments to improve work efficiency and make the museum truly live. In terms of education, the smart museum can create a national museum information base through the integration of national museum resources. The application of big data and cloud computing enables museums to provide better information services for tourists. By accurately grasping the points of interest of users, cultural resources can be accurately and effectively provided to visitors, so that the museum can better serve the people and serve scientific research. Similarly, the smart museum will innovate and enrich the content and presentation of the exhibition. The museum can use virtual reality technology and interactive technology to introduce a variety of digital products and services to the public, such as traditional digital information exhibitions, virtual archaeology, virtual cultural relic restoration, etc., to enhance the interactive experience of tourists. Sensing technologies such as the Internet of Things and mobile internet will enable the smart museum to realize the intelligent and automated voice interpretation. Through GPS positioning and mobile phone sensing, visitors can listen to the exhibits anytime, anywhere, so that visitors have higher autonomy and freedom, and the museum education effect will be optimized. Big data analysis can enable visitors to have exclusive customized services. The smart museum can make different adjustments for visitors from different identities, different classes, different cultural backgrounds and different age levels from the tour route to the explanation content and better play the museum's function of social education.

#### V. CONCLUSION

The rapid development of modern information technology and digital technology is both an opportunity and a challenge for the development of contemporary museums. The development of modern information technology will be a major innovation for museum management concepts and methods. The museum should grasp the rising trend of science and technology, adapt to the trend of the times, actively promote its service capabilities and service scope, in order to better serve the society and contribute its own strength to building a scientific socialist society. As the ultimate goal of the digitalization of museum and digital museum construction, smart museum must adhere to the "people-oriented" service concept, better serve the scientific and cultural level of the whole nation, serve China's socialist modernization, and serve human society and its development.

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