

Technical Analysis and Development Advantages of Online Virtual Exhibition from the Digital Technology Perspective

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Abstract: Institutions and people's lives have been impacted by public health initiatives to contain the COVID-19 virus. The outbreak may qualify as a mega event due to its potential for global impact and transformation. The contemporary art world has especially felt the impact of the epidemic, as the entire cultural activity has been suspended due to the outbreak, including exhibitions and museums of various themes. During this period, art institutions and collectives around the world have responded by providing alternative materials for artistic works through various technological technologies and online. Emerging, high-tech methods such as multimedia art are applied to display design to help the art world continue to develop during the pandemic. This article aims to reflect on the challenges and opportunities of online virtual exhibitions of contemporary art. From the case analysis of 3 online exhibitions (2 museums, 1 art biennale), analyze the development advantages of online virtual exhibitions. Most online virtual exhibitions can use virtual reality (VR), augmented reality (AR), Fabric VR projects, including: 3D Fabric VR, 360-degree Fabric VR, a network-based digital collection system, and other technologies to enhance the exhibition experience. And create related websites or apps to allow visitors to visit online exhibitions. These studies will contribute to a broad understanding of existing online virtual exhibitions, including the technologies used and future application development.

Keywords: online virtual exhibition, epidemic, technology

1. Introduction

The COVID-19 crisis has hit museums and galleries the hardest, when the new crown pneumonia epidemic forced 90% of the world's museums and galleries to close in March 2020 [1], major art exhibitions and museums around the world have launched online virtual exhibitions to break through time space constraints. An early definition of a virtual exhibition (VE) is a dynamic web-based collection of hypertexts dedicated to a particular theme, topic, concept, or idea. To make their collections accessible to end users (typically the general public or professional user groups), museums and archives are credited with creating the majority of virtual exhibitions. Original artefacts are digitally captured, rendered as 2D or 3D objects, packaged together, and connected via hyperlinks [2]. This creates a realistic representation of the artwork in tetrahedral space and enables a full range of dynamic vision. Allow visitors to join the exhibition or museum in an immersive way [3]. The virtualization of exhibits, digitization of information resources, networking of information

dissemination, sharing of information, intelligent information provision, and diversification of information display are new features of online virtual museums that are not present in physical museums. Online virtual exhibitions have a wide range of content, rich forms of expression, and diverse exhibit needs [4]. This kind of online pavilion not only offers extensive product resources, but also permits users to visit repeatedly. The virtual exhibition available online has a three-dimensional, interactive feel rather than just being flat [3]. It strives to give people an immersive feeling. But the most critical issue is how to virtualize real museum exhibits, that is, all exhibits in digital museums should truly represent the functions of real museums, and should expand and extend the functions of real museums [2]. Virtual reality, three-dimensional graphic image, and computer network technologies are now being used in online virtual exhibitions. The three-dimensional format of the actual physical museum is fully presented in the online museum thanks to three-dimensional display systems, interactive entertainment technology, special effects visual technology, and other technologies. Provide new presentation methods and visitor experience, allowing online virtual exhibitions to coexist with physical exhibitions, and enriching the display forms of exhibitions. Therefore, more and more exhibitions have begun to shift to online formats. It brings more experience, excitement and fun to users than just access to information and knowledge [5]. The article uses the analysis of the technologies adopted by the three online museums and outlines the advantages of four aspects brought about by the development of online virtual exhibitions. It is hoped that online virtual exhibitions can be more developed and used in future art exhibitions, museums or some corporate exhibitions.

2. Technical Case Analysis of Online Virtual Exhibition

2.1. Metropolitan Museum of Art

The immersive virtual art and gaming experience Met Unframed, developed by the Metropolitan Museum of Art in New York City in collaboration with Verizon, was unveiled in January. The gallery's collection will be accessible to viewers wherever they are thanks to Met Unframed. The show will provide viewers with a cutting-edge viewing experience that allows them to visit famous locations and works of art virtually [6]. In addition, visitors can learn about the art collections owned by the museum in a more interesting way. Additionally, augmented reality (AR) technology will be used to allow visitors to bring the artwork from the gallery into their own space. It was initially announced that nearly 50 works selected from the gallery's extensive collection would be rendered in augmented reality, though the project does not include every single image in its collection due to technical or financial constraints.

Furthermore, through the project, the Met has made high-quality digital renderings of some of its galleries available. Vincent van Gogh, Jackson Pollock, and Rembrandt van Rijn are just a few of the well-known artists who fall under this category. In addition, in 2011, the Metropolitan Museum redesigned its own website and began to encourage visitors to use mobile phones to visit the website. The Met App, an app created by the museum, helps visitors find artwork and events while also recommending exhibits to them [7]. Users can use the app to find the galleries, artwork, media, events, venues, information, and resources that most closely match their interests. In the Met's upper Manhattan branch of mediaeval art and architecture, the Cloisters Museum and Gardens, as well as in the main building on Fifth Avenue. Additionally, the app now provides a map for each location.

In this evolution, a museum is no longer a drab space filled with stuff enclosed in glass, but rather a space with screens or enabled virtual experiences. With this change comes the issue of how to maintain the funding and staff necessary to maintain the current technology as well as how to keep it updated. Despite these possible issues, museums continue to use technology to reinvent themselves for the future. Depending on the primary objective of the museum, the amount of funding available,

and the resources needed to create and maintain displays and apps, different museums use different types of technology. VR, AR, and high-definition projectors are some of the technologies that provide visitors with an immersive experience [8].

2.2. Wieng Yong House Museum

The museum was established in 2006 by Phra Kru Phaisan Theerakun, the abbot of Wat Ton Kaew, together with the villagers, to preserve the art of the village for the younger generation to learn from. The museum has a history of more than a century and is made up of a wooden house that is based on the homes of the Yong people in the city of Yong, Myanmar. It exhibits Buddha statues, various utensils used by the Yong people, old costumes and costumes from the Kamadevi era. In order to digitize the museum during the pandemic, the Fabric VR project was implemented, which is a platform.

The project consists of three systems: first of all, 3D Fabric VR is a 3D virtual reality application based on the concept of gamification, which can provide visitors with an immersive experience while acquiring preserved knowledge. Secondly, the 360-degree Fabric VR web application enables visitors to explore the virtual museum through a web browser flexibly. Thirdly, web-based digital collections provide efficient information access to repositories. To give users an immersive museum experience, this application primarily makes use of a specialised Head-Mounted Displays (HMD). The understanding of the digital preservation of historical textiles at Wieng Yong House is related to this experience, which includes thorough 3D reconstructions of objects in every setting in the museum to allow interaction with objects, including precise simulations of real fabrics. It is significant to note that the platform needs to be used with a computer, 3D graphics card, and HMD for virtual reality visualisation to be successful. On the other hand, it is more difficult and inconvenient to visit and watch directly on a mobile phone when using it. This app makes use of the gamification strategy, which is based on the idea of incorporating game mechanics into app design to boost user motivation and engagement.

The game scene is further divided into three scenes: the museum's ground level, the scene depicting the museum's architecture, and the gallery room housing the fabric display. The museum's actual building, the Wieng Yong House Museum, is used to construct the design scene, with the museum's structure standing in its centre. A wooden house that is modelled after a typical Thai or Burmese youth is one of the cultural artefacts on display in the virtual museum. Finally, the fabric showroom displays various utensils, ancient clothing and clothes of young people from the Kamadevi era more than a century ago. However, to visualize ancient fabrics kept in cabinets, the visualization of fabrics was gamified by providing a machine to display holograms and metadata of the fabrics. 360-degree Fabric VR is mainly a web application that enables visitors to explore everything inside Wieng Yong House Museum flexibly and conveniently within a 360-degree radius through mobile phones and web browsers on PCs. Visitors can visit the location through interactive hotspots located throughout the museum thanks to this app's use of real panoramas (360 degrees) [9]. Visitors benefit from convenience and a better overall experience. Finally, a web-based digital collection system for historical textiles serves as educational content so that students, librarians, archaeologists, and historians can quickly learn about historical textiles.

2.3. Sydney Biennale

The Biennale of Sydney is a non-profit art exhibition and Australia's largest and oldest contemporary visual art event, founded in 1973. The Sydney Biennale is held every two years and lasts for three months. During the exhibition period, activities such as artist dialogues, academic forums, exhibit guides, and family tours are held. All the above activities are free to the public. The Sydney Biennale

recently announced that due to the worsening of the epidemic, the 22nd Biennale, which just opened on March 14, will be closed and the entire exhibition will be moved online. The Biennale's official organiser declared that they would work with Google to promote the event to a global audience via the Google Arts & Culture platform. The Virtual Biennale features a variety of live content, interactive Q&As, route tours, radio broadcasts, and more. The exhibition brings together more than 700 artworks from 101 artists and groups spanning 36 countries. The virtual Biennale consists of seven venues for exhibitions as well as 30 online exhibitions devoted to particular artists. Visitors to this Sydney Biennale navigate through a variety of different media, offering various levels of access to each exhibition, which is made up of a dynamically scrolling page. There are audio recordings of artists' talks, some video works, text documents (including artist and curatorial statements), video documents, exhibition views, and links to in-depth reading. Additionally, to help visitors navigate the tour, the majority of the rooms have 360-degree virtual navigation. The online exhibition for the Sydney Biennale by Ibrahim Mahama, "No Friends But Mountains," debuts with a larger-than-life documentary film. A picture of the artist and a brief biography is shown as the visitors scroll down, and then his artistic process is explained. The image zooms in on various image details as the visitors move along. Visitors can take a 360° tour of this room and other rooms at the venue by clicking the link at the bottom of the page.

Sydney's online Biennale provides art enthusiasts with a variety of accessible ways to view works and exhibitions in the midst of the pandemic, allowing visitors to browse freely while utilising online platforms and 360-degree virtual navigation. They use this medium to reproduce the value of each work of art in the most appropriate way possible, giving the visitor a good viewing experience [10]. The opening of the online Sydney art exhibition has helped artists and visitors solve the problem of being unable to communicate with related artworks during the epidemic situation, allowing visitors from all over the world to participate. On the contrary, the technical problem of the online virtual exhibition is a big obstacle. Uncontrollable technology may prevent the online virtual exhibition from going smoothly or not allow visitors to have the same visiting experience as the offline exhibition.

3. Development Advantages of Online Virtual Exhibition

The new trend of the museum and exhibition business is marked by the integration of the Internet, technology, and cultural fields, and has entered a period of vigorous development. The digital construction of museums has begun to take shape. In the future, relevant technologies will play a role in changing the way museums are displayed and navigated, and audience interaction and participation will be enhanced. At the same time, technology will also help museums improve in terms of personalization, knowledge and interaction. The attraction of the exhibition comes from the application of AR and VR technologies [11]. The following four aspects of the advantages of the development of online virtual exhibitions are described.

3.1. Artwork Information Digital Archive

The digitization of the data management of exhibition artworks or related cultural artifacts has become a trend that cannot be avoided given the rapid advancement of contemporary computer technology and the widespread adoption of the Internet. Digital information technology enables efficient storage, protection and utilization [11]. Online virtual exhibitions can develop into a useful digital repository for information about the artwork. In addition, access to digital information archives is a fantastic way to educate and inform people. Another scene will appear if the exhibition's form, methods, and materials have significantly changed. Exhibits can be stored in basements, so museums don't have to construct sizable showrooms. To create and maintain digital images of exhibits in a virtual setting, or to upload these images to the Internet to create an online museum, digital technology

can be used. Visitors can download historical documents for free thanks to the easy and free access to the exhibits made possible by this. Almost everyone has a smartphone or tablet to visit museums and exhibits of art, as people do not have the time to visit these institutions and prefer to access these exhibits and museum materials online. The past can be restored creatively, the future can be imaginarily assumed, and the setting can be creatively brought back to the original vision. Despite the fact that they appear to be real, they are not. In this manner, the constrained resources can be fully utilised to create the associative space [3]. To put it another way, even though it's a virtual setting, the audience may be able to become fully immersed in it.

3.2. Expand the Scale of Information Transmission

Regardless of the scale and type of exhibition, the purpose of the exhibition is to convey effective information to the public or some artists. Today's society is an era of information explosion and fierce competition. As a carrier, multimedia technology is responsible for carrying massive amounts of information, and it also serves as a reasonably efficient method of timely information dissemination. Multimedia is used as the medium for the online virtual exhibition, allowing viewers to fully comprehend the exhibits from all angles. This makes the exhibits more vivid and rich than the actual, static objects, models, or photographs. The future growth of online virtual exhibitions is undoubtedly greatly facilitated by this. The theme of the exhibition is made more prominent in the online virtual exhibition by the artists using multimedia technology and rich means, which draws in more viewers and piques their interest. The online virtual exhibition includes a lot of images of the artwork in addition to professional dubbing, music, and other elements. The combined effect of 3D animation and virtual reality offers the audience a novel audio-visual experience, enabling people in the modern world to learn a lot of information more quickly. Additionally, it expands the exhibition's audience and allows for interaction with people of all ages and cultural backgrounds [3].

3.3. Not Limited by Space and Time

The multimedia and related technologies required for online virtual exhibitions can help visitors and exhibition organizers break the constraints of space and time. The multimedia system uses CDs, networks, and multimedia terminals as its primary output carriers, increasing the storage capacity of an exhibition and the ease with which artworks can be called up and stored [3]. For example, the Sydney Biennale, the British Museum, and the Metropolitan Museum of Art have made it impossible for people worldwide to visit the site due to the epidemic outbreak. They used 360-degree panoramic displays, 3D physical model demonstrations, and websites to carry out online virtual exhibitions. This helps visitors to solve the problem of being unable to reach the site.

3.4. Cultural Relics Protection

At present, many cultural relics are damaged to varying degrees due to various transportation problems. By protecting products (such as some expensive jewellery and priceless paintings, etc.) and lowering transportation and production costs, using virtual exhibitions helps exhibitors avoid losses brought on by unavoidable events. Therefore, in the real world, there is no need to place physical exhibits in museum booths, because users only need to wear special glasses to see exhibits that are reproduced one-to-one with those in offline exhibition halls [12]. For example, the Goujian Sword of the King of Yue, or some precious cultural relics unearthed in China, have been exhibited once and have never been exhibited abroad again. This is precisely because considering the probability of damage during transportation and the difficulty of transportation, once it is damaged, it will be a great loss to the country. Therefore, the virtual display is not only for the protection of

cultural relics, but for lovers, they can also see more cultural relics from different countries, so as to connect local cultures around the world and conduct better cultural exchanges.

4. Conclusions

In light of the pandemic outbreak, this article offers an overview of the technologies currently being used for virtual exhibitions as well as their potential future development. Modern technology, apps, QR codes, touch screens, virtual and augmented reality, and many other interactive technologies are being used by more and more museums to deliver information quickly and effectively. The evolution of online virtual exhibition has enhanced and humanised the exhibition experience. This article focuses on the technical application of online virtual exhibitions and the development of online virtual exhibitions, but fails to cover the disadvantages of online virtual exhibitions. Future research should study the deficiencies and limitations of online virtual exhibitions, propose some corresponding solutions, and then further research and improve the development of advanced tools and technologies in the development of online virtual exhibitions.

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