Interactive and Participatory Innovation of Digital Media Technology Research in Museum Exhibition Design

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Abstract: Since the third industrial revolution, the emergence of electronic computers has opened the door to the field of digital media technology. After more than one hundred years of development, so far, the electronic computer technology has been quite mature and perfect, and the digital media technology generated by the electronic computer has also developed rapidly. Nowadays, digital media technology has been widely applied in production and life, and has become an indispensable technology in people's daily life. In the traditional museum exhibition design, it was often necessary to display some cultural relics with profound cultural heritage and historical research significance in the museum for people to appreciate, which was of great educational significance to the viewers. However, in the traditional exhibition design, Chinese objects were directly or indirectly displayed in front of the audience. Such practices have caused serious damage to cultural relics, including the sun's ultraviolet radiation and the camera's ultraviolet radiation, which have caused irreparable losses to cultural relics. However, the replacement of cultural relics with high imitation substitutes cannot fully display the profound cultural heritage and historical research significance of cultural relics. Since visiting cultural relics requires visiting the museum site, many museums have taken restrictive measures to protect cultural relics at this stage. Although this has protected cultural relics to a certain extent, it has greatly reduced the number of visitors, which is not conducive to patriotic education and the spread and inheritance of cultural traditions. Therefore, based on the shortcomings of the traditional museum exhibition design, digital media technology has perfectly solved these problems. Digital media technology can lead viewers to appreciate cultural relics from a new perspective, which is incomparable with traditional museum display design. Digital media technology can also make significant contributions to the protection of cultural relics. Through digital media technology, visitors can enjoy the works directly through video, 3D virtual reality and other channels. Authentic cultural relics can be preserved and not be damaged due to exhibition. By 2020, the number of Internet users in China has exceeded 900 million, accounting for 64.5% of the total population. By 2020, the amount of Chinese Internet users has exceeded 900 million, accounting for 64.5% of the total population. Through digital media technology, cultural relics can be appreciated anywhere and at any time, facilitating the dissemination of cultural relics and related education. At the same time, it can also reduce the pressure of service and security of the museum to a certain extent. Based on the above reasons, it can be concluded that the use of digital media technology in museum exhibition design is completely feasible and necessary. It has facilitated the dissemination of cultural details of cultural relics, which is a new

breakthrough in the historical research of cultural relics, and has far-reaching significance.

1. Introduction

The growth of digital media technology has shown its unparalleled advantages and potential in many industries. The appearance of digital media technology has led to technological upgrading and reform and innovation in many industries. Relying on intelligent devices, digital media technology has become an indispensable and essential technical support in life and production.

Digital media technology is a major technological breakthrough for the development of all walks of life. Gerwin Roslyn L learned through extensive visits and surveys that digital media technology had shown great advantages in all walks of life from its emergence to its development [1]. Dalope Kristin A said that the main reason why digital media technology had gained popularity was because it relied on smart devices. Nowadays, smart devices have gained full popularity. Digital media technology was also very easy and fast to use, which was one of the reasons why it had been able to achieve rapid growth [2]. Through the research and analysis of modern media carriers in the United States, Loonam John found the reason why digital media technology could achieve rapid development. Compared with traditional information carriers, such as newspapers and letters, digital media technology has obvious advantages. Relying on the Internet, digital media technology has obvious characteristics of permanence and real-time in information transmission [3]. The characteristics and advantages of digital media technology mentioned above are the reasons why it can provide new ideas and methods in museum exhibition design.

In the conventional museum exhibition design, it is often necessary to present the works in the museum for people to appreciate. The works on display are treasures of human culture. Selmanovic Elmedin said that both cultural relics and cultural and artistic works had great research significance and artistic value, which could not be measured by money [4]. Chai Rong learned through visits and investigations that these precious cultural relics and works of art were always destroyed for various reasons during the exhibition of cultural relics and works of art in the museum [5]. For example, in the course of the exhibition, the ultraviolet radiation from the sun makes these works lose their original color and become dim. Ultraviolet rays from camera equipment also damage these works. Yunxia Wang said that in recent years, many major cultural relics and works of art had been stolen and deliberately destroyed in many museums around the world [6]. The destruction of these cultural relics and works of art is a loss to all mankind. Therefore, how to effectively change this situation has become the focus of the current cultural relics protection work.

The use of digital media technology has greatly improved the current situation of a series of problems arising in the protection of cultural relics and works of art. Mohammed Mahmoud Mohammed Ahmed Ola, through a large number of research data, said that the use of digital media technology in the protection of cultural relics and works of art provided new ideas and methods for the protection of cultural relics at this stage [7]. Schroeder Ralph said that the use of digital media technology in traditional museum exhibition design had many advantages [8]. The main purpose is to let the viewers appreciate the spiritual shock brought by cultural relics and artistic works. At the same time, in the process of appreciation, they can also combine the relevant historical background and creative background to deepen their understanding of the works, so as to deeply understand the profound historical charm and research significance behind them. Through the use of digital media art methods, the collection can be displayed in a digital way, so that the real collection can be well protected. It can effectively avoid damage during the exhibition process, and can also prevent theft

and deliberate destruction. These are the effects that the conventional museum exhibition design cannot achieve.

2. Significance of Cultural Relics Protection and the Feasibility of Applying Digital Media Technology to Museum Exhibition Design

Most of the works or objects displayed in the museum are cultural relics and other works or objects with profound historical charm and research value. Zhu Kaiyi said that cultural relics reflected the development process and civilization level of a country. The study of cultural relics could enhance the influence of culture, national cohesion and centripetal force, and national patriotism. Therefore, the exhibition and research of cultural relics were of great practical significance [9].

1) Significance of cultural relics protection

① Cultural relics are the core of a country's spiritual civilization, which show the historical development process of a country. Lin Yuan said that cultural relics could show the profound history and culture of a country as a valuable evidence of historical development. Cultural relics are one of the important ways for a country to maintain national cohesion [10]. Most of the cultural relics reflect the background of the times when they came into being. At the same time, they also include astronomy, geography, rivers, oceans, humanities and other important contents. These are not only valuable cultural heritage, but also the most powerful proof of national sovereignty and territorial ownership. Therefore, the relevant information displayed by the cultural relics plays an essential role in enhancing the cohesion of the famous ethnic groups, and also contributes to safeguarding national sovereignty and territorial integrity.

② The increased protection of cultural relics helps to facilitate the development of the national economy and the development of related science and technology. With the number of cultural relics excavated, more and more cultural relics reappear in front of the world, which has many cultural relics on the use of amazing technology, as shown in Table 1.

Table 1: Artifacts with high skills

Name of the artifact	The era	The skills included
Golden jade clothes	Western Han Dynasty	Jade carving technique
Horse Pedal Feiyan	Eastern Han Dynasty	Bronze casting process
Crown of the Huns	Warring States period	Precious metal processing techniques

These cultural relics reflect the peak of technology in different fields in the same period, and have very important reference significance and value for studying the level of ancient technology. Through the study of cultural relics, the advanced techniques used in many cultural relics are still in use, and even many advanced technologies have not been achieved. It is for this reason that these cultural relics containing advanced techniques provide innovative and development ideas for the development of modern science, which is of great significance. Wang Yun-Ciao said that the excavation of some cultural relics filled the gap in history, because some historical periods did not leave relevant written records. However, the excavation of contemporaneous artifacts was important for studying the culture, technology and life of the period [11], as shown in Table 2.

At the same time, cultural relics have very high artistic value and meet the growing cultural needs of people in the current era. By strengthening the management and development of cultural relics, cultural relics can provide local tourism resources and promote local economic development. At the same time, it can also improve people's cultural appreciation level and promote the harmonious development of society.

Table 2: Cultural relics of great significance in various fields

Name of the artifact	The era	Significance
Sanxingdui ruins	2800 BC to 1100 BC	It rewrote the history of the Chinese Bronze Age and changed the existing face of Chinese bronze culture
Hemudu Site	Late Neolithic period in China	7,000-5,000 years ago, there was a splendid culture in the lower reaches of the Yangtze River
Mawangdui Han Dynasty tomb	Early Western Han Dynasty	It provides extremely important material materials for the study of the growth of handicrafts and science and technology in the early Western Han Dynasty, as well as the history, culture and social life of the time

③ The strengthening of the cultural relics protection can improve the cultural quality of all citizens. The excavation and research work of cultural relics all show people the profound cultural connotation and scientific level of cultural relics, and are the witness of the national development process. Therefore, the excavation and research of cultural relics can let the people understand the development process of the country and the development process of cultural level, so as to improve the cultural appreciation level of all citizens. With the help of the profound cultural heritage of the cultural relics themselves, it is convenient to carry out patriotic education for the masses by relying on the cultural relics, so as to strengthen the protection of cultural relics. It can better inherit the national spirit and culture, and deepen the national identity of the national culture, which is of far-reaching significance for enhancing national cohesion.

④ The strengthening of cultural relics protection is conducive to cultural exchange and the promotion of the country's cultural soft power and influence. A country with rich history and culture has a large amount of cultural relics of different periods and styles. The strengthening of the protection of cultural relics and the strengthening of cultural exchanges relying on cultural relics can create a new trend in the cultural field to facilitate the growth of the cultural industry, thus enhancing the people's sense of identity with their own national culture, which is essential for maintaining national unity and enhancing national cultural strength.

2) Concept of digital media technology

The concept of digital media has emerged since the emergence of computers in the third industrial revolution. Through years of research on digital media technology, Reyna Jorge said that digital media was different from conventional media concepts. Digital media is based on computers and networks, and is a new form of information transmission and preservation [12]. Through computer storage and transmission of information, traditional information is processed digitally, which can more flexibly display the content of information. Figure 1 shows the development process of digital media.

Nowadays, the rapid economic growth also makes the growth of digital media faster and faster, and the scope of application is also getting wider and wider. The digital media development has been quite mature in terms of technology, which can be found in many fields. Among them, digital media is mainly used in the following scenarios.

Digital media technology is mainly used in the field of video and audio, mainly including film production, film and television special effects, etc. The emergence of digital media technology has changed the pattern of the conventional video and audio field, and is a huge change in the field of film production. Traditional film production mainly depends on human resources. Nowadays, with the appearance and application of digital media technology, the film production field can break through the restrictions and add more elements to the works, such as the production of special effects. At the same time, the traditional film carrier is mainly in the form of painting or film, which

increases the production cost and is not conducive to transportation and preservation. With the application of digital media, these adverse effects in the past have been greatly reduced. Compared with traditional films based on painting and film, films made by digital media technology have better clarity and sound effects. With the emergence of 3D virtual technology, digital media can give people an immersive feeling in film production, greatly improving the visual effect of film works. At the same time, relying on the convenience and timeliness of digital media, these film works can be well preserved, and occupy less space, greatly reducing costs. These are new heights that the traditional film production industry cannot reach.
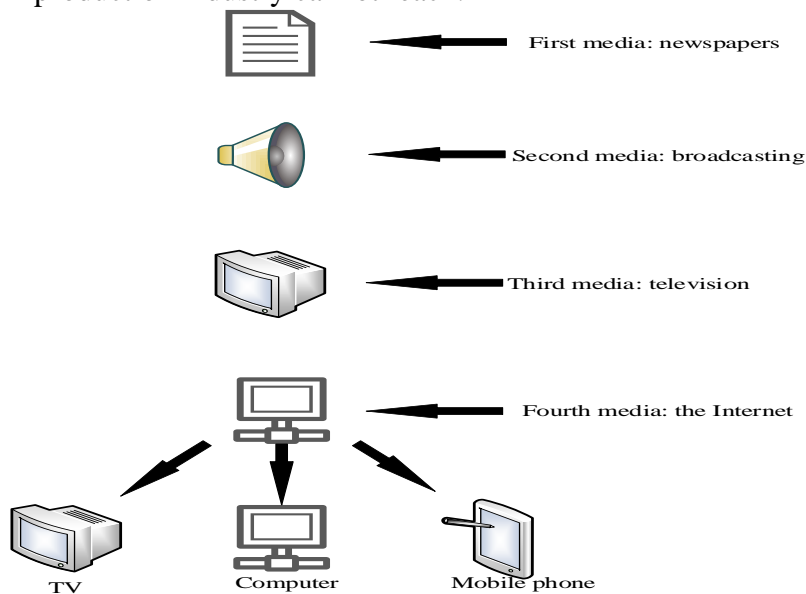

Figure 1: Stages of digital media development

Digital media technology also shines brilliantly in the field of games. The development of the game industry is relatively late and the development process is very short, but it is also developing rapidly relying on digital media technology. Up to now, the game industry is also booming. The participation of digital media technology is indispensable for a game with excellent production and real game pictures. The appearance of digital media technology such as virtual engine makes the game picture more realistic and enables players to integrate into the game more quickly, which greatly enriches people's cultural life.

Digital media technology is very essential in the field of publishing. The emergence and application of digital media technology has greatly changed the pattern of traditional publishing. The main information carrier of traditional publishing is paper, while the information carrier of digital media is network, and the publishing form is more diversified. The traditional form of publishing has great limitations, such as the time difference of information. The fact that information is not delivered in the first place somehow makes it a very fatal flaw. For example, during the war, military information and other important information cannot be transmitted at the first time. The information transmission relying on digital media technology can transmit the information in the first time. Whether it is the snowy mountains on the plateau or the deep mountains and jungles, the required information can be obtained at the first time and anywhere, which is also one of the reasons for the increasing number of global network users. Moreover, the storage and arrangement of traditional information is also very inconvenient, requiring a lot of manpower and paper. With the increase of the amount of information, the cost is also increasing. The digital media is attached to the network, which can realize the permanent storage of information, and can be consulted and used at any time, saving a lot of labor costs and material

costs.

The contribution of digital media technology in multimedia display and other fields cannot be ignored. The growth level of digital media technology is the development level of multimedia display field, which is a new field established on the premise of the growth of digital media technology. Multimedia display is now the most widely used technology, which is different from the simplicity of the traditional display field. There are various forms of multimedia display, including but not limited to projection technology, virtual reality technology, liquid crystal display technology, etc.

3) Feasibility of applying digital media technology to museum exhibition design

The characteristics and advantages of digital media technology in the relevant fields have been described in detail, and it can be seen that it has made an indelible contribution to the development of today's society. By 2020, China's network users have exceeded 900 million, accounting for 64.5% of the total population, and are still on the rise. Figure 2 shows the growth rate of the increase of Internet users and the proportion of population in China in recent years. The left diagram illustrates the amount of user growth, while the right diagram shows the growth rate of the proportion of population accounted for by Internet users in recent years.
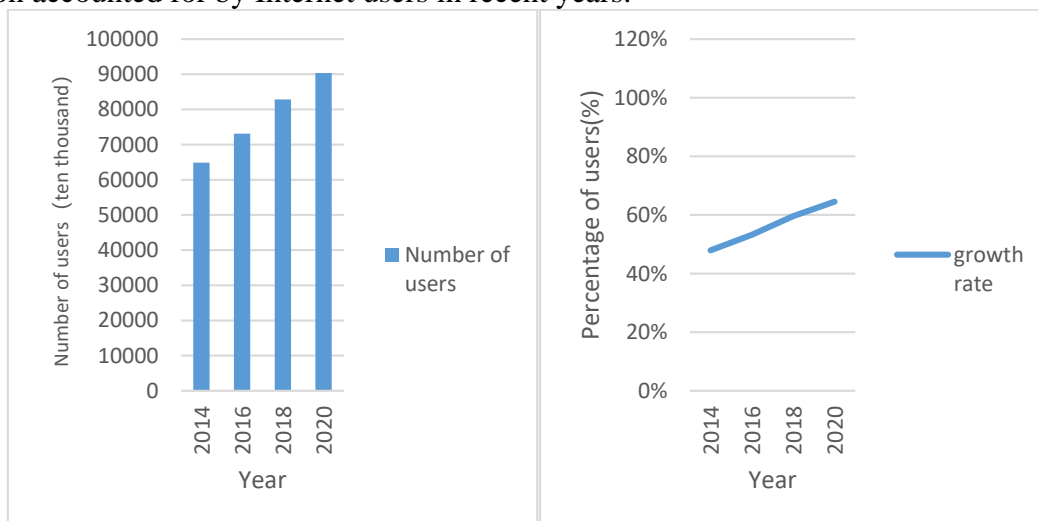

Figure 2: Increase of Internet users and population growth rate

No matter what industry, opportunities should be seized to constantly change to meet the needs of society. With the increasing number of Internet users, the growth of digital media technology is becoming more and more mature. Then, whether digital media technology can be used to museum exhibition design to deal with the issues in the current stage of cultural relics protection and promote the healthy development of the museum industry and cultural relics protection industry is emphasized.

① Relying on the network and intelligent terminal equipment, digital media technology can achieve higher definition in the process of image shooting and make the work more realistic. Viewers can have a detailed understanding of cultural relics and artistic works through video introduction and other ways, which can break the restrictions of time and place. Network users can enjoy cultural relics anytime and anywhere through computers, mobile phones and other intelligent terminal devices, without time constraints. In traditional museum exhibitions, to ensure the safety of cultural relics, many museums limit the time and number of visitors, which is not conducive to people's appreciation and understanding of cultural relics, as well as the transmission and growth of traditional culture. Table 3 shows the opening time and visiting specifications of some museums in China.

Table 3: Opening hours and restrictions of some museums in China

Name	Opening hours	Rules
Hubei Provincial Museum	9:00—17:00	Appointments can be made up to 7 days in advance. Admission is free, with 500 people admitted every half hour, with a daily limit of 5,000 visitors
The Palace Museum, Beijing	8:30—16:00	Limit daily passenger flow to 80,000
National Museum of China	9:00—17:00	The daily flow is limited to 15,000 people, and the maximum number of reservations is adopted for all staff lines, and the entrance is staggered in three periods throughout the day: 4,500 people in the 9:00-10:00 period, 5,000 people in the 10:00-13:30 period, and 5,500 in the 13:30-15:30 period, until the quota is full

After a large number of visits and field investigations, Budget Kylie said that the traditional exhibition form of placing cultural relics and art works in museums had great disadvantages [13]. During the exhibition, these cultural relics and artistic works are vulnerable to damage for various reasons, or more serious theft and vandalism, as shown in Figure 3.
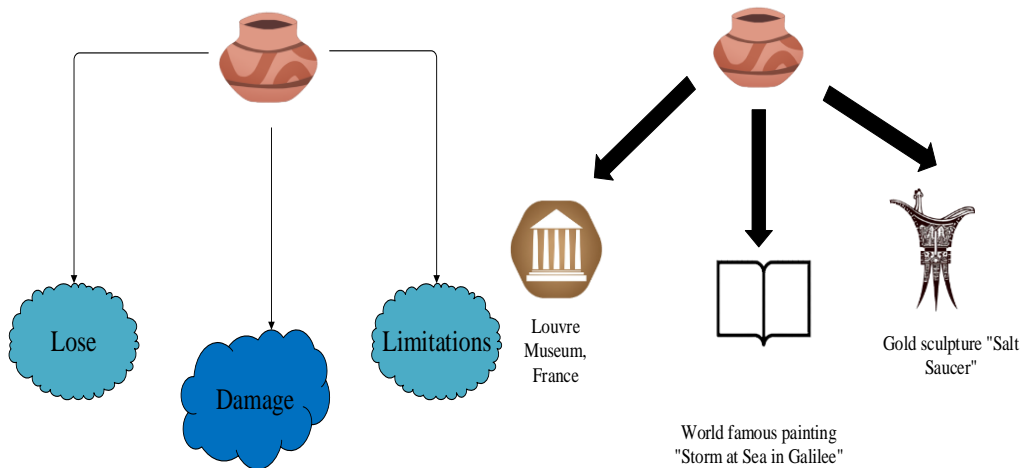

Figure 3: Limitations of museum exhibitions and loss of some artifacts

In the traditional form of exhibition, many of these problems are unavoidable. Some of the problems, while their probability of occurrence can be decreased, also come at a huge human cost, which is an undesirable phenomenon for museums. Based on the above factors, it is very necessary to apply digital media technology in museum exhibition design.

② The use of digital media technology in museum exhibition design makes the interaction between viewers and cultural relics and artistic works across time and space. It can make cultural relics and works of art have more ways of expression and their related culture be spread in more ways. Through digital media, viewers can understand cultural relics. They can appreciate the profound cultural and historical connotation and value of cultural relics according to the age of the cultural relics and the background of the times, which is of great research significance for understanding the historical age of the cultural relics and related culture. Figure 4 shows the value of cultural relics.
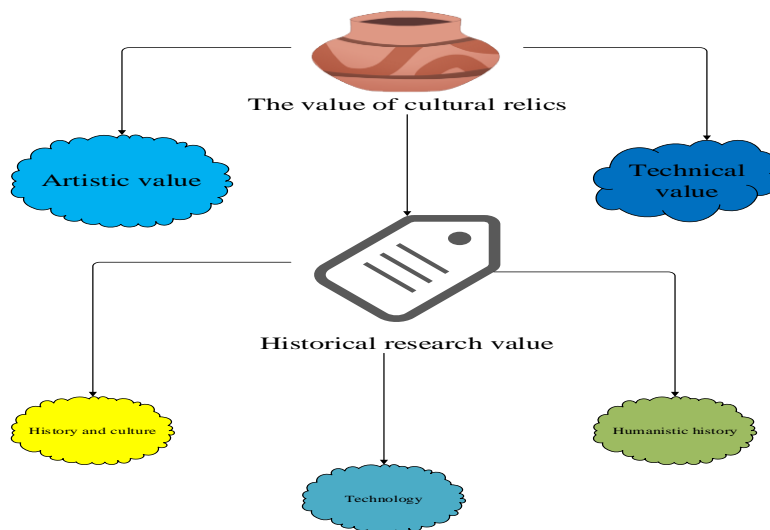
Figure 4: The value of cultural relics

③ The use of digital media technology in museum exhibition design endows cultural relics and artistic works with permanence. Relying on digital media technology, cultural relics and artistic works are permanently preserved with digital information, which is a huge wealth for the entire human world. Through digital media, people can enjoy the spiritual shock brought by cultural relics at any time, any place, anytime and anywhere without the restriction of time and place. People can also use cultural relics and artistic works to better understand and inherit the cultural connotation of the country.

④ The use of digital media technology in museum exhibition design makes outstanding contributions to the protection of cultural relics. In recent years, there have been numerous cases of theft of cultural artifacts, as shown in Table 4.

Table 4: When and why some cultural relics were stolen

Name of the artifact	Time of theft	Reason for theft
Munch's masterpiece *whoop, Madonna*	22 August 2004	Gunmen stole away
Leonardo da Vinci paintings *The Virgin Mary and Arnwind*	August 2003	Stolen by bandits
Golden eagle treasure	May 2003	Stolen by bandits

Table 4 lists some valuable cultural relics and works of art that have been lost in recent years, but this is far from the tip of the iceberg, such as the famous paintings "The Birth of Saint Francis and Saint Lawrence" and Van Gogh's paintings. The loss of these cultural relics has caused great damage to the culture and art of the whole country. Alivizatou Marilena, based on a large number of reports, showed that even some cultural relics were deliberately destroyed, which was a great loss to all mankind [14]. Yousefnejad Soudabeh said through a large number of actual data and reports that there were still many defects in the protection of cultural relics in traditional museum exhibitions [15]. Masciotta Maria Giovanna said that the task of increasing investment in the protection of cultural relics and protecting the common property of all mankind was imminent [16]. According to the defects of cultural relics protection in traditional museum exhibitions, the application of digital media technology has greatly improved this problem. With the help of network and intelligent device terminals, including image and 3D virtual reality technology, digital media technology can use multimedia technology to present cultural relics to the world in a digital way while protecting

the authenticity of cultural relics and artistic works. In this way, theft and damage can be avoided during the exhibition. At the same time, people can have a more comprehensive understanding of cultural relics and works of art in combination with the era background and creation experience of cultural relics and works of art. These are advantages that traditional museum exhibitions do not have.

3. Summary

The protection of cultural relics is an essential guarantee for inheriting and carrying forward the national cultural spirit. The cultural connotation of cultural relics is of great significance to the study and promotion of the excellent culture of the nation. Cultural relics can reflect the development process of a country and the emergence and development of related culture. The study of cultural relics works can enhance the cultural influence of the nation. At the same time, it can also improve the cultural connotation of the nation, the national identity of the national culture and the national cohesion, which is a prerequisite for the development and rapid progress of a nation and a country.

Based on the importance of cultural relics protection, it can be found that there are many hidden dangers in the traditional museum exhibition design. Cultural relics are very vulnerable to damage during the long-term exhibition process, which has brought irreparable losses to the entire country and nation. Even in the process of exhibition, serious acts of theft and deliberate destruction of cultural relics frequently occur. Based on this, given the advantages of digital media technology in the conservation of cultural relics, its application in museum exhibition design seems very necessary.

Digital media technology is applied in museum exhibition design can greatly improve the shortcomings of traditional museum exhibition design at this stage. It has many advantages that traditional museum exhibition design does not have. Digital media technology can display cultural relics in digital form in front of the world, and enable viewers to interact with cultural relics across time and space, which has made great contributions to the protection of cultural relics.

4. Discussion

The above has analyzed the importance of cultural relics protection and the defects in traditional museum exhibition design, and demonstrated the advantages and feasibility of digital media technology in museum exhibition design from many aspects. It has displayed the defects of conventional museum exhibition design, and introduced the advantages of digital media technology and the feasibility of applying it to museum exhibition design. It has provided new ideas and methods for the reform of traditional museum exhibition design, new opportunities for the reform of museum exhibition design, and new methods for the protection of cultural relics.

5. Conclusions

The profound historical culture and research value of cultural relics and artistic works are the wealth of a country and a nation. The protection and research of cultural relics can enhance the cultural influence of a country. At the same time, in terms of the people, it can also improve the patriotic feelings and cultural identity of the people, which is of great significance to enhance national cohesion and centripetal force. Therefore, with the development of the era of opportunity, the museum exhibition design should also seize the storm and reform in time to meet the requirements of the current era and the needs of the people, which has far-reaching significance for the protection of cultural relics and the inheritance and development of national culture.

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