

# Research on Digital Protection of Intangible Cultural Heritage Based on Digital Implantation

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**Abstract.** A large number of intangible cultural heritages (ICH), In the development process of the evolution of world history, have been born. In addition, these heritages preserve the most precious part of historical civilization and have high research value. However, in social modernization, these ICHs are gradually being destroyed, and their preservation is becoming increasingly difficult. The protection of ICH cannot be relaxed at any moment. With the progress of science and technology, digital technology has become one of the means to protect ICH, and also explored new ways for the inheritance of ICH. Therefore, it is necessary to use modern information technology to store and preserve ICH. With the rapid development of the information age, digital implantation technology has gradually entered all aspects of life. This technology was effectively applied to preserve animation in the early days effectively, later researchers found that this technology has an excellent effect on the preservation of ICH, so it has been widely used. This paper firstly summarizes the current domestic ICH protection situation and the corresponding foreign policies. On this basis, digital implantation is applied to the relevant core technologies of ICH protection. The Digital implantation technology model of ICH is analyzed to protect the current ICH effectively and will promote the sustainable development of ICH.

## 1 Introduction

China has a long history of culture, but its response to the protection of intangible cultural heritage (ICH) is later than that of many countries. It started in an all-round way after the issuance of the Opinions on the Protection of Intangible Cultural Heritage in 2005. ICH protection mainly refers to the establishment, archiving, research, preservation, publicity and promotion of ICH. At the same time, the protection of ICH can be divided into two forms, one is rescue mode, and the other is development mode. In addition, these two protection methods are usually productive contents, and their main purpose is to effectively develop and utilize the previously ICH, so as to produce additional value <sup>1</sup>.

The field of ICH protection in China, recently, keeps difficult to start, and the digital process proves a field gradually born with the continuous development of information technology. In China, the pilot projects of digital protection of ICH proves mainly in Dunhuang, as well as the Forbidden City in Beijing. Moreover, these two tourism pilot projects demonstrate the bright prospect of digital protection of ICH well. Therefore, they have attracted special attention from personnel in relevant fields.

In recent years, China has gradually attached great importance to the development of ICH, and in the process of effective connection of information

technology, ICH has also been gradually transformed and developed by information technology. For this direction, the leading domestic fields are the digital method, digital ideas, and the collection process of related information. In addition, in protecting ICH, the use of digital museums to display and promote ICH is also a critical research field <sup>2</sup>.

With the rise of ICH protection, many colleges and universities have begun to set up ICH protection majors, establish relevant research centers, and form good research theories. In terms of digital research, the ICH of Mulao nationality studied in this paper has applied the ICH of Mulao nationality, "ancient songs", to make animated propaganda films, recording the forms, ways and dialects of ancient songs. As shown in Figure 1 and Figure 2, the two photos show Mulao nationality women's clothing taken by our experimental team during the field trip and the status quo of cultural and creative products and craft products sold in the Intangible Cultural Heritage Street. Our laboratory has carried out the VR digital experience project of copper drum casting process for ICH protection. By means of virtual simulation and virtual reality, the aesthetic characteristics and casting process of the bronze drum are reproduced, and the casting process of the bronze drum is experienced by means of cognition, participation, interaction, immersion, experience and challenge in the virtual simulation experience, so as to

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protect and inherit the ICH of ethnic minorities. As shown in Figure 3, it is a picture taken by a professional team to record Mulao nationality women creating handicrafts.



**Fig. 1.** Survey photo of Mulao nationality.



**Fig. 2.** Intangible Cultural Heritage Street sells cultural creativity and craft products.



**Fig. 3.** Video recording when women create handicrafts.

Both the government and the people have deeply realized the importance of ICH protection. More and more government departments have led the development of ICH protection activities. The whole society respects and participates in the protection of ICH. More and more ICH inheritance bases and inheritors have emerged. The whole society is moving towards the prosperity of ICH inheritance. It can be seen that the government, civil society and academia are paying more and more attention to the digitalization of ICH

## 2 Status Quo of Foreign Research

### 2.1 Digital Protection of ICH

With the development of internet technology, the research on digital protection of ICH in foreign countries appeared earlier. Since the birth of the world's first computer, a study in related directions has been ongoing. The United States and Japan have used this technology to preserve and reproduce the ICH of their own country. There are not many ICHs in the United States, but the digital protection of ICHs in the United States is very good, and it is also the first country to start the digitalization of ICHs, such as the Digital Michelangelo Project of Stanford University, Washington University and Cyberware; Sulman Mummy Project of University of Chicago and University of Western Ontario; Japan is a model for the protection of ICH in Asia. Oz University of Japan has conducted a digital protection project for the lion dance, a living cultural heritage in Oz region of Japan. As early as 1950, it was clearly pointed out in the law that architecture, painting, sculpture, handicrafts and calligraphy works were divided into tangible cultural property, while drama, music and technology were divided into intangible cultural property. The libraries, museums and archives in Britain and Canada are highly active and effective in the digital protection of ICH. In the subsequent development process, the design specialty has more and more research and promotion on ICH digital technology<sup>3</sup>.

With the continuous development of digital technology, the digitization of ICH has gradually been

put on the agenda. With the establishment of UNESCO's cultural center in the Asia Pacific region, research, in this direction, has become an exceedingly crucial content in this field. Among them, in the process of ICH protection, the most important technology is the digital library. The preservation and display of ICH through a digital library enables people to have a deeper understanding of the customs of various countries. In 2010, the European Union released a vital plan, taking the European digitization process and digital library as one of the strategic plans of library museums in Europe. Research on the broadest range of dissemination and utilization of resources to make digital cultural protection catch the Internet information express <sup>4</sup>.

The current research on digital protection of ICH in foreign countries is mainly used to construct three-dimensional (3D) models in film and television, static image rendering, and 3D algorithms. In recent years, foreign research on Digital ICH mainly focused on digital processing, restoration, display, and other related aspects and is highly integrated with digital libraries and museums.

## 2.2 Research Status of Digital Implantation in Cultural Field

The research on digital implantation in the cultural field is mainly based on the following two parts: the generation of substantiated 3D images for digital cultural heritage, and the other part is optimized and realistically improved rendering for image processing software and image processing systems.

The 3D solid modeling of digital image processing is mainly aimed at the technology of augmented reality systems. By superimposing virtual objects, their images can be projected in the real world, and many commercial products of this type have appeared, among the most notable is the wearable 3D display device. For example, As shown in Figure 4, the "V (VR) Forbidden City" launched by the Palace Museum allows users to experience how to repair "cultural relics" through 3D digitization. Digital experts have made comprehensive digital records of it, and used various digital technologies such as photogrammetry, 3D modeling, virtual reality, etc. to fully display the humanistic and artistic characteristics of Yuqin Zhai in a virtual space, making it permanent.



Fig. 4. News report of "V Forbidden City".

The imaging software and hardware optimization technology of computer graphics is a technology realized in chips, with the research and development of this technology, the continuous enhancement of computer

information and image processing equipment, and the continuous improvement of computing power. At the same time, with the constant improvement of computer computing power, virtual reality technology has also become the core research direction of this technology. Therefore, the above technology can be highly integrated with the digital protection of ICH, which has become one of the mainstream research directions of foreign computer companies. The specific route for the research on the above technologies in digital implantation culture is shown in Figure 5 below.

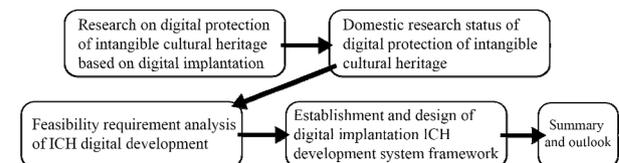


Fig. 5. Research framework for digital protection of ICH based on digital implantation.

## 3 Feasibility Requirement Analysis of ICH Digital Development

### 3.1. Analysis of the Necessity of ICH Digital Development

In the context of cultural globalization, the cultures of various countries are widely spread worldwide, relying on good circulation and digital technology. Therefore, the digital development of ICH is necessary, and this technology is indispensable both in the network and in the daily cultural circulation. Only by taking the fast lane of digitalization and informatization of ICH can it be better to spread among young people worldwide and break through the cultural and identity barriers between countries. In the early years, Western media and institutions disseminated their culture, thus affecting a generation of young people in China.

In recent years, China's Digital ICH is also highly developed, and then the task of promoting Chinese culture should be inherited by digitally implanted ICH, so this technology is critical <sup>5</sup>.

The interpretation of Digital ICH mainly improves the content through display and dissemination presented to the audience. Digital ICH, generally speaking, proves mainly through the simulation and image recording of physical national and cultural products, so as to achieve the effect of storing its digital characteristics. The digital development process of ICH is mainly through the use of digital resources. The digital development of ICH includes three specific measures, namely, acquiring relevant souvenirs and developing the national digital museum, and creating a distinctive ethnic cultural ecological area through sustainable development. Therefore, the digital protection of ICH is to collect, store and establish a database of relevant cultural elements and cultural symbols through digital technology, so as to achieve static protection <sup>6</sup>.

### **3.2. Feasibility Analysis of ICH Digital Development**

In recent years, with the in-depth development of the digital content of ICH at home and abroad, the relevant performance of computer hardware has gradually begun to improve. At present, the leading technologies in this field are 3D tracking technology, image display technology, and network communication service technology. The above technical cores are all related to the digital preservation and development of ICH information, so they have received widespread attention from researchers in this field <sup>7</sup>.

At present, the main research content in this field is the combination of AR scene and virtual reality technology. The two technologies are very mature, so the Digital ICH protection and the implementation of rendering technology are very feasible. In combining virtual reality technology with the digital preservation of ICH, ICH also provides many reference materials for virtual reality technology to more diversely show the connotation of various cultures <sup>8</sup>.

## **4 Establishment and Design of Digital Implantation ICH Development System Framework**

### **4.1. Construction of Theoretical Framework of Digital Implantation ICH Development System**

At present, the development of a digital process for ICH in China is generally carried out in the following ways. The first is the mutual transformation of handicrafts and souvenirs for traditional service and cultural industries. This transformation process mainly records cultural content in an all-around way with pictures and text descriptions through the digital production process and physical form records of physical products. In this process, an industrialized eco-museum and related content display process chain can be formed. Then the second is to open the park of ICH to carry out related exhibitions, and finally form a museum-style exhibition hall. The development, utilization, and protection of the ICH through the above process to achieve the purpose of education and production of cultural content. Digitization is a technology. In the process of digitalization of ICH, it is easy to pay attention to technology, neglect culture, and neglect inheritors and owners. Therefore, when digitalization is applied to the inheritance and protection of ICH, it is particularly important to correctly handle the relationship between digitalization and culture, inheritors and owners. How to keep the true flavor of ICH while digitizing ICH is in line with the needs of the times.

### **4.2. Intangible Cultural Heritage Digital Cultural Creative Product Design**

China has a wide range of ICH, and is taking a variety of protection measures. The digitalization of ICH is one of the ways of ICH protection and inheritance. The greatest

value of the digitalization of ICH lies in its own culture. The digitalization technology mainly relies on computers. It has the characteristics of less pollution, low resource consumption, high added value, huge development potential, and forming lifelong benefits at a time. It inherits ICH by digitalization, and uses digital images and equipment to sort out a set of ICH digital data. In the era of financial media, there are many new media platforms. When digital ICH is spread on the Internet, it is entirely possible to use new media platforms to spread digital ICH, such as WeChat, Weibo, websites, Zhihu, Kwai, Tiktok and other diversified platforms, to expand the spread of digital ICH and improve the efficiency of ICH inheritance. In order to survive and develop in today's society, ICH needs economy as the survival basis; At the same time of communication, the commercial value of ICH can be developed to the greatest extent, and a complete set of ICH digital derivative cultural and creative products can be developed. The digital ICH is spread through the Internet, giving new strength to the ICH, taking the existing cultural and creative industries as the development point, and forming a sustainable ICH digital cultural and creative product ecosystem. Publicize the digitalized ICH on the Internet, make it known to the public through various modern multimedia methods, and develop the commercial value of digitalized ICH through multiple channels and ways. of ICH, and the relevant features are digitally recorded.

### **4.3. Digital Technology Animation Film Preserves Intangible Cultural Heritage Essence for a Long Time**

With the development of science and technology, the progress of society, and the increasing abundance of methods and means for the protection of ICH, the inheritance of ICH is facing an unprecedented crisis with the loss of one group after another. Few young people are willing to accept ICH. Animation is an expression of emotional art, a modern information technology, a digital channel, which can transform the material heritage and ICH into multimedia audio and video images. At present, most government departments in charge of ICH have converted some rare and dying ICH into a complete animation form through digital technology to achieve long-term preservation and dissemination. Therefore, in addition to ordinary digital transformation of ICH, digital means in the form of ICH animation can also be used to carry out ICH inheritance. ICH theme animation can be made into story films and documentaries. Of course, it is also possible to further understand and experience ICH by combining interactive touch technology and guiding the experienter to click, touch, draw, graffiti and other interactive experiences. Today, with the rapid development of virtual reality technology, ICH animation can be developed into VR stereoscopic animation movies, VR real-time rendering animation movies, VR role playing animation movies, etc. With the help of VR technology, when watching ICH movies, audiences can have a better sense of immersive experience through VR technology. You can

wear 3D glasses or virtual listening devices to feel ICH as if they were in the scene. For example, in July 2019, the animated film "Nezha: Birth of the Demon Child" as shown in Figure 6, once it was launched, the box office of the film reached 5 billion yuan, and the related cultural and creative products were sold well. The image of "Nezha" in the film retained the original flavor of the traditional image of Nezha, and absorbed the aesthetic essence of today's society, becoming a Chinese classic cultural icon, and its film cultural and creative products were also sold well.



**Fig. 6.** The film poster of "Nezha: Birth of the Demon Child".

Although the digital development of ICH plays an important role in the inheritance of ICH, the digitalization of ICH still needs a strong team of digital technology talents. Although the inheritors of ICH recognize that the digitalization of ICH plays an important role in the inheritance of ICH, it is almost impossible to achieve the digitalization of ICH by the inheritors. The digitalization of ICH in each ICH center lacks professional equipment and talents; All kinds of companies are unwilling to participate in the development of ICH digitization without economic returns. Some companies are also difficult to carry out ICH digitization, with long cycle and low profits. Therefore, ICH digitization still has a long way to go.

## 5 Conclusion

Researching as well as developing in digital protection technology of ICH, facing the particularity of national folk art and the fact that it is on the verge of extinction, proves a more reasonable and effective solution to the rescue as well as protection of national folk art. In addition, the research as well as development of digital crucial technologies of national folk art is going to provide technical possibilities for the preservation of national folk art and the realization of academic research as well as industrialization. All in all, ICH, in essence, possesses the characteristics of diverse types as well as complete items.

Furthermore, the digital dissemination and display of ICH keeps significantly crucial. The digital protection of ICH, to be frank, never to fail to be assumed as an important integration point between information technology and historical and cultural heritage protection. In addition, integrating information technology into the protection of ICH can not only protect ICH in a good manner, but also make full use of advanced digital information technology, in the

meanwhile, and carry out knowledge renewal and technological innovation. The purpose of this paper, in fact, focuses on the effective improvement of the preservation of ICH in the inheritance process, introduces the way of digital implantation in the improvement process, carries out the relevant digital transposition of the content of traditional ICH, and takes the research on the digital implantation of ICH of a nation as the starting point, which has extraordinarily ameliorated the efficiency of the preservation and dissemination of ICH.

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