

# The Promotion of Intangible Cultural Heritage Tourism Creative Products' Development Through 3D Printing Technology

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**Abstract**—Intangible cultural heritage is the treasure of national culture. It is not easy to protect intangible cultural heritage, especially in countries and regions where the protection consciousness is not strong enough and the funds are scarce. The protection of intangible cultural heritage and the development of tourism products can form a benign interaction. The characteristic tourist commodities of intangible cultural heritage present a static development mode. This paper attempts to explore the creative products of intangible cultural heritage tourism by using modern high-tech 3D printing technology, analyzes the development methods and problems, and looks forward to the future.

**Keywords:** *intangible cultural heritage, creative tourism product development, 3D printing technology*

## I. INTRODUCTION

3D printing, also known as 3D stereoscopic printing, first appeared in the mid-1990s. In 2014, 3D printing technology was named the 25 best inventions of the year by the magazine "Time". It is a rapid prototyping technology that uses technologies such as photocurrent and paper stacking and requires no machining, nor tooling in a factory, thus greatly shortened the product development cycle, reduced the product production cost and improved the product production efficiency. Initially, 3D printing technology was mainly used to manufacture models in the fields of mold manufacturing and industrial design. At present, with the progress of science and technology, the global 3D printing technology is mainly used in the automotive, aerospace, architecture, medicine, industrial machinery products, jewelry design, artistic creation and products in other fields, and the application field is gradually expanding. In the future, with the progress of technology and the update of materials, 3D printing technology will be applied in more and more fields and in a wider range.

3D printing technology is a kind of rapid prototyping technology that uses photocurrent and paper lamination technology, and construct objects by printing them layer by layer with powdery materials such as metal or plastic to bond materials, through the digital technology material printer. 3D printing technology is usually based on the establishment of digital models. There are both similarities and differences in

the working principles of 3D digital technology material printers and ordinary ones. What they have in common is that they all have built-in materials that are printed after the printers are connected with computer. Their difference lies in the materials and forms of objects printed. The built-in material of ordinary printer is paper, and the object printed is flat, while the built-in material of 3D digital technology printer is liquid or powder, etc. and the object printed is three-dimensional after stacking the materials layer by layer.

The principle of 3D printing technology is a kind of revolutionary technology which is based on the digital model data of computer and uses various adhesive materials to rapidly print and shape layer by layer to complete the perfect conversion between cold data and real model with "temperature". In the printing process, the first step is computer modeling and software modeling, then slicing the 3D model built, and the 3D model sliced can be printed after exporting the corresponding file format and importing it to the printer. At present, the 3D printing technology on the market includes FDM (fused deposition modeling), with its main materials as ABS and PLA, SLA (stereo lithography apparatus), with its main material as photosensitive resin, 3DP(3 dimension printing), with its main material as powdered material such as ceramic powder, metal powder and plastic powder, SLS (selected laser Sintering), with its main material as powdered material, LOM (laminated object manufacturing), with its main material as material paper, metal film and plastic film, DLP (digital light processing), with its main material as liquid resin, FFF (fused filament fabrication), with its main materials as PLA and ABS, and the EMB (electron beam melting), with its main material as titanium alloy.

There are many limiting factors for the 3D printing technology in both China and abroad. The first is the limitation of materials. Although high-end industrial printing technology has been able to realize the comprehensive application of plastics, some metals, ceramics and other materials, but these are still far from mature level, and cannot support the daily life of various types of materials. The second is the limitation of the machine. 3D printing technology has reached a high level in the reconstruction of geometric shapes and functions of objects. Almost all objects of static shapes can be printed, but under the current

technology level, it is difficult to print moving objects. In order to realize the widespread access to every household of the 3D printing technology, it is necessary for manufacturers to break the limitations of machines. Currently, the 3D printing technology also involves intellectual property issues. Since the convenience of the Internet will make a lot of things widely spread and people can also copy at will, how to make laws and regulations to protect the intellectual property of 3d printing technology is one of the problems faced by people. With the development of 3D printing technology, overcoming various restrictions means that 3D printing technology will enter into thousands of households, which means the arrival of the era of manufacturing for all, and also a major change for traditional manufacturing and service industries.

## II. INTANGIBLE CULTURAL HERITAGE AND TOURISM CREATIVE PRODUCTS

In 1997, with the adoption of the "Declaration on Representative Works on the Oral and Intangible Cultural Heritage of Mankind" by UNESCO, a worldwide wave of research on intangible cultural heritage started. In 2003, UNESCO promulgated the International Convention for the Protection of Intangible Cultural Heritage", and "protection" has become a main theme of theoretical research and practical operation of intangible cultural heritage. According to the definition of the convention, intangible cultural heritage refers to various practices, performances, forms of expression, knowledge systems and skills as well as related tools, objects, handicrafts and cultural sites that are regarded as cultural heritage by various groups, communities and sometimes individuals.

The protection of intangible cultural heritage is not easy, especially in countries and regions where the awareness of "protection" is not strong and funds are scarce. As intangible cultural heritage has diverse values which can be transformed into cultural productivity and tourism resources, the development and utilization of intangible cultural heritage can seek for more protection funds and arouse people's awareness of "protection". In turn, the protection of intangible cultural heritage can promote the further development of tourism and improve the level of tourism development. In this way, the protection of intangible cultural heritage and tourism development can form a benign interactive relationship. Therefore, tourism development has become an important way for the protection of intangible cultural heritage. With the intangible cultural heritage tourism more and more favored by tourists, the development of tourism resources of intangible cultural heritage has become a hot trend. In this context, academic research on tourism development of intangible cultural heritage has become a focus of attention at present.

Tourism products are the combination of tourist attractions and services provided to tourists by tourism industry through developing and utilizing tourism resources, that is, the sum of all the services a tourist destination needs to provide a tourist in a tourist activity. As early as 2014, General Secretary Xi Jinping clearly put forward the concept

of "mass entrepreneurship and innovation" in the treatment of traditional culture. He pointed out that to carry forward the fine traditional Chinese culture, "it is necessary to properly handle the relationship between inheritance and creative development, focusing on creative transformation and innovative development". In addition, the Ministry of Culture should take "responding to environmental change and realizing sustainable development of intangible cultural heritage" as a priority in policy research and formulation, and give top priority to improving the ability to carry forward the heritage and practice". It is in the context of this trend at the historic moment that tourism product development arises.

## III. 3D PRINTING TECHNOLOGY AND THE DEVELOPMENT OF INTANGIBLE CULTURAL HERITAGE TOURISM CREATIVE PRODUCTS

As one of the important means to obtain economic income in tourism activities, tourism shopping occupies an important position in tourism activities. Intangible cultural heritage characteristic tourism commodities present a static development mode. The characteristic tourist commodities of intangible cultural heritage present a static development mode. In order to get great economic benefit in the tourism development of intangible cultural heritage, it is necessary to resort to the development of tourism commodities. Traditional skills and traditional fine arts are the crystallization of the wisdom of the craftsmen. In order to meet the needs of production and life and the pursuit of aesthetics, they create exquisite handicrafts by using local materials and giving play to the imagination and wisdom of human beings. In the development of tourism commodities, it is necessary to take the market demand as the basis, and develop diversified and diversified series of tourism commodities according to the characteristics of tourism commodities such as technology, practicality, memorial, collectivity, portability and knowledge.

At present, various kinds of tourism commodities have been developed, such as tourism handicrafts/souvenirs, tourism supplies, tourism food, tourism audio and video works, tourism books and periodicals, etc. With the continuous improvement of people's living standards, traditional tourism crafts and souvenirs can no longer meet the needs of tourists, and innovative design and innovative materials are constantly integrated into the design of tourism creative products.

Among the creative products of intangible cultural heritage, tourist handicrafts, souvenirs and tourist articles can be designed by the innovative method of 3D printing. Combined with the advantages of 3D printing, creative products of immaterial culture and tourism can be created. Efforts can be made from the following aspects:

### A. *Creating artistic value-added tourism service souvenirs by use of the 3D printing technology*

In recent years, since the market size of 3D printing shows a geometric growth trend, the distinctive tourist souvenirs can be developed and designed mainly in the

value-added service of regional characteristic tourism. The combination of cultural and creative products and 3D printing is still in its infancy currently and its potential value is immeasurable. Only the tourism value-added service souvenirs with artistry can meet the needs of tourists' aesthetic needs that are gradually rising. The Chinese nation has a profound cultural heritage. The folk tales, legend and customs of weddings and funerals, and life styles are cultural resources with regional characteristics, and they are folk wisdom worthy of inheritance. In order to glow the traditional folk wisdom with new splendor, first of all, it is necessary to improve the contemporary art forms of folk art, so as to present and express the distinctive regional culture and the unique artistic expression means of this region through science and technology. Folk wisdom also includes folk craft means, such as traditional folk toys and Manchu embroidery, paper cutting, farmer paintings, which are very good carriers. The taste and appreciation value of the souvenirs developed and created according to them should be highly refined and the quality should be improved.

#### *B. Shaping the image of tourism destination by selecting characteristic intangible cultural heritages*

A delicate souvenir to which the image of the world is refined and projected can be regarded as a carrier of culture. There are numerous intangible cultural heritages available for research and development. For example, the 3D printed miniature sculptures developed and researched can be used to make decoration parts, reliefs can be used to make refrigerator stickers and 3D desktop decoration parts can be used as pen holders. The 3D printing technology can be designed freely according to the needs. The modern high-tech means can be applied to the intangible cultural heritage, showing the unique national cultural connotation of the region. As long as someone travels here and feel such culture, he or she will inevitably buy such a product as a souvenir. Only such a product has consumption value and commemorative value.

#### *C. Personalized customization*

This is a new consumption model, with strong interaction and high novelty, attracting the attention of consumers. On-site customized printing realizes customized products, allowing anyone to customize their own intangible cultural heritage souvenir. With the support of 3D printing technology, the first thing to do is to select the desired intangible cultural heritage image or representative non-heritage objects, and after designing, they can become three-dimensional by use of 3D Max, Rhino and other software. In addition, they can be adjusted in the software according to different requirements of customers and printed out as tourist souvenirs. Tourists' images can also be scanned through 3d scanners, which can be combined with scenes of performance or techniques related to intangible cultural heritage production to interact with the inheritors. In this way the interactivity and memorial significance and fun can be integrated at the same time.

### IV. EXISTING PROBLEMS IN THE 3D PRINTING TECHNOLOGY AND THE CREATIVE PRODUCT DEVELOPMENT OF INTANGIBLE CULTURAL HERITAGE TOURISM

#### *A. The popularization of technology*

After years of development and innovation, 3D printing has reached the point where it can be popularized to the market. However, for many people, their recognition still remains in the early stage of 3D printing, such as high technology, expensive materials and troublesome modeling. They only have a partial understanding of printing technology, but have no personal contact with it. And to develop and apply the technology to this kind of value-added service products bought by people in travel, especially as gifts bought home. And its application is even rarer in scenic areas, which is related to the lack of publicity and promotion of new technologies.

#### *B. The cost of printing*

With the continuous progress of technology, the consumables of 3D printing are gradually replaced by various new materials, and the cost is gradually reduced. However, the printing materials of 3D printing of some metal or ceramic are still expensive, and the printers required are also in the stage of development and improvement, and have not reached the popularity. So, printers requiring this expensive material and new technology cannot meet the huge demand for tourism value-added services. There is still a need to wait for the technology to mature. Otherwise the expensive and scarce consumables will still be an impassable barrier for wide access of the 3d-printed travel souvenirs to thousands of people. Cutting costs from materials is a major problem for technology developers.

#### *C. Quantity production*

The advantage of 3D printing products lies in customized services, which can adjust model styles in a short time according to customers' personalized needs, and quickly print out the styles ordered by customers. This is the most in absence in the traditional service project, and also the most important significance of carrying out this project. The personalized customized service of 3D printing can certainly satisfy some consumers' pursuit of personalized and unique mentality. Yet to solve the problem of mass production is a problem that needs to be focused on in the later stage of management mechanism, which cannot be replaced by mechanized mass production in a short time. 3D printing plays a major role in enriching and supplementing the market in the development of intangible cultural heritage tourism souvenirs.

### V. CONCLUSION

3D printing manufacturing is still in a stage of constant exploration. Most 3D printing products are just to meet customers' personalized customization needs, without forming a complete industrial chain. But it has been in in-depth segmentation in different industries and areas, especially in the civilian subdivision of technology and

market precipitation. 3D printing will realize industrialization in the research, development and manufacturing of cultural and creative products, and be applied to the development of tourism products of intangible cultural heritage, so as to make intangible cultural heritage take on a new look. Closely connecting the inheritance and innovation of national culture with the progress of science and technology is a new way to explore the innovative development of national culture inheritance in the era of science and technology. It is of great significance to promote the combined development of China's intangible cultural heritage and tourism.

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