

The use of immersive experiences and digital technology in the preservation of intangible cultural heritage - ‘Dongba’

Yatong Shi*

College of Design, Rangsit University, Pathum Thani, Thailand

Abstract. Recently, some precious cultures have been forgotten, ‘Dongba’ as one of the Intangible Cultural Heritages (ICH) is experiencing a disappearance in the modern world. ‘Dongba’ culture includes various elements, such as scripts, graphics, and craftsmanship. To restore the ancient circumstances, scriptures, voices, and movements, to assist the audience in entering the immaterial memorial heritage world, and to explore the civilization of such an ancient tribe culture is the primary purpose of this essay. In this paper, the author attempts to build a conceptual structure of combining digital media and immersive experiences with the ‘Dongba’ and some related cultures. The conceptual design structure will be used in various conditions, for example, education, exhibition, tourism, advertisement, and more commercial purposes. Immersive experiences based on digital technology are a growing trend in the contemporary world. There is a design project for an immersive experience using 3D (Three-dimensional) sculpt modeling technology, providing a conceptual approach for future design and research. The outcome of this research will be 3D models rendering which represent three different elements of the ‘Dongba’ culture, demonstrating that immersive experiences can be an advanced method for preserving intangible cultural heritages, not only just ‘Dongba’ culture.

1 Introduction

‘Dongba’ has been hailed as a ‘memory of the world’ by UNESCO in 2003. ‘Dongba’ Culture is one of the Chinese intangible cultural heritages [1]. It is a culture from the minority ethnic - Naxi people. Naxis are now living at the junction between Yunnan and Sichuan provinces of China. After Naxis migrated from the ancient Qiang tribe the northwestern China, under a tough circumstance, they created the culture of ‘Dongba’. ‘Dongba’ culture consists of symbols, scriptures, drawings, music musical instruments etc. The first manuscript originates from around 2000 years ago. As a sacrificial culture, ‘Dongba’ is rarely mentioned, used, and understood in Naxis’ recent daily life. Only priests and masters inherited most of the skills (scriptures, magic, medicine, art, and craftsmanship) and utilized them in religious sacrificial activity. They are part of their own culture’s religion- the Dongba religion. ‘Dongba’ culture

* Corresponding author: yatong.s66@rsu.ac.th

is diverse and extensive. Hence, the research on ICH sustainability is getting more crucial, with the historical sedimentation of human civilization.

Formal and recent research on the preservation of 'Dongba' is mainly concerned with the traditional media. They are mainly focused on literature, art, design, music and dance. The development of local tourism through souvenir products, interior decorating style, and events style. In recent years, some of the formal studies focused on digital safeguarding and digital archives of Dongba's scripts, but still lack content on the interaction between digitalizing preservation and user experience.

Nowadays, user experience-driven digital technology plays a vital role in supporting modern people's lives. While people are enjoying digital services and functions, Human-centered design and immersive experiences are getting more concerned. Motivating human's deep emotions and providing an experience of people from the physical reality world temporarily. Multiple types of advanced media will be needed, the technology should fulfill humans' various perceptions of watching, listening, touching, and smelling.

The technologies utilized in this paper will combine elements of the 'Dongba' culture. Virtual Reality (VR) will be the first approach to enhance visual effects, bringing people to enter an imagination-structured world using commercial headsets. 'Dongba' Scripts will be incorporated into storytelling using this technology. Additionally, 3D printing technology will be significant for designers to create conceptual constructions of real objects with various forms, shapes, materials, and textures. This will solve the problem of creating and restoring scenarios in art presentations. This part will explain this technology in the restoration and recreation of 'Dongba' relics. Furthermore, 3D Motion Capture will be used to track 'Dongba' folk dance as dynamic human body motions, bringing real human gestures and movements into a virtual and imagination-based world.

The purpose of this study is to discover the usage of advanced digital technology and immersive experience technology to preserve ICH, especially since some cultures are getting handed down from past generations like Dongba. Based on the Dongba culture to combine the local research and visitors' preferences and plan a conceptual project of immersive experience by utilizing the relevant techniques (a) VR (Virtual Reality), (b) 3D (Three Dimension)-printing technology, (c) 3D Motions Captured tracks dynamic human body motions. Aim to interpret how a digital-driven immersive experience will assist the preservation of ICH- 'Dongba' culture.

2 Related work

2.1 Literature review

The exhibition and associated events of 'Dongba' culture have been proceeding for over 30 years. The approaches of events mainly consisted of showcases, exhibition tours, lectures, association-established TV programs, etc. Lijiang Museum serves as the primary location of the 'Dongba' collection, which was established in 1984. Around 3000 relics of 'Dongba' culture are exhibited in the Museum. It has the most complete and diverse 'Dongba' relics collection in the world. The main contents of the showcase display ancient relics of 'Dongba', along with related documents of ICH application and historical photographs [2]. Besides, the 'Dongba' Culture Tour exhibition began in 1990, which was the first time the 'Dongba' culture collection was exhibited in the Chinese National Museum, Beijing. It was selected as one of 'The five most attractive exhibitions at the Asian Games' [3]. Alongside the exhibition, an academic seminar was conducted, bringing together national and international experts for communication and collaboration. May 9, 2015- May 20, 2015, the exhibition of Naxi 'Dongba' launched in the National Museum Again. The exhibition was divided into sectors

such as culture, Religion and ceremonies, ‘Dongba’ pictographic scriptures and ancient literature, the religious art of Dongba, and the research and inheritance of ‘Dongba’. A total of 250 items were exhibited, with the main presenting approaches of display and live performance [4].

Furthermore, The Beijing Association of Dongba Culture and Arts (ADCA) was founded in 1997, to engage in the research, innovation, communication, and development of ‘Dongba’ culture [5]. In 1998, the ADCA organized the ‘Dongba Culture Photographic and Graphic Exhibition’ in collaboration with Peking University and Tsinghua University, the TV film ‘*Mysterious Dongba Culture*’ directed by Zhang, the president of ADCA, screened at the exhibition. The film was broadcast on CCTV (China Central Television), Beijing TV, and globally.

Nowadays, various digitalizing technologies have joined intangible and tangible heritages’ preservation and exhibition globally. Based on the displaying and the presentation of previous approaches to develop a series of conceptual methods human-centered, experience-driven, and state-of-the-art. According to the research, it deserves to be mentioned that the trending study of Virtual Reality technology among the ancient graphic art of The Mogao Grottoes in Dunhuang, China. The authors focused on the digitalizing process of graphic art, and the application of VR to enhance the visual effect of Dunhuang’s Graphics [6]. Meanwhile, 3D printing technology has been employed in restoring the ceramics damaged by previous natural or artificial factors. Researchers from the University of Jinan, Shandong, China, including Jiaxin Tian, Changzhong Wu, and two more authors, introduced the method and the process of 3D printing and emphasized the benefits and limitations of this technology [7]. Motion-captured technology in intangible cultural heritage preservation has significant outcomes as well. In Greece, there is a group of researchers who have been endeavoring to analyze the movements of characters in the video, transforming the two-dimensional motions into three-dimensional ones, aiming to classify the genre of folk dance [8].

2.2 Digitalizing technology

Why do recent researchers and curators aim to find more alternative and advanced methods for the exhibition and preservation of cultural heritages? No longer only relying on the traditional showcase displaying and events planning.

Firstly, Immersive-experience design, such as VR, 3D printing 3D motions captured, etc. make the distance closer between the audience and the relics compared to the previous traditional approach of the exhibition, (such as relics, photograph presenting, film presenting, and lectures). When the relics are presented on the glass shelf from remote history, simple photography to storytelling, audiences find it tough to build an emotional connection with them because they are so far from contemporary people’s lives. Letting the audience be more concentrated on what they are seeing and feeling in scenarios. Especially for the art education of younger generations, immersive experiences can bring easier and more direct visual effects, to help them understand some complex contexts. ‘In the progress of sensations and perceptions, People engaged in a fully focused virtual world.’ [9]. Various scenarios to be provided, the history telling, and the story of relics and artworks are easier to conduct.

Secondly, the relationship between relics and environments is not part of the presentation in the traditional approach. Some relics’ origin places have been damaged by some natural and artificial factors, some relics had significant functions in the previous environment such as the ‘Dongba’ sacrificial instrument in the ceremonies and events. The presentation of immersive experience design can be greatly enhanced by providing the audience with contextual background information, allowing for a deeper understanding of the relics, events, and religious narratives associated with them.

Furthermore, Digital technology offers a sustainable approach to the exhibition. Launching the online-streaming exhibition, an Audience, who wants to participate in the exhibition, but not be able to on the site can join in for an instant. Putting on the headset of VR, downloading the applications, then he/she can enjoy an online immersive exhibition straight forward.

3 The elements of ‘Dongba’ culture and related cultural preservations

In this part, the researcher researched some related cultural heritages and made a conceptual design project for the immersive experience of ‘Dongba’ cultures, aiming to give a combination of the Intangible and Tangible Cultural Heritage and the digitalizing immersive technology.

3.1 Inspiration

The Figure1. provided aims to present the conceptual design process of the three different Dongba elements. During the design, the first part consisted of research and inspiration. In this stage, the researcher analyses the related works, to ensure the structure of the design process, and to find out the specific elements and possible solutions. Researching lots of information on the past traditional methods of Dongba culture’s preservation and exhibition and the current advanced technologies’ methods of other cultures and culture heritages’ preservation and exhibition.

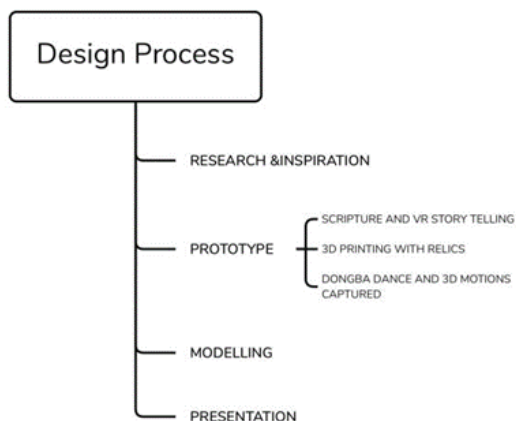


Fig. 1. Design process.

In the process of prototyping, the researcher chooses three orientations with different ‘Dongba’ Cultural elements combined with different technologies. The technology can enhance the presentation effect of the specific elements compared to the previous way. Three orientations are ‘Dongba Scripts and VR storytelling’, ‘Dongba Relics and 3D Printing’, and ‘Dongba Dance and 3D Motions Captured’.

In the third part of the process modeling, the researcher used digital sculpt technology to build the 3D model. This technology was frequently used in game designing, filmmaking, industrial designing, and 3D printing areas. Creating the form, shape, and character to be

more genuine than the traditional 3D model application with different tools. The final stage is the model presentation. Presenting the final model figures attached in the rest of the paper.

3.2 Prototype and modeling- ‘Dongba’ scripts and VR storytelling

The prototype is the ‘Dongba’ script, which is ‘the last living pictographic script in the world’ (UNESCO Supports the Launch of a MOOC of Initiation to ‘Dongba’ Scripts). Now, around 1400 scriptures still be in used by religious priests for religious activities [10]. They are lively, and graphic-structured to tell the story (Figure 2).



Fig. 2. Awaken the gods and sacrifice food [10].

Now, it has a translated version of these scripts in Chinese and an English version. Explaining every single element in the script. People can understand and pronounce it. In this sector, the researcher is aiming to use the technology of Visual Reality to tell the story of Scripts. During the study, the researcher found, that the scriptures mostly are written with a clear storyline, what happened in the story? what is the environment surrounding? or imitate a religious activity in the virtual world. Taking the audience to enter the script’s story, giving the annotation in every scenario, to deeply understand the meaning of every single word (Figure 3).



Fig. 3. Concept design VR scenario.

It not only be able to provide multiple language versions which is convenient for audiences from other countries, but also launch an online streaming program. While ending the VR storytelling, the audience can appreciate the collection of scriptures instantly which will take more perspectives for people with the collection.

3.3 Prototype and modelling-3D printing with ‘Dongba’ relics

The relics of ‘Dongba’ are mainly from sacrificial activities, for example, sacrificial instruments, the crown of the priest, the wand of the priest, and so on. Despite some musical instruments can be used in live performances sometimes, others should be collected in the showcase room

Using the 3D printing techniques in ‘Dongba’ preservation and showcase not only can help restore the Naxi’s relics from remote history but also can print some items and elements in the ‘Dongba’ traditional drawings out of the 2-dimensional world.

In this sector, the researcher selected two typical musical instruments which are using when ‘Dongba’ people were dancing, they were always in one hand were holding flat bells (Figure 4), and in the other hand holding tambourines (Figure 5). Utilizing the application to create the 3D model of instruments, imputing the model into the relevant 3D printing such as Z-suite, with correct formats. Then, set the materials and textures, check the version of the machine, and wait to print it out. The 3D printing machine is a process that melts the material first and reconstructs it with the prototype (heating and cooling). Through this technology, the product of relics with 3D printing can be a sample for presentation on the showcase, and it also can be used for savourer creating and restoration of some relics that are already lost and broken.

3D printing is undertaken the digitalizing modeling, it is more precise than traditional manufacture and handcraft. Especially for some relics repair, the irrational detailed shapes, and the thin and smooth surfaces are necessary with the modeling approach to finish.



Fig. 4. Original flat bell and 3D model.



Fig. 5. Original tambourine and 3D model.

3.4 Prototype and modelling- ‘Dongba’ dance and 3D motions captured

‘Dongba’ dance is normally performed by priests during religious activities. The main locations are Lijiang ancient town, Yulong and Ninglang district. There are 6 books called ‘*Dongba Dance Notation*’ which recorded 52 ways of dancing movements, stages, and relevant information. ‘*The Intangible Heritage- Dongba Dance*’ this book is described specifically and variously.



Fig. 6. Dongba dance [11].

In civil circulating, there still running around 100 types of ‘Dongba’ dance. The theme is mainly surrounding supernatural beings, animals, and sacrificial instruments. During the dancing, there are some leaders to lead other people to dance, and also the musicians to live performances.



Fig. 7. The main character and the scenario.

Folk dance live performances are processed in the exhibitions and events several times. Sometimes audience would get used to it, but feel a lack of engagement. Aiming to let the audience engage with the Dongba dancing, the researcher designed a gaming concept to comply with this immersive demand. In the game, it will have a main character (Figure 6), and the audience will follow the motions of the dancing character in the scenario. At the same time, the audience’s hand and foot movements will be recorded by the camera (Figure 7), which can recognize if the gestures from the audience are the same as the main character. The game makes the audience be part of the dancer not just sit to see the performance. Gaming design with 3D Motions Captured also possibly satisfies online- engagement. People

participate in the dancing game with motion captures, the computer will track their movements of them. People can enjoy the dancing experience instantly around the world.

Folk dance live performances are processed in the exhibitions and events several times. Sometimes audience would get used to it but feel a lack of engagement. Aiming to let the audience engage with the Dongba dancing, the researcher designed a gaming concept to comply with this immersive demand. In the game, it will have a main character, and the audience will follow the motions of the dancing character in the scenario. At the same time, the audience's hand and foot movements will be recorded by the camera, which can recognize if the gestures from the audience are the same as the main character (Figure 8). The game makes the audience be part of the dancer not just sit to see the performance. Gaming design with 3D Motions Captured also possibly satisfies online- engagement. People participate in the dancing game with motion captures, the computer will track their movements of them. People can enjoy the dancing experience instantly around the world.



Fig. 8. The game player and the scenario [12].

4 Conclusion

In conclusion, digital-driven user experience service is the trend to be utilized in all kinds of aspects of people's lives. VR, 3D printing, and 3D Motions Captured Technology as approaches to make the design concepts real, to bring the lost or broken relics back to reality. Meanwhile, taking the audience from reality to the virtual world, and taking the elements from the 2-dimensional world to a 3D world. when people are engaging with the digitalizing world, dimensional changes and spacing changes are happening in seconds.

Immersive experience constructed a world that connected multi-dimensional, virtual, and real. It gives an audience more complete and coherent perceptions of watching, listening, touching, smelling, and so on in the scenarios.

This series of design concepts can also be utilized in other similar intangible cultural heritage protection projects. According to the corresponding sensory needs of people, the further development with specific conceptual immersive designs is more tailored to the sensory needs of different intangible cultural heritage. Innovating from traditions, popularizing knowledge more enjoyably, inheriting the intangible cultural heritages through user experience, and making the local culture more diverse.

Furthermore, considering the response of digitalizing technology, and combining advanced AI (Artificial Intelligence) technology, such as OpenAI and some related applications, in the future, the immersive experience may be more intelligent, automotive, and individualized. Let the audience enjoy a wider world that combines digital and physical.

There are still certain limitations in this study. Due to the limitations of project duration and research space, it is not possible to visit the local area for field research. If there is an opportunity in the later stage, supplement this part of the content and provide richer visit information and local photos to make the investigation more comprehensive.

References

1. Unesco, 'Unesco Supports the Launch of a MOOC of Initiation to Dongba Script, The Last Living Pictographic Script in the World,' UNESCO.Org, **10**, 05 (2024) www.unesco.org/en/articles/unesco-supports-launch-mooc-initiation-dongba-script-last-living-pictographic-script-world.
2. Lijiang Museum, 'Basic Situation of Lijiang Museum,' The government of Lijiang, China, accessed on **16**, 05 (2024).
3. Fuquan, Y., Recalling the first Dongba cultural exhibition held in Beijing, *Century*. **2**, 20-23 (2023).
4. Ruojuan, Z., Ying, Z., Naxi Dongba Culture Exhibition, 5 (2015).
5. Beijing Association of Dongba Culture and Arts, Information of the 'Beijing Association of Dongba Culture and Arts (ADCA),' <http://www.dongba-culture.com/adca/ADCA-English.htm>.
6. Qingqing, G., and Guolong, Z., Research on the application trend of Mogao Grottoes murals based on VR technology, *Xinchuwenhua*. **7**, 55-57 (2024)
7. Tian, J., et al., Application of 3D Printing Technology in Cultural Relic Protection, Proceedings of the International Conference on Information Economy, Data Modeling and Cloud Computing, ICIDC 2022, 17-19 June 2022, Qingdao, China (2022).
8. De Paolis, L. T., Chiarello, S., and De Luca, V., An Immersive Virtual Reality Application to Preserve the Historical Memory of Tangible and Intangible Heritage, *VISIGRAPP (2: HUCAPP)* (2023).
9. Zhang, C., The why, what, and how of immersive experience, *IEEE Access* **8**, 90878-90888 (2020).
10. Zhou, Y., Study on the associative character of Dongba script in Lijiang area, *Open Access Library Journal* **6**, 1-10 (2019).
11. 'Dongba Dance' <http://www.lijiang.gov.cn/ljsrmzf/>.
12. 'Made in Space, Tycho Barhe Planetarium' <https://www.avixa.org/pro-av-trends/article/s/>.