



# Research on the Digital Transformation of Dynamic Display of Intangible Cultural Heritage along the Grand Canal

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**Abstract.** The iterative innovation of technologies such as the Internet, artificial intelligence, cloud computing, and blockchain has been included in the national medium- and long-term strategy. Various fields and industries in economic and social development are using digital technology to enhance their level of informatization and intelligence, and achieve digital transformation. At the same time, the exhibition of intangible cultural heritage has moved away from traditional static displays, and the emphasis is now on showcasing the authenticity and vitality of intangible cultural heritage through dynamic displays. The comprehensive and full-chain transformation and upgrade of cultural dynamic displays is urgently needed. In recent years, breakthrough progress has been made in key technology research, and the creation of digital application scenarios. Therefore, focusing on the Handicraft Dynamic Museum in Gongshu District, Hangzhou, we will analyze the composition, limitations, user experience, and breakthroughs in the dynamic exhibition forms. We will also innovate the exhibition design from five aspects: AR-VR interactive system, interactive exhibits, multimedia display, interactive narration and guide system, and workshops. This will promote the sensory experience of visitors through human-computer interaction intelligence, and provide design solutions for the digital transformation of the intangible cultural heritage dynamic exhibition along the Grand Canal.

**Keywords:** Grand Canal; Intangible Cultural Heritage; Dynamic Display; Digital Technology; Digital Transformation

## 1 Introduction

Digital transformation is the process of adapting to the trends of technological revolution and industrial change. It involves deepening the utilization of new generation

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information technologies such as big data, artificial intelligence, blockchain, Internet of Things, and cloud computing. The goal is to enhance the ability to survive and develop in the information age, accelerate business optimization and innovation, cultivate new driving forces for development, create, transmit, and obtain new value, and ultimately achieve transformation, upgrading, and innovative development. With the increasing uncertainty of the digital economy era and the continuous upgrading of information technology, it is crucial to optimize, innovate, and reconstruct the value system of cultural heritage's dynamic display. By designing and developing new forms of dynamic display for canal heritage, we can stimulate the vitality of intangible cultural heritage along the Grand Canal and transform and enhance the intrinsic driving force of canal culture inheritance and continuity. As an important gateway for out-of-town tourists to gain their first understanding of the intangible cultural heritage of the Grand Canal's handicrafts, the Handicraft Living Museum in Gongshu District, Hangzhou City directly or indirectly affects the dissemination of canal culture through the visitors' experience and the display effect of the exhibits. The research objective of this article is to explore how to apply new technologies to construct new forms of communication on the basis of traditional cultural dissemination, reshape the design of dynamic exhibition display, allow visitors to receive the more authentic and dynamic canal culture from a fresh perspective, enhance their immersive experience, and empower their visit experience.

## **2 The dynamic display effects of traditional handicraft culture along the Grand Canal**

In the living display of intangible cultural heritage along the Grand Canal, handicraft production is an indispensable part. The Handicraft Living Museum in Gongshu District, Hangzhou City, showcases the traditional handicraft skills of the people along the canal. It is the first comprehensive exhibition hall of intangible cultural heritage in Zhejiang Province that combines interactive teaching, experiential learning of intangible handicrafts, and folk art performances. The museum mainly focuses on umbrella making, paper cutting, and fan making, supplemented by demonstrations of paper cutting, purple clay teapot making, pottery, and handmade cheongsam, among other traditional crafts. Scholar Liu Tuo has tentatively divided the display of intangible cultural heritage into four forms: "original ecological" display (non-movable), "quasi-ecological" display (movable), display with inheritors present, and display with inheritors absent, depending on the possible needs.<sup>1</sup> Unlike cultural relics exhibitions, the "living" aspect of intangible cultural heritage exhibits lies in the presentation of the production techniques of the exhibits and the vitality of the exhibits, which include the lifestyle, cultural progress, and human wisdom embodied in them. This allows visitors to feel the integration of handicrafts into life,<sup>2</sup> to experience the details in life, and to sense the continuation and enduring nature of human civilization through the exhibits.

## 2.1 Display forms of exhibits in the museum

The Handicraft Living Museum in Gongshu District, Hangzhou, primarily utilizes two forms of display for showcasing its exhibits: "in-situ" display (non-movable) and "semi-in-situ" display (movable). There are also other forms of display that are occasionally used.

Cultural heritage can be classified into two categories: non-movable and movable. Non-movable cultural heritage refers to artifacts that have a strong dependence on their place of origin and original environment. Moving or removing these artifacts from their original environment can result in the loss of their heritage value or even irreversible damage. Examples of non-movable cultural heritage include ancient buildings and archaeological sites. The venue of the Handicraft Museum has typical cultural spatial attributes. The venue was renovated from the Tongyi Public Silk Factory, and the living museum retains the typical features of the Republican-era factory buildings. It is consistent with the architectural style of the factory buildings from the Republican era.

## 2.2 Analysis of current issues in dynamic display in the museum and the feasibility of "digitization"

In order to better showcase the craftsmanship and cultural heritage of the Grand Canal, it is theoretically more suitable to have artisans present to demonstrate the production process of weaving, manufacturing, bamboo weaving, and purple clay teapots in the exhibition hall. The Handicraft Living Museum in Gongshu District, Hangzhou, attracts national, provincial, and municipal arts and crafts masters and inheritors. In the museum, there is a dedicated hall where artisans demonstrate over twenty traditional crafts such as bamboo weaving and embroidery. However, in reality, it is still quite difficult for the inheritor to participate in the permanent and fixed exhibitions that provide daily life support for them. The inheritor's on-site appearances, duration, frequency, and the content of their core actions vary greatly, while visitors only have a few seconds to stop and watch the live performances. It is crucial to consider whether the performers can attract the flow of visitors with high-quality display effects within the limited time, as well as whether visitors can effectively capture the essence of the performers' performances. By utilizing specialized techniques, tools, props, spaces, text, images, audiovisual media, and other mediums, it is possible to achieve a high level of "exhibition" and "dynamic" display design, which can to some extent meet the need for dynamic display of exhibits. The main purpose of the presenter's presence during the exhibition is to convey the specific meanings, spirit, and values inherent in the dynamic display of exhibits.

### **3 New digital technologies optimize, innovate, and reconstruct the dynamic display system.**

#### **3.1 Digital dissemination models and digital dissemination media for intangible cultural heritage.**

In the new historical context of digitization and the "Internet+", the dynamic protection of intangible cultural heritage is presenting a new direction of digital development. In April 2017, the Ministry of Culture issued the "Guiding Opinions on Promoting the Innovative Development of the Digital Culture Industry", which proposed that under the background of the digital economy, the creative transformation and innovative development of outstanding traditional culture need to rely on the implementation of digital content innovation development projects, and the government encourages the digitization development of cultural resources such as intangible cultural heritage.

#### **3.2 Using digital technologies to create dynamic display applications.**

Many of our intangible cultural heritage skills in China are preserved in economically underdeveloped areas. The original environment is a necessary condition for stimulating the vitality of cultural heritage. The originality and vitality make it impossible to separate from specific places, and regional constraints increase the difficulty of displaying and inheriting intangible cultural heritage.<sup>3</sup> Digital technology, through the systematic transformation of resource digitization, data scenarioization, and network intelligence, reproduces the scenes of intangible cultural heritage production and life, to a large extent, compensating for spatial differences. The core of intangible cultural heritage lies in the necessary conditions of not departing from the original natural environment, ecological environment, and social environment. It simultaneously achieves dynamic display by incorporating various digital technologies, such as 3D holographic projection technology, VR/AR/MR technology, and multi-channel projection/laser projection display technology. These technologies create immersive experiences that guide people into specific scenarios, allowing them to experience the themes and atmospheres of cultural activities, and providing a more diverse and interactive sensory experience. The diversified use of digital technologies in intangible cultural heritage projects has achieved multidimensional protection and inheritance of intangible cultural heritage, and has significantly improved the breadth, depth, and effectiveness of dynamic display and dissemination.<sup>4</sup>

#### **3.3 Analysis of key technologies for dynamic display applications.**

##### **Virtual technology and augmented reality technology.**

Virtual reality technology, also known as virtual technology, encompasses computer, electronic information, and simulation technology. It is a highly advanced simulation system generated with the assistance of computer technology. It combines various high-tech developments such as computer technology, 3D graphics technolo-

gy, multimedia technology, simulation technology, display technology, and servo technology to simulate a three-dimensional virtual world that incorporates multiple senses such as vision, touch, and smell. This technology creates an immersive experience for users when using the equipment. With the continuous development of virtual reality technology, it is increasingly being applied in various industries. Currently, virtual reality technology is used to create VR products through three basic methods: fully three-dimensional reconstruction with interactive features, mixed reality technology, and 360-degree panoramic shooting. By building three-dimensional scenes based on virtual reality technology and combining them with real data and materials, highly realistic environments can be simulated and recreated, providing an immersive experience and better visualization and interactivity. This technology helps users better understand and solve problems.

Augmented Reality technology is a technology that combines various techniques such as multimedia, 3D modeling, real-time tracking and registration, intelligent interaction, and sensing to integrate the real world with virtual information. A complete augmented reality system consists of at least three components: tracking, registration, and display. It captures real-world images through a camera, simulates human sensory experiences such as hearing, vision, and smell, overlays virtual information onto real information, and outputs it to a display. The two types of information complement each other, achieving the goal of "enhancing" the real world.

### **Multi-touch technology.**

Multitouch technology, also known as Multi-touch, is a human-computer interaction technology that eliminates the need for traditional input devices such as mice and keyboards. Unlike single-touch technology used in smartphones and digital cameras, which can only recognize and support one touch or click at a time, multitouch technology allows for interaction by receiving pressure from multiple points on a touch screen or touchpad. When using multitouch products, users can use their hands to perform single-touch actions, as well as gestures such as swiping, pressing, and rotating to manipulate the content. This technology uses infrared light to detect the reflection caused by the obstruction of the finger on a transparent glass panel, combined with gesture recognition and hand-drawn trajectory recognition techniques, to achieve changes in the displayed image. This allows users to have a more comprehensive understanding of the relevant features of the object being observed.

### **Laser projection display technology.**

Laser projection display technology is an advanced display technology that projects images onto a screen using red, green, and blue as the light source. The purity and stability of the light source make the projected images clear and lifelike. This technology offers advantages such as higher brightness, a wider color gamut, and longer lifespan, allowing for a more realistic reproduction of the colors in the real world and a stronger expressive capability. It has a wide range of applications in fields such as education, entertainment, and business. In the exhibition industry, using laser projection displays allows for easy implementation of high-definition large-scale

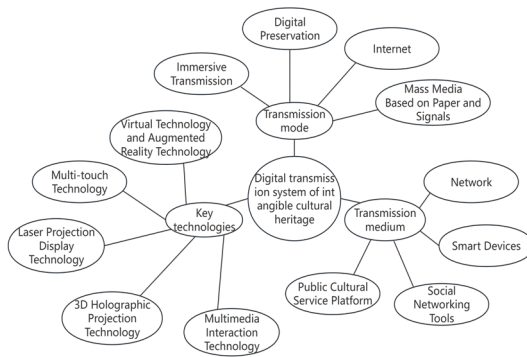
projections, providing visibility and attractiveness for product promotion, exhibit demonstrations, and AR/VR experiences.

**3D holographic projection technology.**

3D holographic projection technology is a photographic technique that uses the principles of interference and diffraction to record the information contained in the reflected light waves of an object. By illuminating particles with a light source and combining their positions with the film, it is possible to reproduce a true three-dimensional image of the object. Currently, 3D holographic projection technology is widely used in creating realistic three-dimensional scenes for visual effects. Additionally, in the field of cultural heritage preservation, this technology is used to create three-dimensional imaging that replaces actual artifacts, allowing for a 360-degree panoramic display. This not only provides viewing value but also prevents the oxidation of artifacts from prolonged exposure to air.

**Multimedia interaction technology.**

Multimedia interactive technology is an innovative approach to traditional multimedia presentation techniques, developed under the advancement of multimedia technology. It involves the integration of various media elements such as sound, images, videos, and animations, presented and communicated in an interactive manner. This technology incorporates rich text and images in display design to enhance visual effects, providing audiences with a truly immersive sensory experience, allowing them to see, hear, and feel. In the field of heritage preservation, multimedia interactive technology is gradually shifting from the traditional static approach to a bidirectional development, transitioning from fixed physical objects to virtual and non-physical representations. By combining virtual reality technology, multimedia interactive technology enables the multidimensional and multi-angle display and interpretation of heritage, enhancing audience engagement and depth of understanding. This approach contributes to a more dynamic and immersive preservation and presentation of cultural heritage. The summary of all technologies are shown in Fig. 1.



**Fig. 1** Digital transmission system diagram of intangible cultural heritage

### **3.4 Analysis of user experience in digital dynamic display.**

Digital transformation is a significant technological revolution. The Grand Canal culture has embraced digital technology as a tool and has found a suitable digital survival mode. It has integrated into contemporary life through diverse digital media and has long shed the label of being a "silent landscape". The Grand Canal culture is adapting to the development of the times and market demands by expressing cultural elements in a more cool and youthful way.<sup>5</sup> It tells the story of the Grand Canal through the "Internet+" model and digitally constructs the "Grand Canal Cultural Relics Monitoring Platform" and the "Grand Canal Cultural Heritage Digital Resources Platform". It also develops the "Internet+" smart scenic area digital cloud platform and provides e-commerce services for cultural and creative products. The digital cloud platform of the Grand Canal National Cultural Park has officially been put into use. Technology continues to "revitalize" the Grand Canal through constant upgrades. The Central Office of the Communist Party of China and the General Office of the State Council have issued the "Outline of the Plan for the Protection, Inheritance, and Utilization of the Grand Canal Culture," emphasizing the need to deeply explore the cultural connotations of the Grand Canal, showcase its historical and contemporary values, and revitalize the associated cultural heritage. The folk songs culture of the Grand Canal is a good example: digitized transcription and archiving, VR real-life display of folk song documents in the Grand Canal basin, creating a virtual mapping of the folk song "Waterborne Homes" using digital twinning technology, recording the entire process of folk song preservation, and ensuring the authenticity and integrity of dynamic exhibitions. As for the handicraft culture, which is an integral part of the Grand Canal's associated culture, it is imperative to digitally showcase traditional handicrafts in a dynamic manner.

#### **Adapting to the discourse system of young people.**

The key driving factor of digital transformation is data. According to the analysis of big data from social media, the youth group is leading the spread of intangible cultural heritage online and showing a rapid upward trend. They are also the group that most recognizes the cultural value of intangible cultural heritage. This has become an important model for the protection and inheritance of intangible cultural heritage. Taking the opportunity of the "Cloud Tour of Intangible Cultural Heritage" image exhibition, Hebei Grand Canal culture is aligning with hot social topics, breaking it down into different themes for dissemination. The bidirectional interaction between digital media platforms and culture is sparking the enthusiasm and attention of the youth group. The Grand Canal culture is entering the discourse system of young people in a special way.

In the era of the digital economy, traditional culture needs to actively adapt to the preferences of young people while also embracing and relying on the development of digital technology in order to innovate and develop in its preservation. The dynamic display of intangible cultural heritage in the Grand Canal showcases the "living" cultural heritage, where dynamic display is a technological transformation of the living display, and activities are the representation of the living display. In the exhibition of

intangible cultural heritage, the exhibits are usually static, but the audience is subjectively dynamic. The audience becomes visitors who move through the exhibits, making the exhibits come to life and achieving the effect of a living display. As the main audience of the living display, the designers of the exhibition need to fully consider the cognitive characteristics and psychological state of the visitors. By conforming to the values, consumption attributes, and discourse system of the youth group, entering the aesthetic world of the youth or youth culture can provide new ideas and new paths for the digital transformation of the Grand Canal cultural living display.

### **"Digital natives" embracing digital technology products.**

As "digital natives", the younger generation is distinct from other age groups. They have a high level of informatization in their daily lives, with a much higher usage of mobile communication and digital products than the average population. This group has diverse perceptions, specific demands, and clear social circles, requiring a high level of professionalism. In the era of new consumption (digitally-driven consumption), the younger generation has become the main consumer force and is more willing to try new digital technology products.

The youth, especially those born between 1995 and 2009, known as the "Internet Generation," have a clear characteristic of enjoying life and experiencing consumption. They are enthusiastic about experiencing different consumption scenarios. Scholar Liu Senlin believes that contemporary youth have distinct personalities and lifestyles that are different from other generational groups. Scholar Wang Min provides two pieces of evidence: first, the experiential consumption centered on enjoyment and new experiences is becoming the mainstream of youth consumption behavior; second, there is an increasing number of leisure consumption places in cities, such as cafes, bars, amusement parks, live houses, cinemas, and large-scale KTVs, which are favored by more young consumers.<sup>6</sup> By using data mining tools like WEKA and SPSS, as well as machine learning techniques, I have analyzed social media data of contemporary youth such as Weibo, WeChat, and comments. I have found that the consumption behavior of today's youth is no longer solely driven by basic survival needs. They place increasing importance on whether they can obtain more excitement and sensory experiences during the consumption and entertainment process. This has led to a general preference among young people for "immersive experiences" in their consumption patterns. The use of digital applications provides the youth with a sense of being fully immersed in a virtual world, where virtual information is seamlessly integrated with the real world through real-time computing, image processing, and sensor technologies. This creates a completely new virtual world visually, and the use of audio technologies, such as surround sound and positional sound effects, enhances the realism of the "immersive experience".



## **4 Digital Transformation and Smart Exhibition Design for the Dynamic Display of the Grand Canal**

### **4.1 Overall Design Concept**

The call to innovate the cultural heritage of the Grand Canal with the help of digital technology promotes the combination of intangible cultural heritage projects with contemporary life, and aims to creatively transform and innovatively develop dynamic displays. This will advance the high-quality development of traditional craftsmanship. Dynamic displays use digital programs as platforms, intelligent virtual scenes as media, and interactive sensing as the foundation. This will assist in the digital transformation of the dynamic display of the intangible cultural heritage of the Grand Canal, conveying the intuitive and tangible value of cultural heritage and enhancing the authenticity and expressiveness of dynamic displays.

### **4.2 Specific Applications of Digital Transformation for the Dynamic Display of Intangible Cultural Heritage along the Grand Canal (Using the Handicraft Museum in Gongshu District, Hangzhou City as an Example)**

#### **AR-VR Interactive System for the Dynamic Museum.**

The AR-VR Interactive System in the Living Craft Museum combines virtual reality and augmented reality technologies. The system is divided into two main modules: the Virtual Reproduction Path and the Enhanced Interaction Path, as shown in Fig. 2.

The Virtual Reproduction Path interacts with the space through VR technology, creating a virtual world using 3D modeling to recreate authentic scenes from the Republic of China era in the Living Craft Museum. This enriches the "native" display of the museum's current living state. The construction of the virtual scenes in the museum is an important part of the Virtual Reproduction Path. Before building the models, it is necessary to comprehensively collect all historical records, photos, paintings, architectural drawings, and other relevant architectural features of the former Tongyi Gong Sha Factory, which was the precursor to the Living Craft Museum during the Republic of China era. This is a crucial step in setting up the scenes, as it allows for a thorough understanding of the functionality, structure, and interior layout of the factory building. Additionally, in-depth investigations into the work habits and life experiences of the factory workers during that period are conducted to accurately reproduce the production and living scenes of the factory building. Using a 3D scanner, I will scan the real-time museum building to detect and analyze its geometric structure and appearance data, including the building's exterior, interior construction, decorative details, color, and surface reflectance properties. I will then use software such as 3DMAX, ArcGIS, and AutoCAD to perform operations such as translation, rotation, and stretching to construct an accurate 3D model of the factory. I will add material and texture to the model using 3D texture mapping, create UV maps, and apply lighting effects. I will use the Unwrap UVW modifier to optimize the placement of virtual textures, making the factory model detailed and realistic. I will also add pre-set char-

acters (such as textile workers, managers, and customers) and animations (such as production and daily life) to the model. By using animation techniques, I will give the characters actions that provide visitors with an immersive experience. Finally, I will render the model and import it into the Unity platform.

Enhancing the interactive pathway through AR technology involves overlaying virtual information onto real-world objects, allowing for interaction with the information related to traditional craftsmanship exhibits. It can also be used to present three-dimensional representations of flat physical objects such as black paper fans or patterned photographs that may be difficult to display or at risk of being lost. By utilizing intelligent recognition, the enhanced interactive pathway can identify various static craftsmanship exhibits like oil-paper umbrellas, knives, carvings, and fans, and showcase them through 3D views and structural perspectives. Additionally, it can utilize the Vuforia SDK to capture the real-time process of crafting exhibits using the camera, track and detect artificial markers, and overlay virtual information onto the real world to enhance the understanding of the craftsmanship process. By importing this into the Unity platform, the enhanced interactive pathway can effectively compensate for the lack of live demonstrations for weaving, manufacturing, and pottery exhibits within the live exhibition hall, addressing the challenges of inheriting traditional techniques when the craftspeople are not physically present.

In this article, we utilize VR headsets (such as the Oculus Rift DK2 VR glasses) and smartphones with Android or iOS operating systems as the display devices for virtual reenactment paths. The VR headset consists of a 5.7-inch AMOLED display, two short-focus lenses, a camera, and other components. It uses head tracking technology to track the user's head movements and display the virtual environment, enhancing the visitor's sense of depth and immersion. Alternatively, visitors can scan a QR code to access a dynamic display of the restored production and living scenes of the Tongyi Public Silk Factory during the Republic of China period. This enhances the interactive path, allowing visitors to easily and conveniently view the specific three-dimensional information of the exhibits on their smartphones with Android or iOS operating systems, without being limited by the exhibition environment. The AR-VR interactive system combines virtual reality and augmented reality technologies to digitally transform the live demonstration of traditional crafts. By enhancing the immersive experience of virtual reality technology and the interactive experience of augmented reality technology, it takes the "digitalization" of the cultural heritage of the Grand Canal to a higher level.

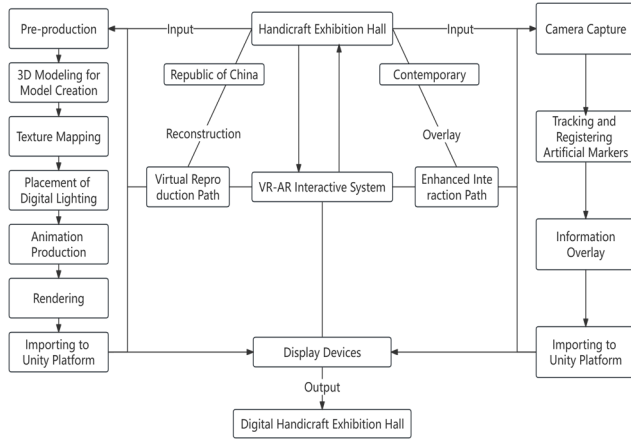


Fig. 2 VR-AR interactive system framework diagram

**Interactive Exhibits.**

Interactive exhibits are application products that showcase interactive displays. Interactive displays are a new way of showcasing that utilize cutting-edge technology. Through the use of multimedia interaction technology, multitouch technology, and 3D holographic projection technology, interactive displays utilize laser projection screens to easily achieve high-definition, large-scale projections. Visitors can interact with the display by touching the touchscreen, and graphic recognition technology can identify the gestures and hand-drawn trajectories of visitors, capturing user input. This can be done through infrared sensing, radar sensing, or other methods. These interactive inputs allow the displayed images on the screen to be transformed in any direction and angle, creating an interactive experience between the audience and the projected scenes.

In the Handicraft Activity Hall, we have installed various multimedia interactive exhibits such as floor projection, virtual flipping books, and holographic imaging. Visitors can interact with the exhibits effectively by using the virtual flipping books, which are connected to a comprehensive database of the intangible cultural heritage of the Grand Canal. By detecting the hand movements of the visitors, the virtual books automatically turn pages, reproducing the flipping and sound effects. Visitors can browse any desired information about the intangible cultural heritage of the Grand Canal. Furthermore, through holographic imaging, we can showcase three-dimensional images of the canal transportation and the process of creating handicrafts without relying on screens or media. These images are superimposed on the real scenery of the exhibits, creating a dynamic and interactive display system.

**Multimedia Presentation.**

In the Handicraft Activity Hall, handicraft products are primarily displayed in a static manner. However, relying solely on textual explanations for these static exhibits

may make visitors feel bored. To address this, we propose integrating the concept of multimedia interactive displays with the exhibition cabinets. Instead of traditional glass display cases, interactive LED transparent screens will be used. These screens will feature carefully designed animations and images of handicraft products. To complement this, we will develop interactive programs that combine canal culture and handicraft elements using HTML, CSS, JavaScript, Node.js, and MySQL technologies. For example, there could be interactive mini-programs online where visitors can make virtual handicraft items such as oil-paper umbrellas, fans, or traditional Chinese dresses. This will transform the static exhibits into dynamic ones, giving them vitality. Visitors can personally experience canal intangible cultural heritage and create virtual handicraft products by simply using their fingers. This will fulfill the emotional need for an "experience-oriented" visit.

### **Interactive Commentary and Guided Tour System.**

The combination of interactive commentary and guided tour systems with digitization and interactivity brings visitors a new way to experience and acquire knowledge.

By using an interactive commentary system in the Handicraft Pavilion, visitors can access comprehensive and systematic information about the exhibits. Through the use of multimedia interactive technology, such as audio, video, and images, the history, cultural background, and craftsmanship of the handicraft exhibits are showcased, enabling a dynamic display of the handicrafts. Additionally, the interactive commentary system changes the traditional form of exhibition commentary. Visitors are no longer passive recipients of information about the Grand Canal culture. Instead, they can actively interact with the system through touchscreens, scanning codes, or mobile devices, choosing the exhibits they are interested in and accessing detailed commentary. This innovative form of interaction allows visitors to actively engage with the Grand Canal culture, gain in-depth knowledge about the exhibits and traditional craftsmanship, and enhances the interactivity, educational impact, and dissemination of the Grand Canal culture during the visit.

Currently, the most common way of providing guided tours in the exhibition hall is through artificial voice guidance. This method involves a tour guide using a microphone to provide explanations. However, this approach requires a high level of personal skills from the tour guide, and the content of the explanations is generally fixed. Visitors listen to the explanations through Bluetooth headphones. This method limits the flow of information about handicraft exhibits to the order in which the tour guide presents them, resulting in a lack of interactivity and potential boredom.

The smart guide system is built on wireless radio frequency identification (RFID) technology, Bluetooth, GPS positioning system, GIS display technology, QR code technology, and various sensors. It provides visitors with comprehensive tour guidance and personalized recommendations. The guide system consists of user positioning system, indoor map system, guide service system, exhibit information system, and multimedia system. Visitors can use their smartphones or the smart guide device provided by the museum to scan the QR codes on the handicraft exhibit showcases, which will redirect them to a WeChat Mini Program. In this Mini Program, they can view the three-dimensional display, related content explanations, and video presenta-

tions of any handicraft exhibit they choose. The Mini Program also includes the overall structure and layout of the museum, basic exhibits, and popular attractions. Based on the visitor's location, it provides voice and augmented reality (AR) navigation, automatically recommending the optimal tour route to enhance navigation accuracy and improve the visitor's experience.

Through the WeChat mini program, we have launched a seamless online ticketing system, facial recognition for entry, voice-guided navigation, and augmented reality experiences, providing visitors with greater autonomy when exploring the exhibits at the Handicraft Activity Hall in Chengdu. By scanning a QR code, visitors can view three-dimensional displays of the handicraft exhibits and access background information, the process of creating the crafts, as well as videos showing how the exhibits were used in daily life and throughout history. This allows visitors to have a comprehensive and immersive experience, bringing the handicraft exhibits to life.

### **Online Interactive Workshops.**

Currently, in the Gongshu District, various types of youth educational activities have been introduced in the Craft Activity Exhibition Hall, which has played a role in showcasing, disseminating, and educating intangible cultural heritage. In a sample survey conducted in the exhibition hall, it was found that the participation and experience of handicrafts have become the biggest attraction of the exhibition hall. By establishing a separate workshop in the Craft Activity Exhibition Hall, participants can personally participate in the inheritance of the Grand Canal culture and handicraft skills, and DIY their own handicrafts, experiencing the value and charm of cultural heritage.

In the development of the online workshop platform, I have integrated augmented reality technology into the traditional workshop model. Visitors can scan the handcrafted products they are interested in using their mobile phones, and then they can access augmented reality information about the exhibit in the mini program. This includes the internal structure of the handcrafted exhibit and the detailed breakdown of each step in the production process. For interactive groups involved in creating handcrafted exhibits, we can place laser projection screens in the workshop to continuously display the production process of the exhibits. This assists visitors in independently completing the production process. The online interactive workshop liberates artisans to some extent and enhances the visitor experience. It allows visitors to explore the process of traditional handicrafts through direct participation, resulting in a unique and profound understanding of traditional handicraft techniques.

## **5 Conclusion**

The dynamic stimulation of intangible cultural heritage craftsmanship not only requires the dynamic display of the craftsmanship itself, but also emphasizes the importance of on-site demonstrations and introductions. The process of digital transformation is a systematic innovation, where digital technology empowers the display and development of intangible cultural heritage. Digital dynamic exhibitions have immer-

sive characteristics, allowing individuals to actively engage with intangible cultural heritage and transform it into personal experiential knowledge. By utilizing digital technology, dynamic exhibition halls undergo digital transformation, accelerating innovative changes in dynamic displays and addressing challenges such as monotony and the absence of inheritors during on-site exhibitions. This not only provides space and convenient conditions for attracting visitors, especially the younger generation, to learn, demonstrate, and showcase, but also creates new advantages for the inheritance of the canal culture, generating new momentum and creating new value. The dynamic exhibitions of the Grand Canal's intangible cultural heritage can effectively convey the cultural connotations and values of cultural heritage, making them more attractive and engaging. The dissemination activities of the exhibits influence visitors' thoughts, beliefs, and behavioral habits, leading to behavioral changes that in turn impact and transmit the intangible cultural heritage of the Grand Canal to a wider audience, resulting in significant social effects.

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