# Digital Immersive Space Design and Application of Intangible Cultural Heritage Museum

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**Abstract:** In recent years, with the rapid development of digital technology, virtual reality, augmented reality and other modern information technologies are widely used in space design, and digitalization has become one of the main ways to protect and spread intangible cultural heritage. In the process of application practice, new interactive mode and ecological civilization concept guide the application of digital technology, integrate into cultural inheritance, ecological green, social service and other immersive experience virtual elements, and then ensure the sustainable and modern development of space art design with digital technology. Different Spaces bring diverse experiences, providing visitors with a variety of learning experiences from the concrete to the abstract. The digital immersive space of intangible cultural heritage museum integrates display and publicity, cultural exchange, communication and inheritance, leisure education, and analyzes the design elements of immersive display space from four aspects: spatial design principle, immersive design mode, artistic expression and audience behavior mode.

## 1. Introduction

The function and definition of intangible cultural heritage museum are constantly explored and revised with the development of The Times. From "object-based" to "human-oriented", great changes have taken place in visitors' psychological expectations of museums and their traditional functions of collection, sorting, storage, research and display, etc., and the dissemination of knowledge and culture and public service have become the new mission of museums. People have come to expect unusual experiences in museums, to satisfy their curiosity through a process akin to finding the answer to a puzzle, and to enjoy the surprise of a new corner of the world being illuminated. This psychology is intrinsically similar to watching a tragicomic movie, role-playing in a carefully designed game setting, and experiencing a different culture in a foreign land. As technology changes and people's demands for museum experience change, immersive experience begins to enter the field of vision of museum curators.

In recent years, with the rapid development of digital technology, digitalization has become one of the main ways to protect and spread intangible cultural heritage. The digitization of intangible cultural heritage includes a series of activities in the whole digital technology environment, involving digital practice such as recording, preservation, display and dissemination. The design elements of exhibition space of intangible cultural heritage museum are analyzed from four aspects of space design principle, immersive design mode, artistic expression and audience behavior mode, integrating exhibition and publicity, cultural exchange, communication and inheritance, and taking Liao Chuanqi intangible cultural heritage Digital Museum as an example. This paper analyzes and summarizes the immersive space design model of contemporary museums and the application and development of museum space design in the future.

## 2. Space Design Principle

Based on a deep understanding of the basic relationship between display elements: people, objects and time and space, the following design principles are tailored for the permanent exhibition vision of the immersive digital intangible cultural heritage Museum.

## 2.1. People-centered Experiential Design

With "exploration, perception, immersion, integration and creation" as the advanced experience mode, it meets the psychological requirements of audiences at different stages and realizes the sublimation from emotion to action. To achieve dynamic and static, ornamental and participation, exhibition and exhibition combined comprehensive effect.

## 2.2. Scientific Planning and cCever Layout of Exhibition Space

Different perspectives -- perfect integration of physical display and digital display.
The dissemination of accurate science, which also re-creates popular feelings.
The expression of something with meaning -- the fit of content attribute and display creativity.

## 2.3. The Flat, Paper-based and Static Intangible Cultural Heritage Display is Perfectly Combined with High-tech Means

The content is based on scientific, factual and accurate expression of intangible cultural heritage. The exhibition techniques will give intangible cultural heritage "dynamic" attributes, with distinct themes, rich and diverse contents, and facilitate the addition and replacement of content in the later period.
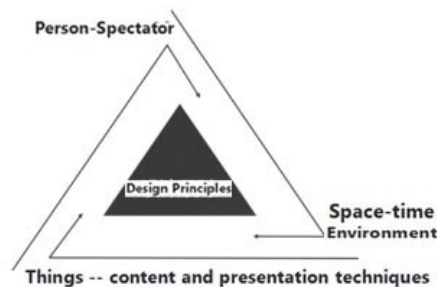


Fig.1 Scientifically plan the relationship between people, things and space and time

## 3. An Analysis of the Spatial Pattern of Digital Immersive Experience --a Case Study of Liao Chuan Intangible Cultural Heritage Digital Museum

Digital Immersive experience Spatial Model Analysis -- Taking Liao Chuan Intangible Cultural Heritage Digital Museum as an example. Liao Chuan Intangible Cultural Heritage Digital Museum is located in the courtyard of Liaoning University of Communication, No. 30, Shenbei Road, Shenbei New District, Liaoning Province. It is a typical display space design of digital museums in Liaoning Province. Three permanent exhibition halls, two temporary exhibition halls and one immersive activity space are planned on the third floor of the museum. The space layout is reasonable, and the exhibition hall theme is distinct and distinctive. All kinds of multimedia equipment, virtual reality and augmented reality are combined to create a strong atmosphere of intangible cultural heritage.

## 3.1. "Long Sreet Vientiane" Series Space Sequence

Serial space sequence is the common space combination method of intangible cultural heritage museums. The Spaces are connected in series one by one according to the "Long street" exhibition route. With clear spatial order and strong sense of direction, visitors can visit the exhibition halls one by one according to a certain tour route, which does not repeat, reverse or cross. Such a spatial combination is suitable for small-scale exhibition halls and strong continuity of intangible cultural heritage pavilions. "Elephant" is invisible and has infinite vitality, reflecting the diversity of exhibits

## 3.2. Digital Immersive Interactive Display Mode

The space design is based on digital technology to increase the decorative effect and interactivity. Taking the exhibition environment space of Liao Chuan Intangible cultural Heritage Museum as the

project background, media equipment, virtual reality, augmented reality, sensor network, power carrier technology, holographic projection and other digital technologies are applied to connect the exhibition elements of the intangible cultural heritage museum, so that visitors, museum buildings and exhibition elements can be harmonized, and visitors can carry out activities with the museum by touching the digital display screen. Obviously, digital technology has met the interactive needs of visitors in the new era.

Digital media equipment has replaced the traditional static display form and replaced the traditional monotonous information output with lively interactive means, enriching the exhibition space experience and interactive function, and establishing the direct connection between visitors and exhibits. Liao Chuan Intangible cultural Heritage Digital Museum is equipped with digital points everywhere, such as the touch-based electronic guide in the lobby on the first floor. After visitors select the target exhibition hall, the optimal route to the target exhibition hall can be displayed. Intangible cultural heritage digital display can watch video commentary; A QR code is designed beside each group of physical exhibits to provide online audio tour and exhibits.



Fig.2 Intangible cultural heritage digital museum exhibition space experience and interactive function virtual effect

### 3.3. Immersive "Scene Representation" Experience Mode

"Scene reproduction" is the most common form of exhibition in contemporary museums. Combining physical objects, projections, sound effects, etc., it simulates and reproduces scenes of historical or cultural life, which has a strong sense of substitution and has a strong display effect for creating the atmosphere of exhibition hall space. Liao Chuan Intangible cultural Heritage Digital Museum has been used many times in the design: in the design of intangible cultural heritage handicraft skills exhibition area, the process of making manual craft is restored, so that you can intuitively understand the craft without explanation; The traditional cultural exhibition area of intangible cultural heritage is designed according to various materials and colors, creating a solemn and mysterious atmosphere. The performing arts, etiquette and celebration exhibition area of intangible cultural heritage restores scenes of people's life and displays customs with intangible cultural heritage characteristics. The exhibition hall is full of cordial life atmosphere, and visitors have a strong sense of inclusion.

### 4. Digital Technology and Artistic Expression of Space Design

Digital technology plays an increasingly important role, which can be applied to all kinds of diversified space design systems to promote the innovation of space design patterns and quality improvement[1].The ultimate service objects and users of digital technology and space design are people. One end of human demand is connected with science and technology that can solve practical problems of space function, and the other end is connected with artistic creation that can solve aesthetic problems. Between them, a new carrier of artistic expression is formed through the combination of practice. In the process of space design and creation, it is necessary to balance the relationship between functionality and artistry, use modern science and technology and means to design artistic expression of space with strong functionality that meets people's actual needs, and create a comfortable and beautiful environment that meets aesthetics, so as to meet people's material

and spiritual needs.

## 4.1. Spatial Visual Image Design

The logo image and guidance system is able to carry out advertising and marketing communication through specific guidance techniques. Sign guide system can create a strong sense of space, not only can help people identify the space environment, but also can bring people visual enjoyment, can play the role of brand image management. Shake the world subvert the traditional thinking, with creative and material clever integration, to help you realize the brand value, to bring the best human experience.

The information visitors get and the environment atmosphere they feel in the exhibition space are all generated by human vision. Spatial modeling is the basis of visual image, and other elements exist on the basis of spatial modeling. Unified modeling elements can create spatial continuity and effectively guide visitors' activity routes[4].As a part of visual image, text and graphics are also important carriers to display spatial output information, such as introduction, annotation, interpretation, and an important part of the guide system. According to different themes of the exhibition space, different styles of fonts and graphics can be selected to echo the overall atmosphere of the space[2]. The combination and contrast of text graphics and other visual images can also form a good visual effect. Material and texture are the physical properties of display space and the basis and carrier of information display and output. The selection and combination of natural materials and modern industrial materials can create an unexpected visual effect.

## 4.2. Space "Light Environment" Design

As one of the important factors in the space environment, light acts on the retina by stimulating visual and non-visual channels, and directly or indirectly affects people's physical and mental health from the three dimensions of vision, psychological emotion and physiological rhythm. Exhibition space has become the core part of museum interior design, but its light environment design is often ignored, resulting in impaired spatial expression and poor visual experience.

Light environment and space are interdependent and complementary. Light environment is an important support for the display space to create atmosphere and highlight the effect. Reasonable arrangement of light and lighting helps to shape the space form, reflect the sense of space hierarchy, can highlight the materials and texture of space and exhibits, and lighting is one of the main ways to create space atmosphere and convey space emotion[3]. Different display needs should be matched with different lighting methods and intensity, in order to achieve the desired effect. Artificial lighting is divided into general lighting, local lighting and decorative lighting. General lighting is to the space uniform, unified, overall light; Local lighting is more purposeful than general lighting. It is the key lighting for an exhibit or exhibition area. Decorative lighting is to add some lighting on the basis of general lighting to create the atmosphere of the space[3].

## 5. Audience Behavior Pattern Promotes Functional Compound

Museums take physical objects as the media of knowledge transmission, which determines the unique mode of communication of museum education. Due to the difference of individual information receiving degree and different needs of visitors, different types of visitors will have different behaviors and activities in the same exhibition space. Therefore, it is necessary to analyze the visitors themselves, predict their behavior patterns, classify and interpret them, so as to realize the reasonable design of space. For example, visitors of different ages have very different behaviors and needs. Children and teenagers have weak ability to accept and understand information, so graphic, annotation and visual content should be added. The vision of the elderly has certain obstacles and limitations, the text size and lighting requirements are higher; People with disabilities have special needs for smooth passage, slope, height of showcase and perspective.[3].

With the change of social needs, the functions of museums are gradually socialized and marketized, expanding the functions of education, consumption, dining and so on. Some visitors come to the museum for a handicraft experience class, while others come specifically to buy

cultural and creative goods. Such visitors only use part of the museum's functions and space[3].In view of the different behaviors and demands of "visiting", "experiencing" and "consuming", more efficient spatial layout and activity routes should be planned, and multi-functional elastic space should be opened up to adapt to different activities and space renewal. In addition, the multi-function museum can provide a large number of public service facilities for the city, provide the public with cultural activities and consumption environment, and assist the city to carry out cultural and art education.

## 6. Conclusion

Intangible cultural heritage museums introduce virtual reality and other technologies to create immersive experience, but they still cannot be perfectly integrated with content immersion. The comprehensive application of information technology, psychology and journalism and communication can provide some solutions to change the status quo. In order for this space to conform to the trend of The Times and the development of The Times, it must be based on the mode of innovative space design, based on the design concept of information and interaction, based on the audience's communication, learning mode and other behavior patterns, and adopt the design methods such as serial space sequence and digital display mode. New technologies are used to create an immersive experience atmosphere for intangible cultural heritage museums, and innovations are constantly made to increase the space for communication experience. Both virtual reality and hologram technology can design interactive narrative systems from the point of view of the exhibits, creating a physical immersive space full of experience. Setting clear exhibition objectives, increasing the sense of ritual, providing immediate feedback, etc., can help visitors enter the immersive state of cognitive space, so as to achieve full immersion exhibition experience.

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