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Research on Jingdezhen Ceramic Culture Digitization

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Abstract: This paper analyzes the researches and practices of cultural digitization at home and abroad in the context of the all-round empowerment of digital technology. The research on cultural digitization abroad began in the middle and late 20th century and has entered the stage of extensive application since the beginning of the 21st century, with diversified research perspectives and an emphasis on interdisciplinary integration. Although the research on cultural digitization in China started relatively late, significant achievements have been made in recent years, mainly focusing on the digitization of cultural resources. Cultural digitization in China has gone through the stages of initial development and deep application. This paper focuses on Jingdezhen ceramic culture, whose digital communication has achieved remarkable results in aspects such as live stream, museum display, and database construction. These remarkable results include the expansion of the online market by live streaming bases, the immersive display by museums using new technologies, and the promotion of culture protection and research by databases.

1. Introduction

Under the comprehensive empowerment of digital technology, many fields such as digital museums, virtual exhibitions, databases, digital mapping, 3D reconstruction, and new media have effectively promoted cultural inheritance and innovation, achieving significant improvements. In 2012, the General Office of the Communist Party of China Central Committee and the General Office of the State Council issued the “Outline of the National Cultural Reform and Development Plan for the 12th Five Year Plan Period”, which clearly proposed the implementation of the “Cultural Digitization Construction Project”. The project covers three important tasks: digitization of cultural resources, digitization of cultural production, and digitization of cultural communication. The promulgation of this policy marks the official launch of cultural digitization as a national project. In this era, many traditional cultural fields have embarked on the path of digital development, and Jingdezhen ceramic culture is no exception. Jingdezhen ceramic culture, as an important representative of China’s excellent traditional culture, has a profound historical background and unique artistic charm. It has broad development prospects and enormous potential in the digital age. This study aims to investigate the current status of Jingdezhen ceramic culture digitization, and demonstrate the role of digital resources in the inheritance and innovation of Jingdezhen ceramic culture through case studies and empirical data. The study focuses on digital empowerment for international communication of Jingdezhen ceramic cultural tourism, and further

explores optimization strategies for the digitization of Jingdezhen ceramic culture and the international communication of Jingdezhen ceramic cultural tourism.

2. Related Work

In the mid to late 20th century, the field of cultural digitization mainly focused on the digital preservation and recording of cultural heritage and the application of digital media. For example, Japan established a record preservation system for intangible cultural heritage in the revised "Cultural Property Protection Law" in 1954; in the 1960s, France conducted a comprehensive survey of its cultural heritage and compiled a keyword index for directory queries; in 1976, the American Folklife Center at the Library of Congress was created to engage in digital preservation of American folk culture. Research works include Mark Poster's (1990) *Information Mode* which delves into the impact of information on contemporary society and culture, and provides important insights for understanding the process of cultural digitization; Nicholas Negroponte's (1995) *Being Digital* which explores in detail the impact of digital technology on social life [1]; David Hillman's (1998) *Multimedia: Technology & Applications* which covers the concepts, applications, and development trends of digital media technology [2].

Since the beginning of the 21st century, with the rapid development of digital photography, digital reproduction, virtual reality, and satellite remote sensing technology, the application fields of cultural digitization have continued to expand, and research perspectives have become increasingly diversified. The researches and practices of cultural digitization have entered a more in-depth and extensive stage. Scholars pay more attention to interdisciplinary integration and conduct in-depth research on cultural digitization from multiple perspectives such as computer science, art, archaeology, sociology, and communication studies. For example, in 2019, the Louvre collaborated with HTC VIVE Arts to launch its first virtual reality (VR) experience, *Mona Lisa: Beyond the Glass*, marking advanced technological application and immersive viewer experience of the Louvre. In 2021, Sahar N. Saleem and Zahi Hawass used advanced digital technology to conduct non-invasive research on mummies, successfully revealing detailed information such as the true face, age, and health status of Amenhotep I. Their research results were published in *Frontiers in Medicine* as a paper titled "Digital Unwrapping of the Mummy of King Amenhotep I Using CT". Scholars in the research field of cultural digitization include Fiona Cameron and Sarah Kenderdine, Manuel Castells, Ethan Watrall and Lynne Goldstein, etc. Fiona Cameron and Sarah Kenderdine (2007) explored the theoretical framework of digital cultural heritage in depth in their book *Theorizing Digital Cultural Heritage: A Critical Discourse*, which combines multiple practical cases and comprehensively analyzes the application of digital technology in cultural heritage protection and display [3]. Manuel Castells (2009) focuses on the concept of "network society" and deeply explores the impact of the information technology revolution on society, including its impact on international communication. He studied the global networking of cultural expression and the impact of new communication technologies upon cultural production and consumption [4]. Ethan Watrall and Lynne Goldstein (2022) explore the practical applications of digital methods in archaeological interpretation and analysis, museum collections and archives in their book *Digital Heritage and Archaeology in Practice: Presentation, Teaching, and Engagement* [5].

3. Cultural Digitization

The research on cultural digitization in China started relatively late, but in recent years, with the promotion of the national cultural digitization strategy and the development of digital technology, cultural digitization research has gradually received more attention from Chinese scholars and achieved a series of significant results. The research in this field mainly focuses on the digitization

of cultural resources, cultural communication, cultural tourism, and digital protection of cultural heritage.

3.1 Development Stage

In the initial stage of cultural digitization, domestic research mainly focuses on the introduction and application of digital technology. This stage of research mostly focuses on how to digitize traditional cultural resources for storage, dissemination, and display. For example, since the late 1990s, the Palace Museum has carried out a large amount of digitization work on cultural relics. In 2002, the first virtual reality work of the Palace Museum, "the Hall of Supreme Harmony", has officially been released. In 1998, National Digital Library of China began to use advanced digital technology to digitize various types of literature, such as ancient books and journals, for storage, retrieval, and dissemination. Research works in the field of cultural digitization include Zhou Mingquan, Geng Guohua, and Wu Zhongke's (2011) book *Digital Preservation Technology and Its Applications for Cultural Heritage*, which systematically summarizes new technologies and advancements in digital preservation of cultural heritage [6]. It introduces the technologies and methods used in digital preservation of cultural heritage from different perspectives. It covers the application of disciplines such as computer graphics, image processing, and virtual reality, and key technical frameworks and typical system applications such as digital modeling, virtual restoration, auxiliary management, and digital display. Yang Hong's (2014) *Research on the Digitization of Intangible Cultural Heritage* systematically reviews the digital practices of intangible cultural heritage at home and abroad, proposes a core metadata element set scheme for intangible cultural heritage digital resources, establishes a classification and coding system for intangible cultural heritage projects, and conducts fundamental research on the standard system for digital preservation and database construction of intangible cultural heritage [7].

3.2 Application Stage

In recent years, with the rapid development of artificial intelligence and virtual/augmented reality, the demand for the digital cultural market has continued to grow. The research of cultural digitization focuses on innovative applications of immersive experience technology, the integrated development of the digital culture industry, and the protection and inheritance of digital culture heritage. Wang Hong and Liu Suren's (2018) paper "Create the Situations and Narrative Story: the Immersive Interactive Experience of the Museum Culture with New Media Technology", Li Xuan and Shu Anqi's (2024) paper "Immersive Experience Design of Intelligent Museum from the Perspective of Interactive Narrative" both focus on the innovative application of immersive experience technology in museums or exhibitions [8][9]. The specific application practices are diverse, such as "Digital Treasure House" and "VR Forbidden City" of the Palace Museum, "VR Elf-guided Tour" of Jinsha Site Museum, "Digital Museum" of Jingdezhen China Ceramics Museum, "Travel in Yunnan with One Mobile Phone" tourism smart platform in Yunnan Province, "Hangzhou Digital Tourism" mini-program service platform in Hangzhou City, the smart display sand table project of Xi'an City Wall, the monitoring and early warning platform for the cultural heritage of Lijiang Ancient City, and so on. These practical application cases fully demonstrate the latest achievements of China's cultural digitization in aspects such as immersive experience, industrial integration and cultural heritage protection, and also truly reflect the crucial role of digital technology in promoting the development of the cultural industry.

4. Digital Communication of Jingdezhen Ceramic Culture

Due to the vigorous development of the Internet, the deep integration of digital technology and ceramic culture industry, and the introduction of various favorable policies, the digital communication of Jingdezhen ceramic culture has made remarkable achievements in recent years.

4.1 Live Streaming Digital Communication

The rapid rise of e-commerce platforms, the prevalence of various social media platforms, and tax incentives for e-commerce enterprises have jointly promoted Jingdezhen ceramic industry to move towards a sales model that combines online and offline. In 2020, Ceramic Art Avenue LIVE live streaming base was officially established in Jingdezhen, providing a series of live streaming operation services and preferential policies for enterprises and merchants who settle in the base, such as free rent, free training fees, etc [10]. As of 2023, the total number of enterprises and merchants who have settled in Jingdezhen Ceramic Art Avenue LIVE live streaming base has exceeded 6000. At the same time, the total amount of commodity transactions at Jingdezhen Ceramic Art Avenue LIVE live streaming base has been increasing year by year, rising from 3.067 billion yuan in 2021 to 5.76 billion yuan in 2022 [11]. The establishment and development of Jingdezhen Ceramic Art Avenue LIVE live streaming base, Kwai Jingdezhen Innovation and Development Center, and "National Porcelain Museum·Tmall live streaming base" have expanded the online market of Jingdezhen ceramic products and promoted the digital communication of Jingdezhen ceramic culture. In live streaming and short videos of Jingdezhen ceramic products, most live streamers or video bloggers will provide detailed introductions to the production process of Jingdezhen ceramic works, from drawing and shaping to painting and firing, allowing people to intuitively feel the exquisite craftsmanship and unique charm of Jingdezhen ceramic production. They not only showcase the inheritance of traditional craftsmanship, but also share modern innovative design concepts, allowing the audience to understand the development and innovation of Jingdezhen ceramic culture in the changing times. The interactive part of live streams and the comment section of short videos have greatly promoted the digital communication of Jingdezhen ceramic culture. Viewers can ask questions at any time and communicate with live streamers or video bloggers about the historical origins, culture, and collection value of Jingdezhen ceramic works. Ceramic artists and craftsmen in Jingdezhen have more opportunities to showcase themselves through live streams and short videos. They tell their stories with ceramics, share their inspirations and insights during the creation process, and let audiences feel the humane sentiments behind ceramic works. At the same time, various creative short videos showcase Jingdezhen ceramics in interesting and innovative ways, attracting more attention and love from young people, injecting new vitality into the inheritance of ceramic culture. These live streams and short videos transcend geographical limitations, conveying Jingdezhen ceramic culture to every corner of the world, allowing more people to appreciate the profoundness of Chinese ceramic culture, and further enhancing the influence and popularity of Jingdezhen ceramic culture.

4.2 Museum Digital Communication

More and more museums are using the latest digital methods to showcase Jingdezhen ceramic treasures and spread Jingdezhen ceramic culture. In April 2024, Jingdezhen China Ceramics Museum held "Chinese Ceramics on Light and Shadow - Immersive Digital Light and Shadow Exhibition". The exhibition uses 3D visual technology, AI interactive technology, and virtual reality technology to allow visitors to immerse themselves in digital ceramic treasures and experience ceramic culture. Jingdezhen China Ceramics Museum has digitized the precious ceramic works,

established a database for managing their information, and set up large intelligent touch screens and electronic display screens to display their information. It has also turned temporary exhibitions into AR online exhibitions, allowing more people to view without being limited by time and space. In 2022, the museum received over 60 million online visitors through various methods such as its digital museum, live streams, and digital exhibitions, and won "2022 World VR Industry Conference VR/AR Annual Innovation Award". In 2023, Jingdezhen Imperial Kiln Museum used digital technology to showcase the imperial kiln of the late Qing Dynasty and various ceramic scenes in Taoyang Alley in the special exhibition area of "Imperial Kiln Universe·Mystery of Blue and White". Jingdezhen Heritage of Ceramic Industry Museum uses black and white individual photos from the electronic archives of ceramic workers in Jingdezhen to create "potters' profiles". The digitization of museums can break the limitations of time and space, enhance interactive experiences, enrich display forms, improve communication efficiency, attract young audiences, and facilitate data management of cultural relics. In terms of digital display, the subtle details of ceramic artifacts are clearly displayed through high-definition images and 3D modeling. Whether it is the exquisite patterns on porcelain or the unique design, they can be fully displayed on the digital platform. For example, a close-up display of the complex intertwining patterns on blue and white porcelain allows the audience to appreciate the exquisite craftsmanship. Meanwhile, digital communication also focuses on telling the stories behind ceramics. By utilizing multimedia technology, the historical background, production techniques, and inheritance of cultural relics are presented to the audience in a vivid and interesting way. For example, through animated short films, the entire production process of a precious ceramic work from clay to finished product can be displayed, allowing the audience to understand the hardships and wisdom.

4.3 Database Digital Communication

The digital communication of databases provides strong support for the protection and research of Jingdezhen ceramic culture. By collecting detailed information on ceramic cultural relics, including their date, material, technology, pattern, etc., a comprehensive and accurate database is constructed. Jingdezhen Ancient Ceramic Gene Bank was established in 2022. It is a database of ancient ceramic specimen information and knowledge graph, collecting "8+X" digital information of more than 20 million ancient ceramic specimens, including "archaeological information fragments", "material technology fragments", "glaze technology fragments", "firing process fragments", "painted decoration fragments" and other digital information. It also includes related overseas archaeological discoveries, academic research results and other extended information. With the help of the Internet platform, these databases are open to the world, so that people around the world can understand the charm of Jingdezhen ceramic culture. No matter where people are, they can appreciate precious Jingdezhen ceramic antiques through online databases and obtain professional interpretations and introductions. In addition, databases can be combined with technologies such as virtual reality and augmented reality to create an immersive experience for database visitors. People can use VR devices to immerse themselves in Jingdezhen ancient kilns and witness the process of ceramic production firsthand. This immersive experience undoubtedly greatly enhances their interest and understanding of ceramic culture. Meanwhile, the digital communication of databases has greatly promoted the development of ceramic academic research. Scholars can easily access a large amount of ceramic cultural relics information in the database for cross-temporal and cross-regional comparison and analysis. Scholars can study the style evolution of Jingdezhen ceramics in different periods by comprehensively comparing ceramic samples from various eras in the database, and clearly see the development trend from the simple and elegant style of the Song Dynasty to the gorgeous and complex style of the Ming and Qing Dynasties. It is

also possible to explore the dissemination and influence of Jingdezhen ceramics at home and abroad by comparing with ceramic databases in other regions, and discover the inspiration and reference of Jingdezhen ceramic technology for ceramic production in surrounding areas and overseas.

5. Conclusions

Digital technology has brought unprecedented opportunities for the inheritance and innovation of Jingdezhen ceramic culture. Live streams have expanded the online market of Jingdezhen ceramic products and promoted the international communication of ceramic culture. The digital communication of museums has enhanced the immersive experience and spread of ceramic culture through the application of various digital technologies. The digital communication of databases has provided strong support for the protection and research of ceramic culture. However, there are still some challenges and areas for improvement. For example, the quality and standardization of live streaming content need to be further enhanced, the digital technology application in museums needs to be continuously optimized to better meet the needs of visitors, and the databases need to further expand its functions and improve its accessibility. Overall, the digitization of Jingdezhen ceramic culture is an important trend, and we need to continuously promote and improve it to make Jingdezhen ceramic culture shine more brightly in the digital age.

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