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# Empowering the Innovative Transformation and Communication of Liangzhu Cultural Heritage with Digital Intelligence

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**Abstract:** Against the backdrop of China’s advancing national strategy for cultural digitization, Liangzhu Culture, as a key piece of evidence supporting the 5,000-year history of Chinese civilization, faces both opportunities and challenges in its innovative transformation and communication through technology. Based on field research, questionnaire surveys, and in-depth interviews, this study systematically examines the current state and key characteristics of digital communication practices related to Liangzhu Culture. It identifies major problems such as the superficial integration of technology, uneven communication coverage, and lack of innovation in cultural products. The paper proposes a four-dimensional optimization pathway—integrating technology and culture, linking online and offline platforms, driving industrial innovation, and fostering social collaboration. This framework aims to provide theoretical references and practical models for the digital preservation and communication of cultural heritage.

**Keywords:** Liangzhu Culture; Digital Empowerment; Cultural Heritage; Innovative Transformation; Communication Pathways

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**Online publication:** November 26, 2025

## 1. Introduction

In 2019, the inclusion of the Archaeological Ruins of Liangzhu City on the UNESCO World Heritage List marked international recognition of this site as evidence of the origins of Chinese civilization. Following this, China has introduced key policies such as the Guidelines on Advancing the National Cultural Digitization Strategy, building a systematic framework that supports the digital transformation of cultural heritage through top-level design, technological support, public services, and industrial integration. At the same time, rapid advances in digital technologies—such as artificial intelligence and virtual reality—are reshaping how culture is produced and shared, enabling a shift from static preservation to dynamic transmission. This is especially relevant for Generation Z, whose preferences for immersive and participatory experiences are driving innovation in cultural communication. In this context, using digital tools to promote the transformation and broader communication of Liangzhu Culture has become an important task in supporting China’s cultural development and enhancing confidence in its civilization. Theoretically, this paper proposes a dual-dimensional model driven by both technology and society to explore the digital communication of cultural heritage, aiming to enrich

research on the digital expression of China's civilizational symbols. Practically, by focusing on real-world challenges in the digital communication of Liangzhu Culture, this study analyzes limiting factors and proposes targeted strategies to improve communication effectiveness and international influence, offering a reference for other heritage sites. To address these issues systematically, this study adopts a mixed-method approach including field observations at key sites such as the Liangzhu Archaeological Site Park, semi-structured interviews with cultural workers, technology developers, and tourists, a questionnaire survey of 400 participants analyzed using SPSS, and literature analysis of relevant policies and academic studies<sup>[1]</sup>.

## **2. Current state and key characteristics of digital communication of liangzhu culture**

### **2.1. A foundation driven by policy and technology**

With the national cultural digitization strategy progressing, the preservation and communication of Liangzhu Heritage have developed through a combination of policy guidance and technological innovation. On one hand, national top-level design provides institutional support for cultural heritage digitization. On the other hand, it has encouraged site management authorities to actively introduce digital technologies and explore new models for heritage protection and communication.

Existing research shows that the application of digital technologies can improve the scientific management of large archaeological sites and enhance the visual and interactive quality of cultural displays. Applied to Liangzhu, this is evident in two main areas. First, in site protection, Liangzhu is gradually building a digital monitoring system. Second, in presentation and communication, technologies such as VR and AR are used for site displays<sup>[2]</sup>.

Overall, the combination of policy support and technological application has laid a foundation for integrating digital preservation and digital presentation of Liangzhu Culture.

### **2.2. A diverse and multi-layered communication matrix**

With the development of digital technology, Liangzhu Culture has gradually formed a communication system that integrates physical spaces, online platforms, and cross-sector collaboration.

Offline, the Liangzhu Archaeological Site Park and the Liangzhu Museum serve as key communication spaces, offering interactive exhibits, archaeological simulation experiences, and themed displays that engage visitors in participatory learning about Liangzhu civilization. Online, Liangzhu Culture reaches broader audiences through official websites, WeChat public accounts, and short-video platforms, featuring cloud exhibitions and virtual guided tours that transcend time and space limitations.

In addition, Liangzhu Culture has expanded its communication channels through cross-sector collaboration. A typical example is "Congcong," one of the mascots of the Hangzhou Asian Games, whose design was inspired by the Liangzhu jade cong. This brought Liangzhu cultural elements into the context of an international sporting event.

### **2.3. Positive feedback in audience recognition and communication impact**

Survey results indicate that the public generally holds a positive view of Liangzhu Culture and its digital communication methods. Most respondents recognize the historical significance of Liangzhu and support the use of digital tools to expand its reach.

In terms of audience composition, the majority of participants in digital experiences are young people aged 18–25 and those with higher education levels, accounting for 73.25% of the sample. This group is more receptive to new technologies and more likely to engage with cultural content through digital media.

Correlation analysis reveals a strong positive relationship between audience awareness, digital experience perception, and cultural identity, with a correlation coefficient of 0.763. In other words, when digital presentations offer more authentic and immersive experiences, users' emotional connection to Liangzhu Culture deepens. Therefore, digital technologies not only broaden the reach of cultural communication but also strengthen public understanding and identification with cultural

heritage<sup>[3]</sup>.

### 3. Key problems in the digital communication of liangzhu culture

#### 3.1. Superficial integration of technology and culture

Currently, the integration of technology and cultural content in the digital communication of Liangzhu remains at a relatively superficial stage. Most digital applications still focus on technological spectacle, emphasizing form over substance, and fail to achieve deep integration between the two.

At the hardware level, issues such as the weight of AR glasses causing user fatigue, incomplete information and lag in virtual tour systems, and inaccurate digital positioning in field sites negatively affect the user experience.

At the interaction design level, most features are limited to basic operations like clicking or answering simple questions. These lack immersive or in-depth forms of participation, making it difficult for users to truly perceive the cultural depth of Liangzhu.

In terms of user feedback, the lack of emotional appeal in digital displays is a core issue, with a mean score of 3.65 and a standard deviation of 1.05. Many respondents feel that some digital exhibits overemphasize technological effects, which weakens the expression of cultural content and fails to achieve the core goal of using technology to empower cultural communication.

#### 3.2. Uneven communication coverage and limited reach

The coverage and reach of digital communication for Liangzhu Culture also show clear shortcomings, with significant localization and segmentation characteristics.

In terms of geographical distribution, over 80% of the audience comes from Hangzhou and the surrounding Jiangsu-Zhejiang-Shanghai region. Efforts to reach audiences outside these areas are relatively weak. International communication still relies mainly on traditional academic exchanges and offline exhibitions, meaning the global advantages of digital communication have not been fully realized<sup>[4]</sup>.

In terms of audience structure, there is a clear digital divide. Middle-aged and elderly groups, as well as those with lower education levels, have very low participation rates. This indicates that current digital communication formats cannot adapt to the preferences of audiences with different ages and knowledge backgrounds. Online communication also suffers from a “wine sells itself” problem—good content fails to reach its audience. For example, awareness of the VR function on the Liangzhu Museum’s official website is below 15%, and the actual usage rate of the virtual tour feature on its WeChat mini-program is far lower than that of offline experiences. This suggests that the effectiveness of digital communication channels has not been fully realized.

#### 3.3. Lack of innovation in cultural and creative product development

The development of digital cultural and creative products based on Liangzhu Culture also shows clear deficiencies in innovation, making it difficult to meet the market’s demand for diverse, high-quality offerings.

In terms of product design, there is a serious problem of homogeneity. Most cultural products simply replicate or combine classic cultural elements such as the jade cong or the divine emblem, without deeply deconstructing, refining, or modernizing Liangzhu’s cultural genes. Some products even have design flaws that reflect a superficial approach, resulting in rigid cultural expression.

In terms of development mechanisms, there is a clear pattern of extensive management. Many museums rely on third-party developers for product creation but lack strong oversight or market research, leading to a disconnect between products and market demands.

In terms of market performance, although over 600 cultural products related to Liangzhu are currently on the market, with annual sales exceeding 300 million yuan, truly influential bestsellers are rare. The added value and distinctiveness of

these products remain low, and international market penetration is minimal. This limits the potential of cultural products to promote Liangzhu Culture globally.

## **4. Pathways for innovation in digital communication of liangzhu culture**

### **4.1. Building a communication system that deeply integrates technology and culture**

Digital communication of Liangzhu Culture should focus on cultural authenticity and promote the transformation of technology from surface-level presentation to value-driven empowerment. On one hand, technological tools need improvement—reducing the weight of AR/VR devices and enhancing the information completeness and loading speed of digital guides. On the other hand, a core digital symbol library of Liangzhu Culture should be built. Generative AI can be used to intelligently derive patterns and algorithmically reconstruct mythological narratives, enabling AI-assisted cultural product design and immersive interactive experiences such as theatrical performances. At the same time, attention should be paid to human details in scenes such as ancient ancestors' labor and rituals. Digital twin technology can be used to recreate lifelike scenes that enhance emotional resonance among audiences.

### **4.2. Building an integrated online-offline digital communication matrix**

At the offline level, digital facilities at the site park and museum should be upgraded. This includes introducing AI-assisted artifact restoration display systems and 3D-printed artifact replication experience projects, as well as creating interactive scenes such as immersive theatrical performances and digital cultural workshops. Local cultural tourism resources should be integrated to form a Liangzhu cultural digital experience zone, enhancing the quality of offline experiences. At the online level, content should be tailored to the characteristics of different platforms—short educational videos on Douyin and Xiaohongshu, community-building content on WeChat and Weibo. A Liangzhu metaverse platform and online digital museum should be built simultaneously, enabling virtual tours of the ancient city and interactions with digital artifacts. Big data analytics can be used to capture audience preferences, enable targeted content push, and track communication trajectories and feedback in real time.

### **4.3. Promoting innovative development of digital cultural products**

Cultural and creative products are important carriers for the digital communication of Liangzhu Culture. A full-chain development mechanism should be established—from archaeological research to design transformation and industrial linkage. By deeply exploring Liangzhu's cultural connotations, a core color and pattern gene pool can be built. Parametric modeling and generative AI can be used to modernize cultural elements. Cross-sector integration of cultural products with cultural tourism, education, and fashion industries should be promoted. Personalized customized products should be developed to further enhance product competitiveness and integrate Liangzhu Culture into daily life.

## **Funding**

Program Project: Application for the 2025 College Students' Innovation and Entrepreneurship Training.

Project Name: "Cong" Ancient "Intelligence" Present: Exploring the Innovative Transformation and Dissemination Path of Liangzhu Cultural Heritage Empowered by Digital Intelligence

Project Number: S202510346002

## **Disclosure statement**

The author declares no conflict of interest.

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