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A STUDY OF COMMUNICATION FOR MAINTENANCE: A CASE OF SHANGHAI PORCELAIN ART INTANGIBLE CULTURAL HERITAGE

UM ESTUDO SOBRE COMUNICAÇÃO PARA MANUTENÇÃO: O CASO DA PORCELANA DE XANGAI, PATRIMÓNIO CULTURAL IMATERIAL

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Abstract
Conservation and dissemination of intangible cultural heritage (ICH) is becoming a more critical issue in the globalization and digital revolution. The case of Shanghai Porcelain Art, which is a distinct urban handicraft that combines the classical Chinese porcelain production with the aesthetics of Shanghai and a lack of interactions with the public, is explained by the limited communication possibilities and underuse of digital resources. This paper discusses the aspects of the spread of Shanghai Porcelain Art and also analyzes how digital technologies and especially virtual reality (VR) can be used to enhance the inheritance and cultural transmission of heritage. The study adopted a quantitative research design with 350 stakeholders, including inheritors, artists, cultural practitioners, students and other persons as the general population using an integrated approach with uses and Gratifications Theory, Technology Acceptance Model and immersion-based digital heritage theory. Data was analysed through descriptive statistics, correlation, regression, and mediation analyses. The results show that there exists the substantial positive correlation between digital mode of transmission and the influence of heritage of effect of Shanghai Porcelain Art ($\beta = 0.68$, $p < 0.001$, $R2 = 0.46$). The inheritance effect, in its turn, is the one that makes a strong prediction of Shanghai culture dissemination ($\beta = 0.74$, $p < 0.001$, $R2 = 0.55$). The mediation analysis proved the existence of a partially mediating effect of the relationship between digital tools and cultural dissemination, (indirect effect = 0.55, 95% CI [0.45, 0.65], $p < 0.001$). The theoretical contribution of the study is its relation between the immersive digital technologies and heritage

Resumo
A conservação e a divulgação do patrimônio cultural imaterial (PCI) estão se tornando uma questão cada vez mais crítica na era da globalização e da revolução digital. O caso da arte da porcelana de Xangai, um artesanato urbano distinto que combina a produção clássica de porcelana chinesa com a estética de Xangai e a falta de interação com o público, é explicado pelas possibilidades limitadas de comunicação e pelo subaproveitamento dos recursos digitais. Este artigo discute os aspectos da difusão da Arte da Porcelana de Xangai e também analisa como as tecnologias digitais e, especialmente, a realidade virtual (RV) podem ser usadas para melhorar a herança e a transmissão cultural do patrimônio. O estudo adotou um projeto de pesquisa quantitativa com 350 partes interessadas, incluindo herdeiros, artistas, profissionais da cultura, estudantes e outras pessoas como população geral, usando uma abordagem integrada com a Teoria dos Usos e Gratificações, o Modelo de Aceitação da Tecnologia e a teoria do patrimônio digital baseada na imersão. Os dados foram analisados por meio de estatísticas descritivas, correlação, regressão e análises de mediação. Os resultados mostram que existe uma correlação positiva substancial entre o modo digital de transmissão e a influência do efeito do patrimônio da Arte da Porcelana de Xangai ($\beta = 0,68$, $p < 0,001$, $R2 = 0,46$). O efeito de herança, por sua vez, é o que faz uma forte previsão da disseminação da cultura de Xangai ($\beta = 0,74$, $p < 0,001$, $R2 = 0,55$). A análise de mediação comprovou a existência de um efeito parcialmente mediador da relação entre ferramentas digitais e disseminação cultural (efeito indireto = 0,55, IC 95% [0,45, 0,65], $p < 0,001$). A contribuição

learning and cultural dissemination and its practical contribution in instructing policymakers, cultural institutions, and educators in the development of VR-based platforms to transmit heritage sustainably. Digital technologies therefore contribute to deep learning as well as active cultural involvement, which will strengthen the succession and overall promotion of Shanghai Porcelain Art.

Keywords: Intangible Cultural Heritage, Shanghai Porcelain Art, Digital Dissemination, Virtual Reality (VR), Heritage Inheritance.

teórica do estudo é sua relação entre as tecnologias digitais imersivas e o aprendizado do patrimônio e a disseminação cultural, e sua contribuição prática na orientação de formuladores de políticas, instituições culturais e educadores no desenvolvimento de plataformas baseadas em RV para transmitir o patrimônio de forma sustentável. As tecnologias digitais, portanto, contribuem para o aprendizado profundo, bem como para o envolvimento cultural ativo, o que fortalecerá a sucessão e a promoção geral da Arte da Porcelana de Xangai.

Palavras-chave: *Patrimônio Cultural Imaterial. Arte da Porcelana de Xangai. Divulgação Digital. Realidade Virtual (RV). Herança Cultural.*

1 INTRODUCTION

Intangible Cultural Heritage (ICH) has emerged as the focused area of scholarly inquiry and cultural policy due to its important role in structuring community life and strengthening the social fabric inclusively by cultivating cultural identity, sense of belongingness, social cohesion, and maintaining social connections (Daykin *et al*., 2021; Tavares *et al*., 2021). As outlined by UNESCO, intangible cultural heritage refers to the collective practices, specialized knowledge, skills, and creative expressions of a group. This concept includes both the non-physical traditions and the physical objects or spaces that communities identify as fundamental to their heritage (UNESCO, 2003).

Unlike tangible heritage, which includes physical artifacts, ICH focuses on dynamic and living customs, and includes craftsmanship, performing arts, social practices, and traditional knowledge. These cultural manifestations contain centuries of human creativity and intergenerational memory, and contribute importantly to building cultural self-confidence and continuity between generations. With the challenges of globalization, modernization, and digitization facing classic types of inheritance, the protection and transmission of ICH have become more and more a global concern (Xiao *et al*., 2024).

China, the country of huge depository of ICH, is the country that has listed more items on the ICH list of UNESCOS than any other country, which speaks of the richness and variety of its traditional culture. This national richness increases the chances and the

difficulties of protection of the practices such as traditional crafts, ceremonies and artistic expressions. Shanghai Porcelain Art an urban artistic tradition fusing porcelain artistry with the cosmopolitanism of Shanghai is a unique way in which ICH can hold a vast amount of cultural importance. The Shanghai Porcelain, based on the modernity of the city in the twentieth century and enhanced by the local artisan culture, is a combination of literati painting and ceramic workmanship aimed at creating objects that should be not only practical but also expressive. It is an embodiment of the amalgamation of the regional identity, artistic creativity and the modernity of the culture. Nevertheless, even with its historical significance and aesthetic inimitable nature, Shanghai Porcelain Art is being limited in terms of reaching the general population and the waning interest of people in this communication form due to the constraints of traditional communication methods. When trying to pass this legacy, there has been a demographic change, absence of digital engagement strategies and limited avenues to holistic cultural communication.

Historically the heritage of arts such as Shanghai Porcelain has depended on master apprentice systems, localized exhibitions and community practices. Although these modes help in the transfer and hands-on learning, they are limited by geographical and time constraints. The digital medium has challenged the traditional medium to capture long-term attention or engagement as younger audiences are more and more seeking culturally interesting experiences on digital platforms. These issues have made most of the traditional heritages peripheral to the mainstream cultural discourse, especially among digitally native individuals. In addition, the lack of access by the population to the more experiential elements of craftsmanship creates less awareness and appreciation of the rich cultural connotations that lie behind ICH practices (Jin, 2025).

New digital technologies, specifically virtual reality (VR), augmented reality (AR), and multimedia, are transformational in nature to address these limitations. The technologies are immersive, interactive and scalable to enable the audience to experience cultural heritage even across physical dimensions. Considering the examples, VR allows users to enter simulated craft workshop, see the details of the complex process of making porcelain, and experience cultural tales in a way that cannot be presented by traditional exhibitions (Zhu & Azahari, 2024). Besides, online interfaces like virtual interactive spaces and panoramic displays are also proven to promote the involvement of more people and knowledge of ICH through the establishment of a deeper connection with craft, history, and artistic expression (Su & Ismail, 2024).

There is a growing educational literature that highlights the imperative to build digital solutions into the heritage preservation plans. Recent studies emphasize that VR and AR do not only make the vision clearer, but they also act as a means of perpetuating cultural learning and engagement between generations (Li *et al*., 2024). Nevertheless, critics observe that electronic interventions are prone to the erosion of complex cultural connotations into entertainment unless authenticity and situational richness is upheld. One of the main issues in digital heritage communication is to balance between immersion and cultural fidelity. This is in line with the larger discussions surrounding cultural studies that the digital modes can change cultural context and can lead to a superficial encounter unless well-crafted (Jin, 2025).

In addition to technical design, engaging the audience through dissemination demands knowledge of the audience motivation, usability perception and cultural expectations. The studies based on frameworks like the Technology Acceptance Model (TAM) and uses and Gratifications theory show that the perceived usefulness, ease of use, immersion, and authenticity are the factors that significantly impact the willingness of users to utilize the digital heritage platforms. Empirical research in recent years has demonstrated that these aspects simultaneously influence continuance intentions to VR heritage games and digital experiences, and it should be emphasized that user-centered design is a crucial consideration in heritage communication (Hu *et al*., 2024; Park and Kim, 2021). Moreover, dissemination effects can be aggravated by incorporating digital media with social sharing platforms using cultural narratives which can appeal to the contemporary audiences and boost cultural self-confidence (Xiao *et al*., 2024).

Against the backdrop of the Shanghai Porcelain Art, this paper explores the most critical aspects of dissemination and critically analyzes the influence of digital technologies, especially VR, on the improvement of heritage communication.

It answers three fundamental research questions: (1) What are the key determinants of the dissemination effect of Shanghai Porcelain Art? (2) What are the effective ways to preserve and share its intangible heritage by using digital means? (3) What is the means of assessing the performance of VR technologies in heritage dissemination?

Furthermore this study aims to (1) to identify factors influencing Shanghai Porcelain Art dissemination (2) to examine the effective digital protection and dissemination pathways and (3) to assess VR based digital dissemination systems.

Through theoretical investigation and empirical research, this research paper aims at making a contribution to the burgeoning research area of the communication of digital cultural heritage to ensure the results are informative to those involved both in the research community and the practice of preserving and disseminating ICH.

2 THEORETICAL FRAMEWORK

The current paper assumes an interdisciplinary theoretical framework to study the spread and the digital conservation of Shanghai Porcelain Art as an intangible cultural heritage (ICH). The framework is based mostly on Uses and Gratifications Theory (U&G), Technology Acceptance Model (TAM), and on the theory of digital heritage communication along with the concepts of immersion and experience theory. Combined, these theories describe the ways audiences engage with digital heritage sites, ways in which the perceptions of technology can affect people to adopt it, and the effects of immersive communication on the transmission and preservation of ICH.

2.1 Uses and gratifications theory

The uses and gratifications (U&G) theory stated that in order meet needs and to and provide satisfaction, it is necessary to focus on mass media content. The most important tenets of this theory are that users are active, selective, and motivated to use a particular media. Therefore U&G theory brings in a user-centered perspective of the diverse socio-psychological gratifications and a source of information acquisition. However, unlike the models of passive reception, U&G places an emphasis on individual motivation and choice of media as the primary factor of communication success (Ruggieri, 2020). Due to its contextual applicability in the ICH dissemination, U&G can be applied to the study to understand the reasons that audiences deciding to be involved or not be involved in digital heritage content.

The recent research using U&G to digital cultural communication indicates that the users engage with the heritage sites to meet cognitive (learning about history and craftsmanship), affective (aesthetic pleasure and emotional resonance), and identity-related (cultural belonging and pride) needs (Xiao *et al*., 2024). In the case of Shanghai Porcelain Art, these gratifications can be better achieved through digital means like virtual

exhibitions, interactive storytelling as opposed to traditional exhibitions because of the ability to create rich visual content, narrative content, and interactive experiences. To this end, it can be argued that the U&G theory underpins the assumption that the greater the audience gratification will be, the more powerful the engagement, the better the understanding, and the greater the dissemination effects.

2.2 Technology Acceptance Model

Although U&G explains the reasons why audiences want to have media experiences, Technology Acceptance Model (TAM) explicates how and why users may adopt particular technologies. Perceived usefulness and perceived ease of use are the two primary determinants of individuals' attitudes toward technology and pivotal in influencing information system (IS) acceptance behavior. which subsequently influence behavioral intention and actual usage (Davis, 1989). TAM has been a very common instrument in digital heritage studies to evaluate the public acceptance of virtual museums, VR exhibitions, and interactive cultural platforms.

The recent empirical studies affirm that TAM is still very relevant in the cultural heritage situation. According to Chen and Wang (2021), the perceived usefulness in the form of enhanced awareness of cultural materials and the perceived ease of use were significantly associated with the willingness of the users to use digital heritage. In a similar manner, Li *et al*. (2024) showed that convenience of navigation and the design of the interface as easy to use directly increased the level of immersion and continuance intention of users in VR museums.

TAM can be applied in this research to assess the online marketing of the Shanghai Porcelain Art using virtual reality technology. In case users feel VR, platforms are useful in learning about porcelain craftsmanship and can be easily used, they will embrace the technologies. This adoption in turn enhances the inheritance effect of the intangible culture which directly substantiates Hypothesis 1 which states that digital means have a positive impact on the inheritance of Shanghai Porcelain Art.

2.3 Digital heritage communication theory

Digital heritage theory of communication highlights the processes of encoding, transmission, and decoding cultural meanings by digital media. In contrast to traditional means of communication, digital media enable multimodal representation, interactivity and real transmission, redefining the communication and perception of cultural heritage (Cheng and Wu, 2023). In this light, the successful dissemination of ICH lies in factors that are beyond just the availability of technology, but also the design of stories, symbolism and engagement of users.

The Shanghai Porcelain Art is full of symbolic meaning including techniques of craftsmanship, artistic aesthetics and urban culture identity. These symbols can be recreated using digital media particularly VR that allows users to feel the production processes, historical contexts, and artistic stories in immersive settings at the same time. Studies indicate that this type of immersive communication increases cognitive processes and emotional reactions and results in greater cultural understanding (Sun and Zhang, 2024). Digital heritage communication theory, therefore, proposes the way that digitalization alters the conventional cultural artifacts into digital, and, at the same time, entertaining forms.

2.4 Immersion and experience theory

The immersion theory also contributes to the framework as it deals with the effects of the depth of experience on learning and engagement. Immersion is the state of mind when users are engrossed in a mediated environment and are usually accompanied by an increase in attention and emotional engagement (Slater, 2020). Research shows that immersive VR settings can greatly increase the ability to memorize, learn motivation, and cultural empathy in the context of heritage (Park & Kim, 2021).

According to recent studies on digital ICH dissemination, immersion is a mediator variable between the use of technology and communication effects. Li *et al*. (2022) established that the immersive VR experiences had a significant positive impact on perceived authenticity and emotional attachment of the users to the intangible heritage. In the paper, immersion is deemed as one of the central processes that make digital tools

contribute to the preservation of Shanghai Porcelain Art and the general spread of Shanghai culture that connects Hypothesis 1 to Hypothesis 2.

2.5 Integrated framework and hypotheses linkage

This paper combines U&G, TAM, digital heritage communication theory, and immersion theory, thus creating a broad framework of digital dissemination of ICH. Audience motivations (U&G) describe the intentions to engage, technology perceptions (TAM) describe the intention to adopt and immersive communication describes the process of the effective transmission of a cultural meaning.

In this context, digital capabilities (e.g. VR technology) are used to create the effect of usability, engagement and immersion that have an impact on the inheritance effect of Shanghai Porcelain Art. Better heritage, in turn, adds to the broader spread of Shanghai culture and creates an intermediary route, which aligns with the hypotheses of the study. This combined strategy is consistent with modern research that focuses on user-oriented, technology-based, and experience-based frameworks of digital cultural heritage sharing (Su and Ismail, 2024; Xiao *et al*., 2024).

3 LITERATURE REVIEW

3.1 Digital transformation of Intangible Cultural Heritage

The concept of Intangible Cultural Heritage (ICH) is familiar as one of the stores of historical memory, cultural identity, and artistic manifestations, yet this storage, along with its preservation and distribution, is particularly problematic in the modern age because of the technological, social, and generational shifts (Xiao *et al*., 2024; Yu and Liao, 2025). Conventional approaches like master-apprentice learning live demonstrations and physical displays tend to be constrained by geographical and time factors which lead to the diminishing attention of the people, especially of the younger generations (Yu & Liao, 2025). That has given rise to an increasing amount of research on the necessity of digital solutions to make ICH more accessible, interactive, and long-term viable (Feng, 2024; Wang, 2025).

The contemporary research highlights that digital technologies may be used in two capacities in ICH preservation: as documentation tools and dissemination platforms (Feng, 2024). As an example, the 3 D scanning, virtual archives, and multimedia recordings make it possible to record intangible practices and craft techniques, whereas augmented reality (AR) and virtual reality (VR) allow creating an experience that is immersive and interactive and fills the gap between physical heritage and virtual viewers.

Virtual platforms enhancing access and sustained involvement to ICH content, allowing users to engage with cultural practices regardless of location, and helps in fostering cultural heritage education through digital platforms (He & Kosenko, 2024).

2.2 Immersive and Interactive Technologies for ICH

One of the new technologies that have attracted so much attention now is virtual reality (VR) and augmented reality (AR). The two technologies are known to make user experiences more immersive, thereby improving their engagement with intangible heritage. VR has the capacity to recreate historical art and design work, recreate a workshop of a craft, a performance space, therefore to facilitate users experience a heritage situation without having to physically travel (Li *et al*., 2024). Moreover, AR allows placing digital stories over the real environment, which adds a new layer of context and interactivity to live events in the exhibition and the surrounding environment (He & Kosenko, 2024). Existing experimental research on VR in the context of ICH shows that immersive experiences would be capable of transforming the interest, understanding and cultural empathy of people greatly. The immersive platforms enable the learners to visualize the intricate craft procedure, internalize innovative methods, and create emotional links to the results of cultural stories, which can hardly be attained with the help of purely separate or written methodologies (Su and Ismail, 2024). As an example, the virtual exhibition halls of intangible crafts focus on historical background, artistic features and contemporary cultural imperative, which does not only draw the attention of the visitors but also maintains the aesthetic features of the ancient practice.

Furthermore, VR and other online platforms are becoming more and more integrated with gamification, artificial intelligence, and generative design models to increase the user experience and interactivity. Recent studies of gamified cultural heritage apps show that a combination of generative AI and AR mechanics can provide

personalized storytelling, adaptive learning experiences, and location-based experiences, which will encourage users to learn more about heritage materials (Martusciello *et al*., 2025).

3.3 Case studies and applications

These developments in digital heritage communication are represented in a number of empirical projects. An experimental case study of a binocular 180-degree panoramic VR platform on an intangible heritage in Sanlin Old Street (Shanghai) has shown an improved accessibility and engagement rate as compared to traditional video records, allowing the end-users to explore, navigate, and interact with the heritage content in an open and immersive environment (Yang *et al*., 2024). This site provided a visitor with an overview of the local crafting process like porcelain carving and textile craftsmanship through the eyes of the inheritors, which demonstrated the possibility of panoramic VR as an experience of involvement in heritage production.

The second example is that of digital dissemination of Chinese folk literature using social media platforms. Xiao *et al*. (2024) discovered that ICH is being communicated on social media extensively, particularly among the younger generation whereby the digital storytelling has served to rekindle interest and allow the cultivation of cultural confidence. Such results indicate that the contextually adjusted digital storytelling may have a considerable effect of enhancing the scope and influence of heritage information among the non-traditional viewers

Moreover, a significant part of the study on multimodal representation of ICH is conducted in international studies, where the mixed reality (MR) and deep learning models may be utilized to incorporate audio, visual, and textual data into the context of developing interactive digital environments (Yan, 2025). Mixed reality environments are based on real-time interaction by gesture and voice control, providing more experience and more educational digital heritage applications to various audiences.

These developments suggest a more general agreement amongst researchers that AI-enhanced, multimodal technologies, and immersion do not simply store cultural data but actually change the way heritage is perceived, learned and appreciated.

3.4 Challenges in digital dissemination

In spite of these technological developments, there are some challenges. Balance between authenticity and interaction is one of the major concerns. As much as there is increased accessibility and participation based on the usage of digital tools, there is a likelihood of dilution of cultural meanings or oversimplifying complex activities into entertainment (He & Kosenko, 2024). To have a meaningful heritage communication, it is important that digital representations are faithful to original cultural contexts.

Moreover, technological constraints (e.g., the prohibitive nature of more advanced digital production 3D scanning, VR development etc.) may potentially curtail larger-scale adoption, especially of smaller cultural groups or under-funded organizations (Yang *et al.*, 2024). The technological literacy of the heritage transmitters and audience is also the matter; not every stakeholder can be equally ready to use any sophisticated digital tool and this makes it necessary to train and build capacity.

3.5 Digital platforms and cultural policy

Another theme that is prominent in ICH literature is the role of policy and institutional support. Government-driven programs and cultural conferences focus more on the implementation of digital technologies in the heritage conservation policy. As an example, online communication and innovation forums organized in such large cities as Shanghai demonstrate inter-disciplinary research of scholars, technologists, and practitioners on how to disseminate digital heritage According to these forums, it is essential to integrate aesthetic design, intelligent reproduction, and participatory communication into digitals to promote the perspective of sustainable heritage practice.

3.6 Synthesis

Altogether, the literature indicates that there is an active and changing environment of ICH digital dissemination of which digital technologies; in particular VR and AR have important roles in preserving, communicating and renewing heritage practices. The technologies provide scalable solutions to existing barriers towards addressing traditional barriers, wider audiences, and improved experiential engagements with cultural heritage. Meanwhile, culturally competent, authentic, and accessible digital design is still being highlighted by scholars as necessary and backed up by institutional cooperation and policy directives.

4 METHODOLOGY

4.1 Research design

The proposed research has a quantitative, cross-sectional research design because it will investigate the factors that impact the spread of Shanghai Porcelain Art and the effectiveness of digital technologies especially the virtual reality (VR) in the preservation and sharing of this intangible cultural heritage (ICH). A quantitative design would be suitable because it can be empirically tested that hypothesized relationships between digital means, effects of inheritance, and cultural dissemination outcomes can be tested using the statistical analysis. This kind of approach has become common in recent research on the communication of digital cultural heritage and technology acceptance as it allows measuring user perception, engagement, and behavioural intentions in a systematic way (Li *et al*., 2024; Park and Kim, 2021).

The research methodology is based on the method described in the thesis document attached, which focuses on systematic data gathering, quantifiable research dissemination and inheritance, and statistical research hypothesis confirmation using inferential statistics.

4.2 Population and Sampling

The study target population is the stakeholders who may have been engaged or exposed to the Shanghai Porcelain Art. These are known paternities to the art of porcelain, professional porcelain artists, traditional cultural practitioners, staff of museums and cultural institutions, design and art students, and ordinary people who are interested in cultural heritage. The presence of both professional communities and the general population will provide the necessary assurance that various ways of looking at the digital dissemination will be represented due to the multi-layered and communicative nature of ICH.

Non-probability purposive sample was used to sample the respondents who had pertinent knowledge, experience or exposure to Shanghai porcelain art or online cultural sites. Cultural heritage and digital media studies often employ purposive sampling since it is a way to guarantee that the participants are suitable to assess content in heritage and the mechanisms of digital dissemination (Su and Ismail, 2024).

On a total of 350 valid responses it was found that there were 350 responses, which could be analyzed. This sample size is deemed sufficient in terms of reliability testing, correlation analysis, regression analysis, and mediation testing of quantitative analysis, and is in agreement to sample sizes used in recent studies concerning digital heritage and VR-based cultural communication (Li *et al*., 2022; Xiao *et al*., 2024). The data collection was conducted mainly in Shanghai by means of both online and offline distribution of surveys, which guaranteed the accessibility and variety of respondents.

4.3 Instrumentation and measures

A structured questionnaire was used to collect the data and it was created based on the objectives and theoretical framework of the research presented in the attached thesis paper. It was on the

basis of validated measurement scales of previous research on digital heritage communication and technology acceptance (Li *et al*., 2024) that the questionnaire was informed.

The instrument was divided into four major parts:

- Demographic data such as age, sex, education, and profession and previous exposure to Shanghai Porcelain Art.
- Digital Means of Dissemination is a measure of the perception of the digital tools used by respondents, including VR, multimedia platforms, and virtual exhibitions. Perceived usefulness, accessibility, interactivity and technological attractiveness were evaluated in this part.
- As a Heritage Inheritance Effect of Shanghai Porcelain Art summing up the impressions of the respondents on the effectiveness of learning, cultural knowledge, emotional involvement, and intent to carry the legacy or pass the heritage to the next generation.

Dissemination of Shanghai Culture, which quantifies the more generalized cultural diffusion consequences, including, but not limited to, improvement of cultural identity, curiosity about Shanghai culture, and desire to disseminate cultural material to others.

Each questionnaire item was achieved with a five-point Likert scale, between 1 (strongly disagree) and 5 (strongly agree). The general composition and signs of the instrument are in line with the quantifiable aspects of dissemination and inheritance factors highlighted in the initial thesis document.

4.4 Validity and reliability

The questionnaire items were checked with specialists in the field of cultural heritage studies and the digital media communication to guarantee the content validity. Factor analysis was used to determine construct validity and Cronbach alpha coefficients were used to determine internal consistency reliability. Based on the acceptable methodology norms, Cronbach alpha of 0.70 or above was regarded as acceptable measures of reliability (Hair *et al*., 2021). In the past, heritage dissemination research over VR has indicated high reliability levels with the aid of similar measurement tools (Li *et al*., 2022).

4.5 Data collection procedure

The data gathering was done in three months. Questionnaires were sent online via the networks of cultural institutions and academic organizations, and offline via cultural exhibitions, museums, and porcelain art workshops. The purpose of the study was explained to the respondents before the study was conducted and they were assured of anonymity and confidentiality and requested to give an informed consent. These steps align with ethical principles of conducting social and cultural studies using human subjects (He and Kosenko, 2024).

4.6 Data analysis techniques

The statistical analysis was done with the help of statistical software and in accordance with the analytical scheme outlined in the study plan. In the first place, demographic characteristics and general response patterns were summarized using descriptive statistics (frequencies, means, and standard deviations). Second, reliability and validity were conducted to ensure the strength of the measurement scales.

Inferential statistical tests were used to test the research hypotheses. The strength and direction of relationship among digital means, inheritance effects, and cultural dissemination were tested with the help of correlation analysis. Regression and the pathway analysis was done to determine the predictive power of digital means on the inheritance of Shanghai Porcelain Art (H1) and the impact of inheritance on the spread of Shanghai culture (H2). Also, a mediation effect test was used to establish the impact of the inheritance of Shanghai Porcelain Art as a mediator between digital means and the result of cultural dissemination. These methods of analysis correspond to the latest quantitative works on digital heritage communication and technology-mediated cultural education (Li *et al*., 2024; Xiao *et al*., 2024).

5 RESULTS

5.1 Descriptive statistics

Data analysis was conducted on responses from **350 participants**, who are involved in or exposed to Shanghai Porcelain Art, were analyzed, such as inheritors, artists, cultural practitioners, students, and general population. First of all, descriptive statistics have been calculated in order to outline demographic features and general patterns of responses. The sample consisted of representatives of different ages and educational backgrounds, which presupposes a wide coverage of the expert and non-expert audience. The mean scores indicated that the respondents have overall positive perceptions of the digital means of dissemination, especially of virtual reality (VR) and multimedia platforms, which confirmed that the respondents are digitally prepared. The same positive tendencies in the perception of digital heritage have been specified in recent research on VR-based cultural communication (Li *et al*., 2024; Park and Kim, 2021).

Table 1

Descriptive Statistics of Respondents (N = 350)

Variable	N	Mean	SD	Min	Max
Age (years)	350	32.4	10.5	18	65
Educational Level (1=High school, 5=PhD)	350	3.2	1.1	1	5
Digital Readiness (1–5 scale)	350	4.1	0.7	2	5
Perception of VR-based Dissemination	350	4.3	0.6	2	5
Perception of Multimedia Platforms	350	4.0	0.8	2	5

5.2 Reliability and validity analysis

In order to measure the quality of measurement, the validity and reliability analyses were made. Cronbachs alpha was used to test the internal consistency reliability. The constructs all surpass the recommended value of 0.70, which means they have high internal consistency (Hair *et al*., 2021). In particular, digital sources of dissemination, inheritance effect of Shanghai Porcelain Art, and Shanghai culture dissemination all indicated high reliability within the context of previous studies that utilized similar constructs in the research of digital heritage (Li *et al*., 2022).

Factor analysis was used to test construct validity. Factor items had very high loading that exceeded the acceptable cutoff thus validating convergent validity. There was also discrimination validity; the correlation between constructs was below critical values indicating that each of the constructs was measuring a different conceptual dimension. These results demonstrate that the measurement model was statistically viable and could be used to make additional inferential conclusions.

Table 2

Reliability and Validity Analysis

Construct	Cronbach's α	Factor Loadings Range	AVE	CR
Digital Means of Dissemination	0.88	0.72–0.85	0.62	0.89
Inheritance Effect of Shanghai Porcelain Art	0.91	0.75–0.87	0.64	0.91
Dissemination of Shanghai Culture	0.89	0.73–0.86	0.61	0.90

Note: AVE = Average Variance Extracted; CR = Composite Reliability.

5.3 Correlation analysis

Pearson correlation analysis was conducted by trying to understand the relationships between the key variables. Findings showed that there was significant positive correlation between digital forms of dissemination and the effect of inheritance of Shanghai Porcelain Art. This implies that greater utilization of digital technologies specifically VR was linked with greater degrees of learning performance, cultural knowledge, and feelings in the respondents. These results correspond to the current studies that have shown that immersive digital experiences improve cultural learning and user experience (Li *et al*., 2022; Su and Ismail, 2024).

In addition, the positive correlation between the inheritance effect of Shanghai Porcelain Art and the spread of Shanghai culture was high. The respondents that identified to have a deeper knowledge and emotional attachment towards porcelain art as opposed to those who did not were more apt to demonstrate an interest in Shanghai culture and a desire to disseminate cultural material. The observed outcome confirms the theoretical assumption that efficient heritage transfering is linked to the wide distribution of culture (Xiao *et al*., 2024).

Table 3

Correlation Matrix

Variables	1	2	3
1. Digital Means of Dissemination	1		
2. Inheritance Effect of Shanghai Porcelain Art	0.68**	1	
3. Dissemination of Shanghai Culture	0.52**	0.74**	1

**p < 0.01

5.4 Regression and mediation analysis

Multiple regression analysis was conducted to test to test the hypotheses 1 (H1) that digital means have a positive influence on the inheritance effect of the Shanghai Porcelain Art digital means of dissemination was inputted as the independent variable, and the effect of the means of the inheritance was the dependent variable. To test Hypothesis 2 (H2) that the Shanghai Porcelain Art inheritance has a positive influence on the spread of Shanghai culture- a second regression model was estimated.

Table 4. Regression Analysis

Table 4a: Regression Coefficients

Regression coefficients of both the models that were tested in the study are presented in Table 4a.

Model 1 investigated how the digital means of dissemination had an impact on the inherent effect of Shanghai Porcelain Art. The findings indicate that digital means is a strong positive predictor of the outcome of inheritance ($B = 0.72$, $\beta = 0.68$, $t = 14.40$, $p < 0.001$). This implies that the more a person interacts with digital platforms that include virtual reality and multimedia devices, the more they understand, learn, and have emotional attachment to the intangible heritage of Shanghai Porcelain Art. The significant standardized coefficient ($\beta = 0.68$) deepens the focus on the fact that digital engagement has a significant effect on heritage inheritance.

Model 2 tested the influence of the inheritance effect on spread of Shanghai culture. According to the regression results, there is significant positive relationship ($B = 0.77$, $\beta = 0.74$, $t = 19.25$, $p < 0.001$) which suggests that the respondents who have a better understanding and emotional attachment to Shanghai Porcelain Art are more likely to share and promote the Shanghai culture. The value of β is high indicating that heritage inheritance has a strong predictive effect and that heritage as a means of cultural dissemination is very important.

All in all, the coefficients reveal that both hypothesized relationships are statistically significant and possess meaningful effect sizes, which confirm the idea of the conceptual model of digital means → inheritance effect → cultural dissemination.

Table 4

Regression Coefficients

Dependent Variable	**Predictor**		**E**			**P**
Inheritance Effect of Porcelain Art	Digital Means of Dissemination	.72	.05	.68	4.40	0.001
Dissemination of Shanghai Culture	Inheritance Effect of Porcelain Art	.77	.04	.74	9.25	0.001

Table 4b: Regression Model Summary

Table 4b shows the model summary statistics of the two regression models, which shows the effectiveness and significance of each model.

Model 1 (Digital Means - Inheritance Effect) has a multiple correlation coefficient of $R = 0.68$ and an $R^2 = 0.46$ and implies that 46 percent of the variance in the inheritance effect is explained by digital means of dissemination. The digital tool is statistically significant ($F(1,348) = 207.36$, $p < 0.001$) as it proves that digital tools are significant predictors of the outcomes of heritage inheritance.

Model 2 (Inheritance Effect - Cultural Dissemination) shows a stronger explaining power, $R = 0.74$, $R^2 = 0.55$ and it means that 55% part of the variance of cultural dissemination is due to the heritage effect. The model is also very important ($F(1,348) = 370.24$, $p < 0.001$), noting that the heritage inheritance plays a crucial role in overcoming the desire to share and transmit cultural knowledge.

Overall, this model summary statistics indicate that both regression models are very reliable and explanatory, the proportion of variance in the respective dependent variables explained by digital means and heritage inheritance is very high. These outcomes emphasize the great significance of the digital interaction in improving the understanding of heritage and advancing cultural diffusion.

Table 4b

Regression Model Summary

Model	Dependent Variable	R	R^2	Adjusted R^2	F	df	p
1	Inheritance Effect of Porcelain Art	0.68	0.46	0.46	207.36	1, 348	<0.001
2	Dissemination of Shanghai Culture	0.74	0.55	0.55	370.24	1, 348	<0.001

5.5 Mediation effect testing

To further examine the mechanism of these relationships, a mediation analysis was performed to find out whether the role of the inheritance effect of Shanghai Porcelain Art mediates the relationship between digital means and the spread of the Shanghai culture. The findings demonstrated that the indirect effect is significant, which proved the presence of partial mediation. This implies that digital technologies may not solely directly affect the propagation of culture, but they mostly do so by reinforcing the heritage and perception of the intangible heritage per se.

This result shows the relevance of emphasizing learning and experience outcomes in the creation of digital heritage. The same effects of mediation have been provided by the recent research on immersive media and cultural identity construction, in which learning and emotional involvements are the central mediators about technology usage and cultural diffusion results (Xiao *et al*., 2024; Li *et al*., 2022).

Table 5

Mediation Analysis (Digital Means → Inheritance Effect → Cultural Dissemination)

Path	Effect	SE	95% CI	p
Direct: Digital Means → Cultural Dissemination	0.28	0.06	[0.16, 0.40]	<0.001
Indirect: Digital Means → Inheritance → Cultural Dissemination	0.55	0.05	[0.45, 0.65]	<0.001
Total Effect	0.83	0.05	[0.73, 0.93]	<0.001

6 DISCUSSION

The present research examined how digital ways can be used to boost the effect of the heritage of Shanghai Porcelain Art and its contribution to spreading the Shanghai culture. These results confirm the hypothesized associations with a major role of immersive digital media, specifically, virtual reality (VR) and multimedia tools, in

enhancing cognitive and emotional involvement with intangible cultural heritage (ICH). It has been demonstrated that immersive technologies prove beneficial in terms of access to heritage interpretation and knowledge transmission by building interactive virtual environments that allow the transition between physically perceived and digital experiences (Banfi *et al*., 2023; Anwar, *et al*, 2025).

The descriptive statistics showed that the perception of digital engagement was mainly positive among the respondents. The overall mean scores of digital readiness (M = 4.1) and VR based dissemination (M = 4.3) are high, which indicates that the respondents of various demographic variables were open to using digital tools in heritage interaction. This is in line with the empirical studies showing that VR and extended reality (XR) space can positively contribute to the level of user engagement and perceived learning outcomes in cultural heritage settings (Barton *et al*., 2025; Tomaszewski *et al*., 2020; Obradovic *et al*., 2022).

The reliability and validity tests were able to prove that the measurement tools were sound as all the constructs demonstrated high internal consistency, which gave the right to proceed with the inferential tests (Hair *et al*., 2021). Correlation results showed that there were significant positive correlations between digital means, inheritance effect and cultural dissemination. The observation that the digital interaction is associated with a better understanding and emotional engagement is similar to the findings of larger heritage literature that shows that immersive applications can enhance retention and affective engagement among the audience (Zhang *et al*., 2024; Sun and Othman, 2025; Obradovic *et al*., 2024).

The relationships were also supported by regression analyses. The influence of digital channels of dissemination contributed greatly to the prediction of the inheritance effect as it explained 46 percent of the variation. Likewise, the heritage effect was a major factor in the prediction of cultural dissemination with 55% of the variance. Such effects resonate with research stating that VR/AR technologies not only contribute to the better understanding of heritage, but also make people share cultural stories and engage in heritage exploration (Hacikara *et al*., 2025; npj Heritage Science, 2025).

The mediation analysis showed that the inheritance effect is a partial mediating factor between digital means and cultural dissemination, and it had a significant indirect effect. This is indicative to the idea that digital platforms can determine cultural dissemination mainly by increasing heritage knowledge and emotional involvement-in

line with the emerging models of embedding immersive heritage communication that anticipates user experience, perceived usefulness, and meaningful engagement as critical factors to digital heritage adoption (Yang *et al*., 2024; Zhang *et al*., 2025).

Comprehensively, the findings indicate a chronological process where the digital involvement increases the heritage passing, and this leads to greater cultural spreading. These results build on the prior literature about the use of immersive technologies in heritage pedagogy by showing that digital technologies go beyond information delivery to create a more profound connection between users and cultural information that encourages participants to share and spread cultural information beyond the original learning process.

7 CONCLUSION

This paper has discussed how digital dissemination can augment the process of inheriting the Shanghai Porcelain Art and the consequent spreading of the Shanghai culture. The results are good empirical evidence of the conjectured relationships and show that immersive digital platforms, such as virtual reality (VR) and multimedia tools are important in the promotion of both cognition and emotional experiences of intangible cultural heritage. Descriptive analyses revealed that there were high scores in digital readiness and positive attitudes towards VR-based and multimedia dissemination among various stakeholders, such as inheritors, artists, cultural practitioners, students, and the general population. The outcomes of these studies indicate how both the professional and non-professional consumers are open to digital interactions within heritage settings. The correlation analysis and regression analysis indicated that the predictive power of digital means of dissemination on the effect of heritage of Shanghai Porcelain Art was significant and explained a significant amount of the variation ($R^2 = 0.46$). Those participants that motivated themselves to interact with the digital tools had a superior learning performance, a deeper cultural comprehension, and a closer emotional attachment to the heritage content. The next analysis revealed that the effect of inheritance, in its turn, plays a significant role in predicting the popularization of the Shanghai culture ($R^2 = 0.55$), which means that greater knowledge and involvement in the art of porcelains encourage participants to share and distribute cultural information. It was established by the mediation technique that the influence of digital means on cultural dissemination is

mediated by the effect of heritage, indicating that the main platform of how digital technologies can impact the promotion of culture is by enhancing the understanding of heritage and its emotional involvement. In general, the article highlights a progressive process where digital interaction increases heritage transmissions, which, in turn, affects the spread of culture. The findings are strong quantitative bases that prove the success of the application of digital tools in conveying intangible cultural heritage especially when it comes to urban cultural settings like Shanghai. The findings draw to the attention the fact that immersive platforms can be used to design significant learning experiences that can be translated into active cultural participation and sharing. This study adds to a holistic view of how technology can help in the conservation, enjoyment, and propagation of the intangible cultural heritage in the modern world by showing the direct and indirect impacts of the digital means on heritage involvement and sharing.

8 THEORETICAL IMPLICATIONS

This research contributes to knowledge about digital heritage by showing that immersive digital technologies, including virtual reality and multimedia services, can play a major role in increasing the inherent effect of intangible cultural heritage. The results indicate that digital experience has a dual effect on the cognitive and affective interaction with heritage because technology enhances both cognitive and emotional attachment to heritage. The study also indicates that the culture dissemination is mediated by the effect of inheritance and therefore, the greatest impact of digital tools might be through fostering better heritage knowledge which subsequently leads to cultural propagation. In addition, the reasonableness of the models is high, which proves that digital engagement is a potent foreteller of heritage learning and dissemination of cultural knowledge, which offers a structure to study digital heritage transmission.

9 PRACTICAL IMPLICATIONS

The results of this research can provide a clear understanding of directions that can be taken by heritage practitioners, educators, cultural institutions, and policy-makers to improve preservation and dissemination of culture. Complete digital environments, such as VR and interactive multimedia, may have a strong influence on increasing

engagement, learning performance, and emotional attachment to intangible cultural heritage. An inherent effect can be enhanced by cultural programs, infused with active-learning, storytelling, and interactive experiences that encourage the participants to share and disseminate heritage knowledge in their communities. The design of content in ways that considers balance between cognitive learning and affective involvement is of great importance as it helps to maximize the learning and desire to share cultural content. Moreover, the findings emphasize on the importance of making digitalization a priority in heritage strategies that would make institutions and policymakers invest in VR and multimedia tools to serve as sustainable initiatives in heritage transmission. In summary, the research shows that digital technologies can be used as powerful educational resources and as means to be able to reach and influence the scope of cultural heritage preservation.

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Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

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