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Article

# The Design of Museum Development Guideline for the Presentation of Artworks in Guizhou Provincial Museums

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**Abstract:** Museums play an essential role in preserving cultural heritage and disseminating artistic knowledge to the public. With the rapid advancement of digital technologies, museums worldwide have increasingly integrated digital media into exhibition design to enhance visitor engagement and improve the effectiveness of cultural dissemination. Nevertheless, many regional museums still rely heavily on traditional exhibition approaches, which often provide limited interpretive information and insufficient interactive experiences for visitors. As a result, the communication potential of museum collections may not be fully realized. This study investigates the current challenges of artwork dissemination at Guizhou Provincial Museum and explores how digital technologies can improve exhibition communication. A mixed-method research design was adopted. Quantitative data were collected through a questionnaire survey of 100 museum visitors to identify key problems encountered in artwork dissemination and visitors' expectations for digital interpretation services. In addition, qualitative insights were obtained through semi-structured interviews with five museum staff members and five experts in museum digitalization and exhibition design. The findings reveal three major issues in the current exhibition system: insufficient interpretation of artworks, limited opportunities for interactive engagement, and inadequate digital communication support. Based on these findings, the study proposes four strategic directions and a structured framework for digital development guidelines aimed at enhancing artwork dissemination. This research contributes to the field of museum digital communication by providing a systematic guideline framework tailored to regional museums and offering practical insights for improving digital exhibition design and cultural dissemination.

**Keywords:** digital museum, augmented reality, museum communication, artwork dissemination, digital exhibition design

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### 1. Introduction

Museums serve as important institutions for preserving cultural heritage and communicating historical knowledge to the public. In the digital era, technological advancements have significantly transformed the ways museums present cultural content and interact with visitors. Emerging technologies such as augmented reality (AR), virtual reality (VR), and interactive multimedia systems enable museums to create more immersive exhibition environments and enhance visitor engagement [1, 2].

Among these technologies, augmented reality has attracted increasing attention in museum exhibition design. AR integrates digital information with physical artifacts, allowing visitors to access additional interpretive layers and contextual narratives during

their visits [3]. Recent research indicates that AR-based museum applications can significantly enhance visitor participation and knowledge acquisition by providing interactive and immersive experiences [4].

Despite these developments, many regional museums still rely mainly on traditional exhibition methods such as display cases and textual labels. These conventional approaches often provide limited contextual explanations and offer minimal opportunities for visitor interaction. Consequently, visitors may encounter difficulties in understanding the cultural significance and artistic value of museum artifacts.

Existing research on museum digitalization mainly focuses on large national museums with advanced technological infrastructures. In contrast, regional museums often face challenges such as limited digital resources, insufficient technical support, and the absence of systematic digital development guidelines [5].

#### Research Objective

In response to these research gaps, this study aims to examine the current situation of artwork dissemination at Guizhou Provincial Museum and explore strategies for improving digital communication in museum exhibitions. By combining quantitative and qualitative research methods, this study seeks to identify the key problems encountered by visitors during museum visits and analyze the types of digital communication services expected by museum audiences.

#### Research Questions

Specifically, this study addresses the following research questions:

Research Question 1: What problems do visitors encounter in the process of artwork dissemination at Guizhou Provincial Museum?

Research Question 2: What types of digital communication services do visitors expect in museum exhibitions?

## 2. Conceptual Framework

To investigate the effectiveness of artwork dissemination in museum environments, this study proposes a conceptual framework that outlines the research process from problem identification to strategy development [6]. The framework begins with the identification of key problems in current artwork dissemination practices [7]. Based on these issues, a visitor needs analysis is conducted through questionnaire surveys to understand visitors' expectations and experiences. In addition, semi-structured interviews with museum staff and experts provide professional insights into digital exhibition design and technological implementation [8].

Drawing on the findings from both quantitative and qualitative analyses, the study develops digital design strategies, which are further translated into digital development guidelines for museum applications. Through this process, the framework aims to enhance the effectiveness of digital technologies in supporting improved artwork dissemination and visitor engagement. As shown in Figure 1.



**Figure 1.** Conceptual framework of digital artwork dissemination research.

### 3. Research Methodology

This study develops a conceptual framework to explain how technological, user-related, and environmental factors influence the effectiveness of artwork dissemination in museums [9].

#### 3.1. Independent Variables

The independent variables in this study include technological characteristics, user characteristics, and environmental factors.

Technological characteristics refer to the design and performance of AR systems used in museum exhibitions. These include interaction methods such as touch interaction, gesture interaction, and voice interaction, as well as digital content forms such as 3D reconstruction and historical scene restoration [10]. Technical performance indicators include recognition accuracy, response speed, and system stability.

User characteristics include demographic and cognitive factors such as age, educational background, previous experience with AR technology, and interest in cultural heritage.

Environmental factors refer to the physical and social context of museum exhibitions, including lighting conditions, spatial layout, and social interactions such as family participation or peer influence.

#### 3.2. Dependent Variables

The dependent variables describe the effectiveness of artwork dissemination.

User engagement includes interaction frequency, interaction duration, and willingness to reuse AR systems.

Cultural understanding refers to visitors' comprehension of the historical background and artistic value of exhibited artifacts.

Emotional experience includes immersion, enjoyment, and cultural identification during the museum visit.

### 3.3. Moderating Variables

Moderating variables may influence the relationship between independent and dependent variables.

These variables include museum management strategies such as staff training and equipment maintenance, policy support for cultural digitalization, and ethical considerations related to digital representations of cultural heritage.

### 3.4. Relationships Between Variables

The conceptual framework assumes that technological characteristics, user characteristics, and environmental factors jointly influence the effectiveness of artwork dissemination. For example, well-designed AR interaction systems may increase user engagement, while user familiarity with technology may influence emotional immersion.

This study adopts a mixed-method research design combining quantitative and qualitative approaches to investigate the current problems and development needs of artwork dissemination in Guizhou Provincial Museum.

## 4. Results and Analysis

This study adopts a mixed-method research design combining quantitative and qualitative approaches to investigate the current situation of artwork dissemination in Guizhou Provincial Museum. As shown in Figure 2.

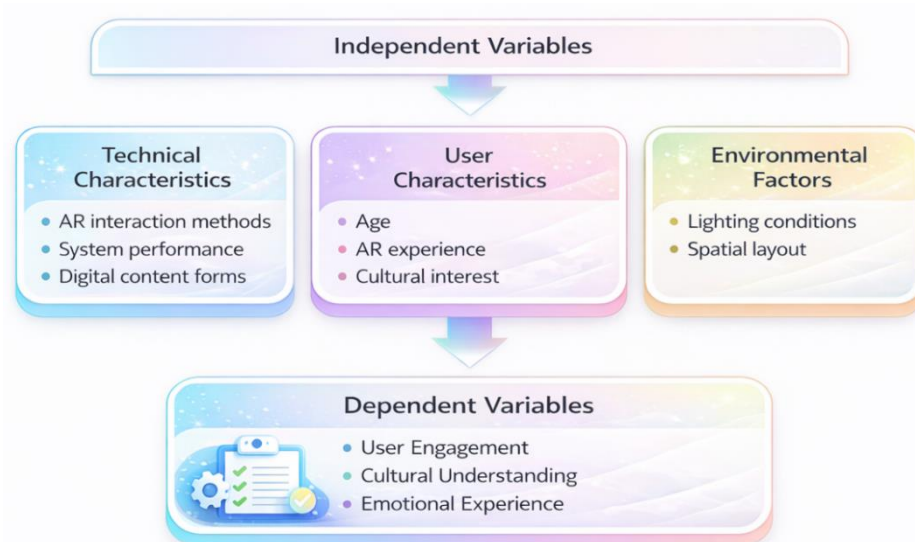


Figure 2. Conceptual Framework of Artwork Dissemination.

### 4.1. Questionnaire Survey

A questionnaire survey was conducted among museum visitors to examine their experiences and perceptions of artwork dissemination and digital interaction.

A total of 100 questionnaires were collected from visitors at Guizhou Provincial Museum. The sampling method adopted in this study was stratified sampling combined

with on-site random distribution. Visitors were stratified according to age groups, visit purposes, and AR usage experience.

The questionnaire measured visitor satisfaction with AR interactive experiences, participation motivations, and behavioral indicators such as interaction frequency and willingness to reuse AR systems.

To ensure the reliability of the questionnaire, Cronbach's alpha was used to test reliability, and content validity was assessed through expert review.

#### 4.2. Interviews with Museum Staff

Semi-structured interviews were conducted with five museum staff members.

The selection criteria included staff members from core departments such as the Information Technology Department, Exhibition Department, and Public Education Department, individuals with experience in AR technology application or audience services, and those familiar with museum digitalization projects.

These interviews aimed to understand the current deployment of AR technologies, identify technical challenges, and explore management issues related to resource allocation and cross-department collaboration.

#### 4.3. Expert Interviews

Five experts from relevant fields were interviewed.

The selection criteria included engineers involved in AR system development, scholars specializing in digital cultural heritage research, and cultural management experts from cultural tourism departments or museum associations. As shown in Figure 3.



**Figure 3.** Overview of Data Collection Methods Used in the Study.

## 5. Discussion

The development of this recycled art activity guide serves as more than just a pedagogical manual; it functions as a strategic intervention in the landscape of rural Hubei's primary education. By analyzing the findings from our interviews and the iterative design process, we can discern several critical layers that define the intersection of creativity, sustainability, and educational equity.

### 5.1. Re-evaluating the "Resource Gap" through Material Agency

The prevailing narrative in rural education research often fixates on the "lack"-the lack of funds, the lack of materials, and the lack of specialized staff. Our interviews with the principal and the art teacher at Huarong Primary School certainly echoed these

constraints. However, the synthesis of their feedback suggests a paradoxical opportunity. While professional-grade art supplies are scarce, the rural environment is replete with "found objects" that possess high creative potential.

The guide we developed transforms this scarcity into a curriculum of abundance. When a student views a plastic bottle not as refuse, but as the structural core of a sculpture, they engage in a sophisticated cognitive shift. This is not merely a cost-saving measure. It is a lesson in material agency. By utilizing paper, cardboard, and leaves, we bridge the gap between the student's daily life and their artistic expression. This connection validates their local environment, suggesting that art is not something that arrives in an expensive box from the city, but something that is discovered in the soil and the scrap pile.

### *5.2. The Cognitive Scaffolding of "Simple and Engaging"*

During our focus group discussions, experts emphasized that for students in Grades 1-3, the instructional design must be "simple and engaging". This isn't a call for oversimplification. Rather, it is an acknowledgment of the developmental stage where sensory exploration precedes technical mastery. The sixteen activities in our guide were specifically curated to build what we call "creative confidence".

We moved away from rigid, product-oriented outcomes. Instead, the "Activity Procedures" prioritize the "Creation" phase as a space for open-ended play. For a seven-year-old in a rural classroom, the act of "Texture Rubbing with Natural Materials" (Unit 2.0) is a gateway to understanding the physical world. They are learning to observe. They are learning to touch. By defining cognitive, psychomotor, and affective objectives for every task, we ensure that while the student is "playing" with leaves and twigs, they are simultaneously meeting rigorous educational benchmarks. This structured flexibility allows a child to fail, iterate, and ultimately succeed without the pressure of wasting expensive materials—a freedom that is often missing in traditional art classes.

### *5.3. Empowering the Rural Teacher as a Facilitator*

Perhaps the most significant challenge identified was the "lack of diverse art materials" and the corresponding burden on teachers. Rural teachers in Hubei often juggle multiple subjects with minimal support. Therefore, the "Classroom & Safety Notes" and "Step-by-Step Procedures" included in our guide are not just helpful tips; they are essential survival tools for the educator.

The art education expert we interviewed was adamant: the guide must support the teacher in guiding students effectively. We responded by creating a five-step workflow—Introduction, Demonstration, Creation, Presentation, and Wrap-up. This provides a predictable rhythm. It reduces the teacher's "instructional anxiety." When the teacher doesn't have to worry about where to find materials or how to structure the hour, they can focus on the students' creative efforts. This shift from "lecturer" to "facilitator" is crucial. It allows the teacher to observe the "Ability to complete basic rubbing operations" or "Active participation" as defined in our Formative Assessment section, rather than merely grading a final drawing.

### *5.4. Environmental Stewardship as a Living Curriculum*

While creativity is our primary goal, the environmental awareness component is an inseparable byproduct. Rural China is currently navigating a complex transition toward ecological sustainability. By integrating "environmental protection" into the cognitive objectives of the art activities, we are teaching students that their creative choices have real-world implications.

The use of "locally available recycled materials" like plastic bottles and paper isn't just a matter of convenience; it's a form of practical ethics. Students learn to curate their surroundings. They learn that their "tangible artistic creations" are a result of transforming waste. This fosters a sense of responsibility. As they share their work in the "Presentation"

phase, they aren't just showing off a toy; they are demonstrating a solution to the problem of waste. This creates a "long-term impact" on their environmental consciousness, moving beyond the classroom and into their homes and communities.

5.5. Methodological Reflexivity and Future Trajectories

Our Research and Development (R&D) framework allowed us to pivot based on real-world feedback. The two rounds of expert discussions were transformative. Initially, some activities were too complex; we simplified them to ensure "suitability for primary school students". This iterative process highlights the importance of localized research. A guide designed in a vacuum would likely fail in the specific context of a Hubei rural primary school.

However, we must acknowledge the limitation of our sample size. While the insights from the principal, teacher, and expert were invaluable, they represent a specific moment in time at Huarong Primary School. The next logical step is full-scale "classroom implementation" to evaluate the guide's impact on students' "artistic expression and environmental awareness" over a longer duration. We propose that this guide serves as a template. It is a living document. Other rural schools can take this "structured yet flexible" framework and adapt it to their own local waste materials, whether that be agricultural byproducts or different types of industrial scrap.

6. Discussion

Based on the empirical findings from the questionnaire survey and the qualitative insights obtained from interviews with museum staff and experts, this study proposes a structured framework for the digital dissemination of artworks in museum environments. The analysis revealed several key issues in current museum exhibitions, including limited interpretation of artifacts, insufficient interactive experiences, and inadequate integration of digital technologies. These findings indicate the need for a systematic strategy that can guide the effective implementation of augmented reality (AR) technologies in museum communication.

To address these challenges, this study develops an AR Dissemination Guideline Framework, which integrates design strategies, technological infrastructure, and management mechanisms to support sustainable digital transformation in museums. The framework consists of four core strategic modules-immersive AR navigation, digital platform integration, equipment optimization, and unified management mechanisms-supported by a three-stage implementation process. This process includes the stages of diagnosis, construction, and optimization, ensuring that digital communication strategies can be implemented progressively and continuously improved. The overall structure of the proposed framework is illustrated in Figure 4.

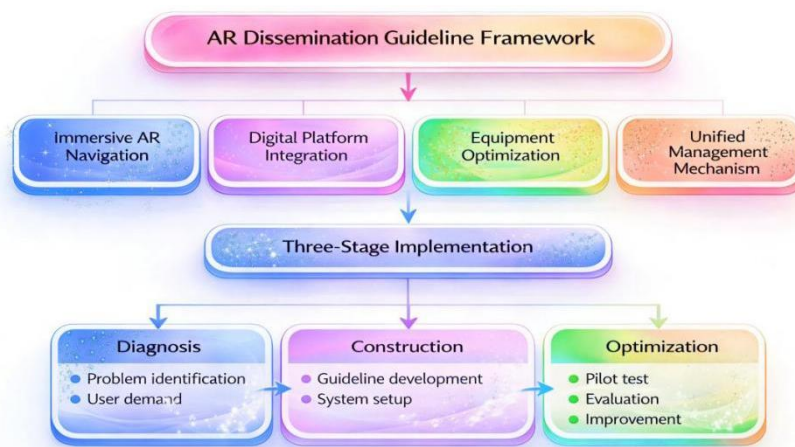


Figure 4. AR Dissemination Guideline Framework.

### 6.1. Problems in Artwork Dissemination

The survey results reveal several key problems in the current dissemination of artworks at Guizhou Provincial Museum.

One of the most significant issues is the insufficient interpretation of exhibited artworks. Traditional exhibition labels provide only basic information and lack deeper cultural explanations.

Another major issue is the lack of interactive exhibition experiences. Most displays rely on static presentation methods such as display cases and textual panels.

In addition, digital technologies are not widely applied in the museum exhibition environment.

The major problems identified in the current artwork dissemination system include limited interpretation of artifacts, a lack of interactive exhibition experiences, and the insufficient application of digital technologies, as shown in Figure 5.



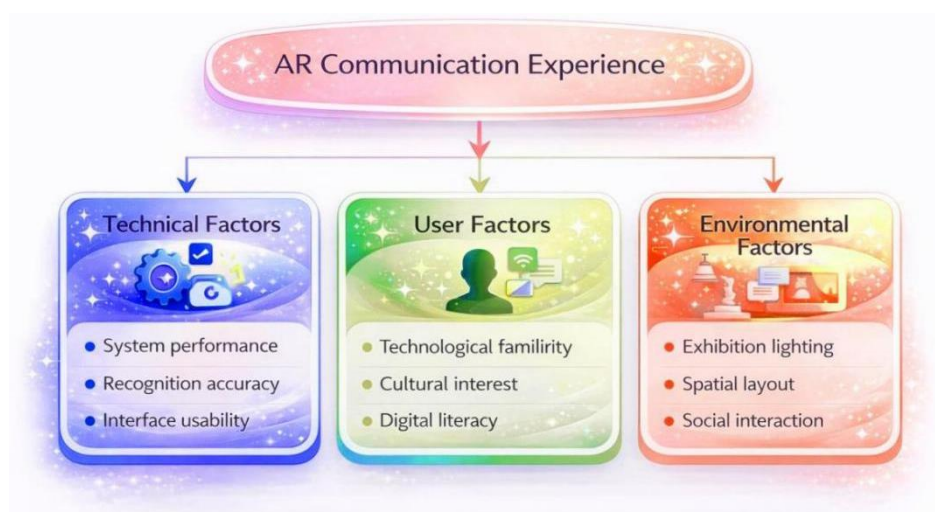
**Figure 5.** The actual scene.

### 6.2. Visitor Needs for Digital Interaction

Visitors expressed strong interest in more interactive and immersive digital experiences. Younger visitors particularly showed interest in AR technologies that allow interaction with digital reconstructions of artifacts.

Visitors also emphasized the importance of intuitive interface design and clear operational guidance.

The key factors influencing AR communication experience in museum exhibitions are illustrated in Figure 6, including technological factors, user-related factors, and environmental conditions.



**Figure 6.** Factors Affecting AR Communication Experience.

### 6.3. Opportunities for Digital Communication

Augmented reality technologies provide significant opportunities for improving museum communication. AR systems can present historical reconstructions, interactive storytelling, and immersive learning experiences.

Previous studies demonstrate that AR technologies can effectively integrate digital content with physical artifacts, thereby enhancing cultural interpretation and visitor engagement.

Based on the research findings, this study proposes four strategic directions for improving artwork dissemination:

1. Enhancing digital interpretation of artworks
2. Developing interactive exhibition technologies
3. Improving digital infrastructure for museum communication
4. Establishing systematic digital development guidelines

These strategies aim to bridge the gap between traditional exhibition practices and emerging digital communication technologies while supporting sustainable museum development.

## 7. Conclusion

This study investigates the challenges of artwork dissemination in Guizhou Provincial Museum and explores strategies for improving digital communication in museum exhibitions.

Through a mixed-method research approach combining questionnaire surveys and semi-structured interviews, the study identifies three major problems in the current exhibition system: insufficient artwork interpretation, limited interactive experiences, and inadequate digital support.

Based on these findings, the study proposes strategic directions and digital development guidelines for improving museum communication.

The research provides both theoretical insights and practical guidance for the digital transformation of regional museums and contributes to the broader field of museum digital communication.

Future research may further evaluate the effectiveness of digital exhibition strategies through pilot implementations and long-term visitor studies.

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