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# Research on the Digital Conservation and Living Transmission of Red Architectural Heritage

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## Abstract

Red architectural heritage constitutes a distinctive form of cultural heritage shaped within the historical context of modern China, embodying significant historical memory and multifaceted cultural value. In comparison with large commemorative buildings, such heritage is generally characterized by a small physical scale, a dispersed spatial distribution, and a strong narrative quality. Owing to its location in relatively remote areas, it has long remained outside the core focus of formal conservation systems. This study concentrates on the value characteristics, digital conservation approaches, and living transmission strategies of small and medium scale red architectural heritage. Drawing on a combination of literature review and field investigation, the research first provides a systematic analysis of its value composition, then examines digital conservation pathways from three analytical dimensions, and finally proposes adaptive strategies for its living transmission. The study seeks to offer a theoretical reference for the digital conservation and sustainable transmission of local cultural resources, while contributing to the continued educational and social function of red culture in the contemporary context.

**Keywords:** Red Architectural Heritage; Digital Conservation; Value Transformation; Living Transmission

## 1. Introduction

Red architectural heritage constitutes the representation of key historical events experienced in modern Chinese history within the built environment, encompassing a wide range of important commemorative sites, monuments, and memorial institutions. It embodies profound cultural significance and possesses rich historical, emotional, and educational values, serving as a tangible expression of historical spirit (Li and Wang, 2024). As an important form of material evidence of modern Chinese history, red architectural heritage also functions as a crucial carrier for the transmission of cultural memory and historical identity. Compared with well known large scale memorial sites, a vast number of small and medium scale red architectural heritage resources, such as slogan walls and former transportation or liaison stations, are scattered across urban rural fringe zones and remote areas. Due to their limited physical scale, low public visibility, and inadequate preservation conditions, they have long remained outside the mainstream of public awareness. Small and medium scale red architectural heritage is characterized by spatial concealment, morphological diversity, and a high degree of contextual authenticity (Table 1). However, owing to the lack of systematic written documentation and public recognition, such heritage is often known only within restricted local communities. In addition, insufficient management and conservation mechanisms render these sites vulnerable to gradual deterioration caused by natural weathering as well as human induced damage. In recent years, the acceleration of urbanization and the continuous outflow of rural populations have further intensified the

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challenges facing the survival of this category of architectural heritage. How to realize the conservation and transmission of small and medium scale red architectural heritage while safeguarding its authenticity and integrity has therefore become an urgent issue in contemporary cultural inheritance and historical resource protection. In response to this challenge, the present study takes small and medium scale red architectural heritage as its research focus, emphasizing value oriented digital conservation and living transmission. By integrating multidisciplinary perspectives from heritage studies, architecture, and sociology, and drawing on data obtained through field investigation and literature analysis, the study starts from an examination of the value connotations of red architectural heritage and seeks to propose strategies for digital conservation and living transmission, with the aim of providing theoretical support for the systematic protection of local cultural resources.

**Table 1.** Conceptual Framework of the Early Chapters on Digital Revitalization of Chinese Intangible Cultural Heritage.

Category	Representative Forms	Spatial and Morphological Characteristics	Core Value Connotations
Revolutionary Activity Sites	Former transportation stations, liaison stations, meeting venues	Small in scale, highly concealed, often embedded within villages or natural settings	Directly bear witness to specific revolutionary events, with strong historical authenticity and evidential value
Revolutionary Remains	Symbolic Slogan walls, propaganda murals, revolutionary inscriptions	Attached to existing buildings or boundary walls, with original materials and evident weathering	Reflect revolutionary propaganda methods and mass mobilization strategies, embodying distinct historical spirit
Commemorative Buildings	Martyrs' memorials, small memorial halls	Simple spatial forms, strong symbolic meaning, often constructed in later periods	Carry collective memory and commemorative functions, with pronounced educational and symbolic value
Revolutionary Remains	Daily Life Residences, shelters, storage facilities	Strongly function oriented, emphasizing practicality and safety	Reveal everyday life during revolutionary periods, with social historical and architectural research value
Composite Heritage Sites	Multi functional and compound remains	Complex spatial relationships and dense historical information	Integrate historical, social, and educational values, requiring holistic conservation

## 2. Value Analysis of Red Architectural Heritage

## 2.1. Historical Value

Small and medium scale red architectural heritage possesses irreplaceable value as a repository of historical memory. Such heritage is often closely associated with specific historical events, organizational nodes, or the activities of particular individuals. In comparison with large memorial buildings that have undergone extensive reconstruction or transformation, small and medium scale heritage sites tend to preserve their original historical conditions to a greater extent. The location of the buildings, their spatial organization, construction materials, and even the weathered slogans remaining on walls constitute primary historical evidence that has not been subject to later reinterpretation or modification. This high degree of authenticity and originality makes them the most reliable physical evidence for the study of specific historical events and activities, providing compelling and direct support for historical research. Moreover, all historical events take place within particular spatial contexts. Through their material form, small and medium scale red architectural heritage fixes revolutionary activities within concrete spatial settings. Interior layouts and relationships with the surrounding environment reveal the strategies and practical wisdom underlying revolutionary activities, including considerations of concealment, defense, and popular support. In this sense, these buildings represent the materialization of revolutionary strategic thinking and offer a distinctive spatial perspective for understanding revolutionary history (Figure 1).



Figure 1. Anti Japanese War Culture of Fuxing Bao..

## 2.2. Social and Cultural Value

Small and medium scale red architectural heritage is predominantly distributed within rural settlements, where it has long coexisted with local communities and become embedded in collective daily life and memory structures. Beyond recording historical events, this heritage carries strong dimensions of local identity. It represents the localization of national memory and serves as a critical link through which local memory is integrated into broader national narratives. For local residents, such buildings constitute an integral part of hometown history and form an important foundation for the development of local pride and cultural identity. At the national level, these dispersed heritage sites collectively construct a memory network of the Chinese people's pursuit of independence and liberation, continuously reinforcing collective identity and national cohesion. In addition, owing to their accessibility and close connection to everyday environments, small and medium scale red architectural heritage sites function as highly effective educational spaces. They provide immersive learning experiences for younger generations and serve as important bases for patriotic education, traditional values education, and the study of Party history, playing an indispensable role in the transmission of red cultural genes and the cultivation of core socialist values (Figure 2).



**Figure 2.** Fujian Tulou.

### **2.3. Architectural and Artistic Value**

Many small and medium scale red architectural heritage sites are themselves representative examples of vernacular architecture from specific historical periods. They were commonly constructed using locally available materials and traditional building techniques, such as rammed earth walls, small clay tiles, and timber structures. As such, they constitute valuable samples for the study of regional construction technologies, material practices, and residential forms within particular historical contexts, documenting architectural characteristics shaped by the social and economic conditions of the time as well as the practical ingenuity of local communities (Figure 3). The design and construction of these buildings generally followed principles of extreme functionality and pragmatism, eliminating unnecessary ornamentation and allowing form to be determined by use. This functionalist approach reflects the pragmatic, efficient, and frugal ethos of the revolutionary period and embodies a distinctive aesthetic value rooted in its historical context(Cheng.2020).



**Figure 2.** Yunsheng Lou, Yong'an City.

### 3. Conservation Principles for Small and Medium Scale Red Architectural Heritage

#### 3.1. Principle of Authenticity

Since its formal articulation in the Venice Charter, the principle of authenticity has become a fundamental criterion for defining and evaluating cultural heritage values in international conservation practice, as well as one of the core principles guiding heritage protection(Liu and Yan,2024). The concept of authenticity has long existed in the Chinese context, where the legal principle of preserving cultural relics without altering their original condition has consistently been upheld in heritage conservation. However, the Chinese understanding of authenticity has traditionally emphasized the pursuit of a complete and intact original state, rather than fully acknowledging the authenticity embodied in historical continuity and transformation(Qiao, 2023).

In architectural heritage conservation, the principle of authenticity stresses the maximum preservation of historical information embedded in heritage sites. For small and medium scale red architectural heritage, authenticity is reflected not only in material aspects such as construction materials, building techniques, and structural systems, but more importantly in the historical events, spatial atmosphere, and physical traces associated with revolutionary activities. Authenticity in this context extends beyond the retention of physical form to include the faithful preservation of spatial scale, historical marks, and contextual ambience as integral cultural representations.

#### 3.2. Principle of Integrity

An examination of existing red architectural heritage reveals that a large number of small and medium scale sites are located in mountainous or remote areas. Consequently(Lu et al.,2023), conservation efforts should not be limited to individual buildings in isolation. Instead, it is essential to avoid fragmented treatment and to conduct comprehensive assessments that take into account the surrounding environment, transportation conditions, and local customs and cultural practices, while respecting original historical relationships and preserving key historical information(Ruan and Lin,2023).

Although small and medium scale red architectural heritage often appears as individual architectural entities, its value does not exist independently. Rather, it is embedded within a broader system that includes village spatial patterns, natural landscapes, and social relationships, collectively forming an integrated red heritage setting. Conservation strategies should therefore extend beyond the architectural fabric itself to encompass the protection of historical environments, spatial routes, and collective cultural memory as an interconnected whole.

#### 3.2. Principle of Sustainability

The goal of sustainable development is to meet the needs of the present without compromising the ability of future generations to meet their own needs. As non renewable cultural resources, historic buildings cannot be recreated once destroyed, making sustainability an inevitable requirement of contemporary heritage conservation. The principle of sustainability emphasizes that conservation practices must possess long term vitality, enabling heritage values to continue to function and generate meaning within modern society while benefiting future generations.

This requires conservation to be understood not only as a technical endeavor, but also as a social and economic process. At the level of physical sustainability, scientific restoration methods and routine maintenance are necessary to ensure the long term survival of the architectural fabric. In terms of cultural sustainability, the cultural meanings and spiritual values embodied in heritage should be continuously recognized, interpreted, and transmitted within society. From a social sustainability perspective, heritage conservation should be integrated with community

development, allowing heritage sites to serve as shared cultural resources that strengthen community cohesion and provide public benefit. Finally, with regard to economic sustainability, appropriate and carefully managed modes of utilization should be explored, provided that they do not compromise the principles of authenticity and integrity.

#### **4. Digital Conservation Pathways for Red Architectural Heritage**

The primary task in the value oriented digitalization of small and medium scale red architectural heritage is the establishment of a comprehensive digital archive. The core objective lies in the systematic and accurate documentation of architectural heritage information, ensuring the faithful reconstruction and long term preservation of spatial form, structural characteristics, environmental context, and associated cultural information(Wang and Zhang,2019). The digital documentation process for small and medium scale red architectural heritage requires the integrated application of multiple advanced surveying, mapping, and information technologies.

First, precise surveying and measurement techniques should be employed to construct three dimensional models that capture architectural structures, dimensional proportions, and component details. This process enables the complete recording of geometric form, structural relationships, and spatial organization, thereby generating a three dimensional and visualized spatial database. On this basis, detailed features of the architecture should be further documented, including the weathered textures of wall materials, the erosion patterns of doors and windows, and historically significant elements such as wall slogans, traces of combat such as bullet marks, and other material remains that carry critical historical information. Textual and semantic data collection is equally important. Historical documents, archival materials, and records related to the use and evolution of the buildings should be systematically compiled to achieve an integrated digital archive that unifies physical space with cultural narratives. To ensure data integrity and future scalability, standardized archiving systems and update management mechanisms should be established, allowing digital outputs to be reusable, extensible, and accessible for long term public sharing(Li and Li,2025).

Digitalization not only serves the function of spatial reproduction, but also plays a crucial role in enhancing heritage narration and public engagement. After the completion of digital documentation of physical attributes, interactive digital environments should be developed to enable immersive experiences with architectural heritage and to present its overall value in a multidimensional manner. In terms of content construction, emphasis should be placed on the intrinsic relationship between architectural space and historical events, with contextualized approaches used to reconstruct historical narratives. Narrative frameworks should be structured around temporal sequences (Figure 4), key figures, and spatial trajectories in order to strengthen historical logic and scene continuity, thereby improving users' understanding of historical processes and their level of immersion. Through the application of virtual reality and augmented reality technologies, historical scenes can be dynamically reconstructed and vividly interpreted. Audiences may engage in immersive experiences through virtual reality devices, or use augmented reality applications to scan physical buildings and view overlaid historical images and interpretive information within real environments. By integrating multisource information and employing contextual reenactment, digital technologies significantly enhance the communicative power, accessibility, and emotional resonance of red architectural heritage values(Zhao and Liu,2003).



**Figure 4.** Propaganda Slogans inside Shenxiu Bao, Yong'an City.

The ultimate purpose of digitalization lies in application and transmission. Accordingly, the value oriented digitalization of small and medium scale red architectural heritage should not be limited to internal data integration or static presentation, but should be extended toward the development of open platforms that promote broader social sharing and public use. The establishment of an open digital resource platform capable of serving diverse user groups and sustaining long term vitality is essential for transforming the outcomes of the previous stages into public cultural products that can be widely accessed and utilized by society. The application services of such a platform should reflect a multilayered and differentiated structure. For professional researchers, the platform should provide access to high precision raw data and downloadable models to support rigorous academic research and conservation practice. For the educational sector, systematic online virtual exhibitions and interactive learning modules can be developed, enabling the platform to function as an effective resource for Party history education and ideological and political instruction. For the general public, user friendly websites, mobile applications, or mini programs should be designed with engaging content and intuitive interfaces, offering services such as virtual tours, narrative interpretation, and visit scheduling. Through the construction of a digital sharing hub of this nature, the value of small and medium scale red architectural heritage can transcend temporal and spatial constraints. The cultural meanings embodied in such heritage are thus able to achieve continuous transmission and wide dissemination within digital environments, ultimately realizing the maximization of the social value of digital conservation outcomes.

## **5. Strategies for the Living Transmission of Red Architectural Heritage**

### ***5.1. Strengthening Building Management and Conservation Practices***

The fundamental prerequisite for living transmission is the sustainable preservation of the architectural fabric itself. It is therefore essential to establish a scientific, standardized, and refined system of building management and conservation. Small and medium scale red architectural heritage sites are widely dispersed and governed by diverse management entities.

For a long time, inconsistencies in standards, unclear responsibilities, and insufficient funding have constrained effective conservation practice. To enable living transmission, the primary task is to improve the overall management framework (Feng et al., 2024). On the one hand, local governments should clearly define heritage categories and protection levels, formulate operational guidelines for classified management and graded maintenance, and clarify the responsibilities of property owners and local authorities with respect to routine inspection, use supervision, and maintenance interventions. On the other hand, financial guarantee and technical support should be strengthened through the establishment of dedicated funding mechanisms and professional teams to support basic work such as digital documentation, conservation design, and risk assessment.

At the same time, traditional craftsmanship, local materials, and regional artisans should be actively involved in the conservation process to ensure that interventions do not detach heritage from its historical authenticity and local characteristics (Wang et al., 2022). Where repair is necessary, strict adherence to the principles of minimum intervention and repair in accordance with original conditions is required. Priority should be given to traditional materials and techniques, and the reversibility of interventions should be ensured so as to preserve historical information to the greatest possible extent. In addition, safety and risk prevention capacities should be enhanced. According to the specific conditions of each building, necessary fire protection and security facilities should be discreetly installed, and comprehensive emergency response plans should be developed to address risks such as fire, theft, and natural disasters, thereby ensuring the long term and secure transmission of architectural heritage (Weng, 2025).

### ***5.2. Establishing a Multi Stakeholder Participatory Mechanism***

The living transmission of small and medium scale red architectural heritage constitutes a complex social undertaking that cannot be sustained by government agencies or heritage authorities alone. It is necessary to move beyond traditional boundaries and construct an open governance framework that enables coordinated participation by government, market actors, social organizations, and local communities. Within this framework, government should assume a guiding role by formulating overarching policies, providing legal guarantee, and offering basic financial support. Professional social forces and market entities with technical expertise and innovative capacity should be actively introduced to participate in heritage activation and day to day management.

Most critically, the enthusiasm and initiative of local communities and residents must be fully mobilized. Through training programs and capacity building, residents can be encouraged to become interpreters and guardians of heritage sites. Such a multi stakeholder participatory mechanism not only alleviates pressures related to funding and human resources, but also enables heritage to take root within local communities, fostering broad social recognition and cultural awareness. In this way, continuous vitality is injected into the living transmission of small and medium scale red architectural heritage.

### ***5.3. Construction of Regional Cultural Corridors***

To overcome the inherent limitations of small scale, dispersed distribution, and limited attractiveness of small and medium scale red architectural heritage, it is necessary to transcend single site conservation approaches. By integrating surrounding natural and cultural heritage resources within a given region, a scale effect can be achieved through joint management, coordinated development, and comprehensive planning at a broader regional level. This approach seeks to linearly connect multiple heritage sites that are geographically proximate and historically related, thereby forming a cultural experience zone with strong narrative capacity and overall appeal.

The construction of cultural corridors should be grounded in in depth historical research and structured around major historical events or the trajectories of key historical figures. Through the

joint development of integrated cultural and tourism products, visitor experiences can be enriched and diversified. By establishing regional cultural corridors, dispersed heritage resources can be effectively integrated, scale advantages can be generated, and regional socioeconomic development can be stimulated. More importantly, this strategy enables the holistic protection and systematic living transmission of small and medium scale red architectural heritage at a higher spatial level.

## 6. Discussion and Conclusions

As important material evidence of modern Chinese history, small and medium scale red architectural heritage carries not only profound historical memory and cultural value, but also significant contemporary relevance for cultural transmission in the new era. Compared with well known commemorative landmarks, this category of heritage is more closely connected to grassroots society and everyday life, serving as a critical interface between national history and local memory. From the perspective of value oriented digitalization and living transmission, this study has examined conservation pathways and dissemination mechanisms for small and medium scale red architectural heritage under conditions of digital technology. It emphasizes the need to transform static preservation into socially shared use on the basis of respect for authenticity and integrity.

Beyond the technical logic of digital documentation, contextual interpretation, and open utilization, greater attention should be given to the strengthening of participatory mechanisms, management systems, and regional integration strategies, so that such heritage can be genuinely embedded within public cultural spaces and contemporary social life. Future research may further advance empirical investigations across specific regions and technological approaches, with the aim of constructing more systematic, dynamic, and transferable conservation and transmission frameworks. In doing so, it can provide both theoretical and practical support for the sustainable development of regional cultural heritage.

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