



Design Proposal for a Lightweight Self-Service Interactive Exhibition System for the Living Heritage of the Xinshan Lisu Ethnic Group

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Abstract. This paper proposes a lightweight, self-service interactive exhibition system for the living heritage of the Xinshan Lisu in Miyian County, Sichuan Province. Unlike high-cost VR installations, the design follows a lightweight philosophy: no backend servers, no specialized hardware, and minimal staffing. The central problem originates from a field observation: the Lisu Ancestral Land Folk Museum remains locked during low visitation due to operational costs and staffing shortages. This reality, common in western China, is taken as a generative design constraint. The paper shifts the research question from “how to build a rich digital exhibition” to “how to design a self-service experience requiring minimal human supervision and zero ongoing technical maintenance”. A digital archiving specification using Dublin Core with Lisu extensions is prescribed. Three low-threshold interactive modules are outlined, namely pattern visualisation, ritual narrative, and audio immersion, all of which are designed to run on off-the-shelf tablets. A heuristic evaluation with three digital heritage experts was conducted. The system is presented as a replicable blueprint for resource-constrained institutions.

Keywords: Lightweight interactive exhibition, self-service museum, living heritage, Xinshan Lisu, digital archiving, interactive narrative, heuristic evaluation.

1 Introduction

In late 2025, the author visited the Lisu Ancestral Land Folk Museum in Xinshan Village. According to official sources, the museum (completed 2019, 806 m², 414 artifacts) integrates multimedia technologies to present Lisu culture^[1]. The village has received substantial rural revitalization investment, including 230 million yuan for a 4A-grade terrace scenic area^[2]. Yet on that afternoon, the museum was locked. A staff member cited low visitor numbers. Other tourists independently confirmed that the museum is rarely open except during major holidays or group reservations, suggesting a regular operational pattern. Research on small museums in western China has identified a recurring pattern: low visitor numbers lead to staffing reductions, which further depress attendance^[3]. As Zhang put it, “audiences are very limited, and

their scarcity causes serious survival problems for the museum, which then neglects its educational functions, resulting in unique cultural heritage not receiving the attention and concern it deserves”^[3]. The Lisu museum thus embodies this paradox. The rural revitalization literature celebrates the region’s transformation^[4], but a culture that cannot be seen, heard, or touched remains effectively invisible. Admittedly, these conversations were informal; a more rigorous longitudinal observation is planned (Section 6.3).

This paper starts from the locked museum. The question is not “how to build the most sophisticated exhibition,” but “what exhibition can operate reliably with no one to open the door, no explainer, and no IT support?” The answer lies in a self-service, lightweight, offline-first design. Unlike costly, hardware-intensive installations that require ongoing maintenance^[5], the proposed system runs on a few off-the-shelf tablets left powered on in the museum, requiring no staff intervention. A QR code at the entrance could turn the locked space into a self-guided cultural journey.

This paper makes three contributions. First, it starts from an observed failure—the locked museum—rather than from technology. Second, it provides concrete technical constraints derived from real rural devices, reusable for similar ICH contexts. Third, it offers a replicable blueprint for a self-service exhibition requiring zero ongoing maintenance and only basic web technologies.

2 Xinshan Lisu Heritage: An Updated Profile

Xinshan Lisu Ethnic Township is in Miyian County, Panzhihua. Its four villages have about 7,200 people; Xinshan Village is over 92% Lisu (roughly 1,800)^[6]. At 1,500–3,300 m altitude, its “Lisu Terraced Fields” are a National 4A attraction^[2].

The area has rich intangible heritage: five provincial-level items (embroidery, weaving, Hulusheng dance, Yuede Festival, Pigeon Drinks Water) and twelve county-level items^[1]. A 2025 survey documented traditional crafts and created a digital archive^[1]. Rural investment has funded roads, viewing platforms, and tourism infrastructure^[2]. A collaborative model promotes rural tourism^[4]; visitor numbers have grown, and the Yuede Festival is a major attraction^[2]. These developments contextualize our proposed system.

3 Digital Archiving Specification for Xinshan Lisu Heritage

We prescribe a standardised archival framework that can be incrementally filled by local centres or future researchers.

Based on the Miyian County Cultural Heritage Survey (2023)^[7], four heritage categories are defined: (1) costume patterns and embroidery, including geometric, natural, and totemic motifs; (2) craft techniques (hemp weaving, cross-stitch, silver accessory making); (3) rituals and festivals (Yuede Festival, Pigeon Drinks Water dance, weddings); (4) oral and musical culture (folk songs, Hulusheng melodies, epic narratives).

Dublin Core is adopted as the base standard ^[8], with three Lisu-specific extensions: (1) practitioner/transmitter (name, lineage, recognition); (2) usage context (ceremonial vs. daily, gender/age); (3) cultural sensitivity level (open vs. restricted). For example, ritual chants recited by the Niba (shaman) are restricted to adult community members. Each archive entry is a lightweight JSON object, enabling offline deployment without a database server.

To ensure low-end device accessibility, images must be JPEG/PNG (≤ 2 MB, 1080p) and audio MP3 (128 kbps, < 5 min). These constraints are realistic: a Lenovo Tab M8 (32 GB) has 16 GB reserved for content, allowing roughly 8,000 images; a 3-minute MP3 track is under 3 MB. All archival materials are from public sources, including the Panzhihua Municipal Culture Center's open database ^[9] and the Sichuan ICH website. No primary data collection is reported in this study.

4 Lightweight Self-Service Exhibition System Design

The system is client-side only: no backend, no databases, no VR/AR hardware. It runs on touchscreens (10—24 inches) and requires no staff assistance. Two deployment options are possible: museum-fixed tablets or visitor-owned smartphones accessed via QR code.

4.1 Architecture Overview

A flat-file, client-side architecture is adopted. The data layer uses local JSON files; the logic layer is plain JavaScript (ES6); the presentation layer is responsive HTML/CSS.

Three interaction design principles are followed: (1) tap/click-first (direct manipulation); (2) progressive disclosure via micro-narrative steps, which improves comprehension in museum kiosks ^[10]; (3) offline-first: all assets load from local storage, no internet needed after deployment.

4.2 Module 1: Pattern Gallery with QR-linked Annotations

Module 1 targets the “visible but unreadable” gap: visitors see patterns but miss meanings. A recognition-over-recall design lets users tap for explanations. A grid gallery shows 24-36 motifs (geometric, natural, symbolic). On hover/tap, an overlay reveals cultural meaning, usage scenario, and material/technique. In the museum, each artifact has a QR code to load the digital entry on the visitor's device, turning static exhibits into self-guided stations—no explainer needed. Figure 1 shows a mock-up with a highlighted icon and a text box.

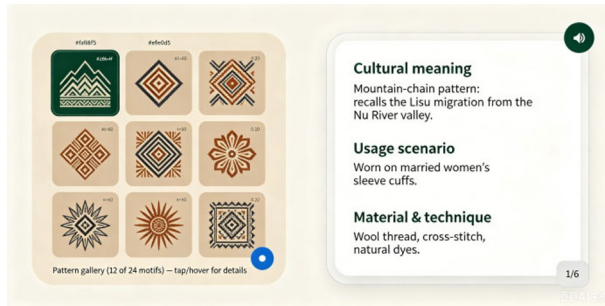


Fig. 1. Pattern gallery mock-up with hover overlay.

4.3 Module 2: Interactive Narrative for Rituals

Module 2 uses a timeline-based narrative for rituals that unfold over time, such as the Yuede Festival and the “Pigeon Drinks Water” dance. Each ritual is broken into sequential stages (e.g., Yuede: preparation, opening invocation, core dance, feast, closing blessing). Users click stage cards to reveal a short text, archival photos, and a 15–30s audio snippet. The linear, self-explanatory design assumes no prior knowledge; a visual progress indicator provides feedback. Figure 2 shows the Yuede timeline with five clickable circles (third highlighted) and a card with a dance photo and explanatory text.



Fig. 2. Timeline narrative interface for the Yuede Festival.

4.4 Module 3: Audio Immersion and the “Soundscape Library”

Module 3 uses a simple locally stored audio player for tracks like Hulusheng melody, work song, and children’s rhyme, with play/pause, scrub, and volume control. Beside it, a static panel explains instrument construction, performance context, and transmission mode. In the museum, a headphone-based “soundscape station” can be set up, including a quiz game that matches audio to cultural scenarios with immediate feedback. Figure 3 shows the player with waveform, controls, text description of the Hulusheng, and toggles between “Quiz mode” and “Free listening”.

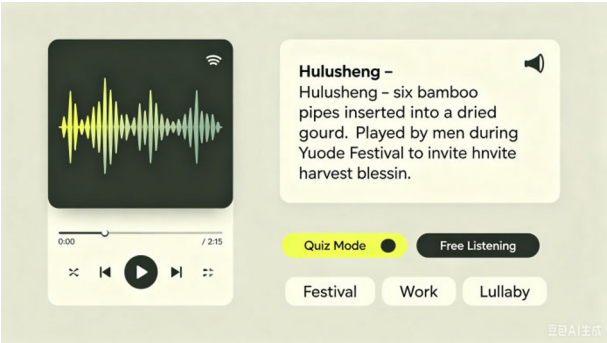


Fig. 3. Audio player with annotation panel and quiz mode.

5 Heuristic Evaluation and Expert Feedback

We assessed the design via a heuristic evaluation with three experts. Community validation is a separate phase.

5.1 Expert Recruitment and Procedure

We conducted a heuristic evaluation with three experts: two in HCI and digital heritage (5+ years each), one in digital humanities for minority ICH. All were from Chinese universities. None had visited Xinshan Village or worked with Lisu communities—this was intentional, as the goal was professional critique, not cultural validation. Their prior experience covered Tibetan, Yi, and Miao projects. Names withheld for blind review. Each expert received system descriptions and wireframes (Sections 3-4, Figures 1-3). They assessed technical feasibility and usability for rural users; on cultural matters, they commented only on surface-level visual and narrative consistency, not deep appropriateness.

5.2 Findings and Design Responses

All three experts agreed the lightweight, offline-first, self-service approach is technically feasible and suitable for resource-constrained museums, including those with staff shortages [3]. They praised progressive disclosure and the timeline narrative as “well-matched to oral tradition.” However, several issues were identified, each leading to a design change. The identified issues and the corresponding design changes are summarized in Table 1.

Table 1. Summary of expert feedback and design responses.

Expert feedback	Design response
The pattern gallery grid may be too dense	Touch target size changed from default

Expert feedback	Design response
for older users with reduced vision. Touch target size should increase.	44×44 px to minimum 60×60 px.
The “match three clips” game assumes users can distinguish subtle melodic differences. A simpler mode is needed for first-time users.	Added a toggle between “quiz mode” and “free listening mode” in Module 3.
Low-literacy elders would struggle with text overlays. A text-to-speech function is required.	Added a “speaker” icon to every text overlay, invoking the Web Speech API.

All changes rely on existing browser APIs and do not violate the lightweight, offline-first constraint.

5.3 Limitations of this Evaluation

This was a heuristic evaluation, not a user study with Lisu community members. The three experts were not representative of the target users (rural elders with varying literacy). Findings indicate technical and general usability, not cultural appropriateness. No claim of cultural appropriateness is made; that must come from the Lisu community through future participatory research. A full user test with community stakeholders is planned for Phase 2 (late 2026).

6 Conclusion

A design without reflection remains unfinished. This section therefore revisits what has been offered, where it falls short, and where it will go next.

6.1 Proposed Contributions

We restate the three contributions from Section 1.3. First, this study offers a problem-driven design that starts from an observed institutional failure—the locked museum—rather than from a technological solution. Second, the paper provides concrete technical constraints derived from real rural device specifications. Third, it offers a replicable blueprint for a self-service interactive exhibition that requires zero ongoing technical maintenance.

The system proposed here is designed for exactly the scenario described in Section 1.1: no staff, no internet, no technical support—just a tablet that stays on and a door that stays open.

6.2 Limitations

This study has several limitations. First, no working prototype has been built; the design remains conceptual. Consequently, functional feasibility and user experience have not been empirically tested. Second, and most importantly, no field study or user testing has been conducted with Lisu community members. The heuristic evaluation used only three experts who had no direct experience with the Xinshan Lisu community. Therefore the findings should be considered indicative of technical and general usability issues, not definitive assessments of cultural appropriateness. Third, the metadata schema has not been validated by cultural bearers. Fourth, the cost estimate excludes development labour.

6.3 Future Work

We plan three phases. Phase 1 (July-Aug 2026): build a low-fidelity clickable prototype (HTML/CSS/JS) with the three modules, test on Lenovo Tab M8 for file constraints, touch targets, and offline function, plus a pilot usability test with 3-5 HCI students. Phase 2 (Sep-Oct 2026): one-week field study in Xinshan Village, including (a) observation of daily operations and visitor flows across different days and two seasonal points; (b) semi-structured interviews with staff and cultural bearers; (c) user testing with 20-30 Lisu community members to evaluate usability, learnability, and cultural appropriateness, followed by iterative refinement. Phase 3 (late 2026-early 2027): use AI as a design-time tool (open-source upscaling, LLM for draft annotations^[11]) with manual verification; no AI runs on the device^[12]. The ultimate goal is to deploy a working system in the Lisu museum—to unlock the door, turn on the tablets, and let the culture speak for itself.

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Disclosure of Interests

The authors have no competing interests to declare that are relevant to the content of this article.

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