

Co-designing a Digital Intangible Cultural Heritage App with Older Adults

Huize Dong^{1,*}

¹Universiti Sains Malaysia, 11800 USM, Penang, Malaysia
18063498739@163.com

*Corresponding author

Abstract: The digital communication of intangible cultural heritage is moving from archival preservation toward interactive and experience-oriented forms of public engagement. Yet many heritage applications still organize culture as a collection of texts, images, and videos, with limited attention to older adults who may be users, local knowledge holders, and participants in transmission. This article presents a participatory design case concerning the development of a digital intangible cultural heritage application in Shandong, China. The project combined user research, approximately 50 interviews, co-design activities involving older adults and heritage practitioners, interface prototyping, and iterative refinement. A retrospective analysis of the design process traced how reported barriers and cultural expectations were translated into the information architecture and interaction logic of a high-fidelity prototype. The case identified four connected requirements: reduce the effort needed to locate meaningful content; make navigation and system status explicit; support legible, forgiving interaction; and preserve room for practitioner explanation and user contribution. These requirements shifted the application from a display-led catalogue toward a layered service that connects cultural items with people, processes, places, and opportunities for participation. The study argues that accessibility in digital heritage is not an optional interface adjustment. It determines who can encounter, interpret, and contribute to living heritage. It also shows that involving older adults as design partners can reveal cultural and experiential knowledge that is missed when they are treated only as users with limitations. The article concludes with practical implications for participatory design, interaction design, and community-oriented digital heritage projects.

Keywords: Participatory Design, Intangible Cultural Heritage, Older Adults, Interaction Design, Digital Heritage, Co-design

1. Introduction

Intangible cultural heritage is sustained through practice, memory, social relationships, and transmission. The 2003 UNESCO Convention defines it through the practices, representations, knowledge, skills, and associated cultural spaces that communities recognize as part of their heritage. The Convention also gives communities, groups, and relevant individuals a central role in identifying, safeguarding, and managing that heritage ^[1]. This people-centred definition matters for digital design. A digital record can preserve information about a practice, but it cannot by itself maintain the relationships through which the practice acquires meaning.

Digital archives and mobile applications have expanded access to heritage materials, but technical availability does not ensure meaningful participation. Heritage interfaces often inherit institutional categories, dense content, and specialist labels. Small text, hidden gestures, weak feedback, and deep navigation can create further barriers, especially for users with varied vision, dexterity, memory, device experience, and confidence. When people cannot locate or operate cultural content, access to the heritage represented by that content is narrowed.

Older adults are more than end users in this setting. They may also hold local memories, vocabulary, stories, or practical knowledge. A design process that defines them mainly through decline overlooks this diversity and may remove culturally knowledgeable people from decisions about representation ^[2]. Participatory design instead treats people affected by a system as contributors to inquiry and design. Prior Chinese work has shown that collaboration with heritage inheritors can change the narrative and spatial logic of a digital experience ^[3].

This article examines a digital intangible cultural heritage application project in Shandong, China. The project included approximately 50 interviews, participatory activities with older adults and heritage practitioners, and iterative high-fidelity prototyping. It asks what barriers older adults encountered, how participation influenced the application, and what practical design considerations follow. The contribution is a traceable account of how situated knowledge became interface requirements, not a universal model.

2. Literature Review

2.1. Digital intangible cultural heritage as representation and participation

Digitisation can connect photographs, sound, video, oral history, spatial information, and procedural explanation. These capacities suit intangible heritage because a practice is rarely represented by one object or description. Yet tacit and embodied knowledge remains difficult to encode ^[4], and metadata choices determine how resources are described and connected ^[5]. A digital structure is therefore already an interpretation.

Technical richness does not guarantee cultural adequacy. A platform can detach a practice from its social setting or treat practitioners as data sources rather than authors of meaning. UNESCO's participation principle applies to decisions about selection, terminology, access, narrative order, and attribution ^[1]. Participatory projects with Egyptian Bedouin communities ^[6] and Chinese diabolo inheritors ^[3] show that involvement can change both content and interaction. For mobile applications, the practical challenge is to preserve reliable classification while offering everyday routes through place, people, occasion, process, and story.

2.2. Older adults and digital interaction

Older adults are not a uniform technology group. Experience, education, health, social support, device ownership, motivation, self-efficacy, and anxiety all influence use ^[7,8]. Chronological age should not become a direct explanation for every difficulty. Poor contrast, small targets, inconsistent navigation, gesture-only actions, and weak recovery nevertheless create barriers that may combine with changes in vision, dexterity, attention, or memory. W3C guidance connects these needs to established accessibility practices such as resizable text, sufficient contrast, clear organization, consistent labels, and explicit instructions ^[9].

A compensatory view remains incomplete. HCI can reproduce narrow accounts of ageing when it assumes dependency and decline ^[2]. Reviews of participatory design instead emphasize diversity and sustained involvement ^[10]. Older adults may contribute knowledge about language, trust, routines, teaching, and cultural relevance. If they enter only during final testing, they can comment on a button but have little influence over what the application considers important. Partnership requires early, iterative participation and visible influence on the outcome ^[11].

2.3. Participatory design as a case study method

Participatory design learns practical and tacit knowledge through intervention, reflection, and prototyping ^[12]. Co-design extends this shift from designing for users toward collective creativity with them ^[13]. Interviews, storytelling, mapping, sorting, sketching, scenarios, and prototype review can all support the process. Their presence alone is not enough: participation depends on when people enter, what they can influence, and whether their contributions remain visible.

Older adults can contribute creatively during ideation ^[14], while age stereotypes can weaken partnership ^[11]. Cultural setting also shapes facilitation. The Qi2He framework developed in rural China argues that local epistemology and creative practice should structure collaboration ^[15]. The present case therefore examines the chain from interview account and collaborative discussion to requirement and interface decision. This makes the prototype a record of negotiated translation rather than the sole object of study.

3. Research Design

3.1. Case setting and evidence base

The case concerns a mobile application for communicating intangible cultural heritage associated with Shandong. It aimed to help the public discover heritage items, understand their context, and encounter the people and activities through which they continue. The evidence comprised approximately 50 interview encounters, participatory design records, successive interface proposals, and a high-fidelity prototype. Older adults contributed as anticipated users and possible holders of local knowledge; heritage practitioners assessed cultural accuracy and emphasis.

The project summary reports the interviews as an approximate corpus and does not provide a verified demographic breakdown for statistical comparison. They are therefore treated as qualitative design evidence, not as a measure of prevalence. The unit of analysis was the design decision: which reported concern motivated it, how the concern became an interface requirement, and what trade-off followed. This makes participant influence inspectable without implying that a prototype follows directly from raw comments.

3.2. Participatory process

The process moved through inquiry, collaborative interpretation, prototyping, and refinement. Interviews explored current information practices, expectations, difficult mobile interactions, and meaningful forms of content. Participants then responded to example screens, labels, groupings, and task routes. Concrete materials reduced dependence on technical vocabulary. Practitioners emphasized context, sequence, terminology, and attribution; older participants emphasized readability, orientation, trust, stories, and local connection.

The team translated contributions into provisional requirements rather than literal instructions. A request for a larger button could indicate target size, visual priority, or uncertainty; a request for more information could conflict with reduced screen density. Alternative responses were tested as prototypes progressed from content structure and task flow to detailed interface states. Iteration considered location, predictability, return, recovery, and cultural recognition. The high-fidelity prototype consolidated the resulting hierarchy, typography, controls, media treatment, and feedback.

3.3. Analytic procedure and quality boundaries

Evidence was organized into four recurring themes: access to relevant content, orientation and navigation, legibility and confidence, and cultural voice. Conflicting needs, such as concise screens versus cultural depth, were retained as design tensions. The analysis followed the iterative human-centred design logic of ISO 9241-210 ^[16] and participatory design's emphasis on practical knowledge ^[12]. No inferential statistics were used, and the prototype does not prove improved learning or transmission.

4. Findings and Design Development

4.1. Finding relevant cultural content required less effort and more context

The first problem concerned the gap between institutional organization and user intention. Participants did not necessarily begin with the formal name or administrative category of a heritage item. They might remember a place, a material, a person, a festival, an image, or an activity. When the interface required a precise term at the outset, discovery became a test of prior knowledge. Deep category trees also made it difficult to judge which route would lead to useful material.

The prototype response was a layered information architecture with more than one route into the collection. Search and formal categories remained useful, but browsing also supported recognizable themes and contextual cues. The home level emphasized a manageable set of destinations rather than presenting the full database structure. Item summaries answered basic orientation questions before asking users to open longer material: what the practice is, where it is associated, who performs it, and why the item may be relevant. Deeper layers then provided process, history, practitioner accounts, and related content.

This hierarchy addressed two needs that initially appeared to conflict. Older participants wanted

screens that were not crowded, while heritage practitioners resisted the reduction of living practices to short promotional cards. The design did not resolve the conflict by removing detail. It separated orientation from depth. Concise summaries reduced the initial reading and navigation burden, while a clear path to extended material preserved complexity for users who chose to continue.

4.2. Navigation needed to explain itself

Participants' difficulty was often caused by uncertainty rather than inability. An icon without a label required users to guess its meaning. A gesture with no visible cue could remain undiscovered. A screen transition without a clear title or selected state made users unsure whether the application had responded. When several such uncertainties occurred in sequence, users became reluctant to explore because they feared losing their place or changing something unintentionally.

The prototype therefore favored explicit navigation. Important actions combined text labels with familiar visual symbols. Titles, selected states, and consistent placement showed location. Back and home routes remained visible at points where users might otherwise feel trapped. Primary actions were distinguished from secondary actions by position and emphasis, not by color alone. Gesture-only controls were avoided for essential tasks, and media controls exposed their current state.

Feedback was designed as part of the action rather than as decoration after it. A selected item visibly changed state; loading or saving actions indicated progress; completion messages stated what had happened; and recoverable mistakes offered a direct next step. These choices reduced the need to infer system status from subtle animation. They also supported learning because the interface confirmed the relationship between an action and its outcome.

4.3. Legibility and forgiving interaction supported confidence

Readability concerns affected typography, spacing, media, and task length. The prototype emphasized legible text, strong contrast, sufficient line spacing, and clear separation between headings, descriptions, and controls. Text was not embedded in images when it needed to be read or resized. Dense paragraphs were divided into short sections with descriptive headings, while captions and transcripts supported audiovisual content. These decisions align with accessibility guidance for older users and with the broader principles of perceivable and understandable content [9].

Touch interaction used adequately sized targets with space between adjacent actions. The design avoided placing destructive or easily confused controls next to routine navigation. Tasks were divided into visible steps when a single screen would have become dense, but the number of steps was kept low and progress remained apparent. Inputs used plain labels and examples. Where an action could be reversed, the interface made that possibility visible; where it could not, confirmation occurred before commitment.

The design also allowed users to proceed without mastering every feature. Browsing, reading, listening, and watching formed a complete basic experience. Optional functions such as saving, sharing, or contributing did not interrupt that path. This mattered because mandatory registration or unfamiliar permissions at the beginning could exclude a user before cultural content appeared. Progressive disclosure applied to functionality as well as to information.

4.4. Cultural voice changed the content model

Heritage practitioners and older participants drew attention to what a catalogue view leaves out. A heritage item is connected to people who teach, perform, make, remember, adapt, and debate it. Presenting only a definition and a polished image can make the item appear complete and fixed. Participants instead valued process, personal explanation, local variation, and the circumstances in which a practice is learned or used.

The prototype therefore treated practitioner context as part of the item rather than as supplementary biography. Content could connect an overview with a demonstration, a spoken explanation, a process sequence, or a story about place and use. Attribution remained visible so that knowledge did not appear to come from the platform itself. The design also distinguished authoritative description from personal account, allowing different kinds of knowledge to coexist without implying that they were interchangeable.

Participation influenced the proposed contribution flow. A community-oriented application should

allow people to suggest information, share a memory, or point out an error, but an open submission button is not sufficient. Contributors need to understand what can be submitted, how it will be reviewed, how attribution works, and whether material will become public. The prototype direction therefore emphasized guided contribution, consent, preview, and review status. These features were framed as requirements for trust and cultural responsibility, not only as moderation tools.

5. Discussion

5.1. Accessibility is a condition of cultural participation

Accessibility should be treated as part of digital safeguarding, not as late compliance. Information that is technically online but difficult to perceive, navigate, or understand provides only nominal access. The consequence is exclusion from discovering a practice, recognizing a local connection, or contributing knowledge. The response is structured complexity rather than maximum simplification: multiple entry routes, layered content, stable navigation, and explicit feedback allow depth without placing every detail on the first screen.

5.2. Older adults should be recognized as heterogeneous partners

Participants identified interaction barriers, but they also evaluated relevance, language, trust, and cultural context. This supports critiques of deficit-based ageing discourse ^[2] and research that defines partnership as early, iterative involvement ^[11]. Concrete materials can support participation without equating unfamiliarity with a lack of ideas. Stories, comparisons, and demonstrations may carry design knowledge that a sketch does not. Participants should be able to review how designers translate that knowledge into a proposal.

5.3. Co-design requires traceable influence

Participation is credible when the connection between contribution and outcome can be shown. Teams can record the concern, requirement, implemented response, unresolved trade-off, and participant review. This distinguishes co-design from consultation and reveals disagreement. The goal is not automatic consensus but a process in which reasons are visible and affected participants can challenge the translation. Low-detail alternatives are especially useful before visual polish makes a proposal appear settled.

5.4. Practical implications for digital heritage teams

Four implications follow. Content architecture should begin with how people remember practices as well as with institutional classification. Legibility, target size, navigation consistency, and feedback should remain core requirements through visual refinement. Practitioners should influence selection, terminology, sequence, attribution, and review before the content model is fixed. Finally, contribution should expose consent, attribution, correction, review, and access conditions. Human-centred design standards support the process ^[16], but heritage work adds a further test: whether the representation is legitimate to the people whose heritage is represented.

6. Limitations

This study reports one design case and does not establish a general model for all older adults, heritage communities, or regions of China. The source project recorded approximately 50 interviews, but the available case documentation did not support a verified breakdown by age, role, gender, location, or digital experience. The analysis therefore does not compare subgroups or claim thematic saturation. More complete participant reporting is needed in future research.

The evidence concerns a high-fidelity prototype rather than long-term use of a released application. The study cannot determine whether the design increased knowledge, continued participation, or heritage transmission. Controlled usability testing could examine task completion, error recovery, comprehension, and perceived confidence. Field deployment would be required to study repeated use, contribution, moderation, practitioner workload, and the durability of community involvement.

Finally, co-design does not remove power differences. Designers still selected activities, interpreted

comments, and controlled implementation. The decision-tracing approach makes some of that mediation visible, but it does not guarantee equal influence. Future work should report how disagreements were resolved, how participants were credited or compensated, and how communities can continue to revise content after launch.

7. Conclusions

The Shandong case shows how participatory design can connect accessibility and cultural representation in the development of a digital intangible cultural heritage application. Interviews, collaborative interpretation, prototyping, and iteration identified needs that a display-led approach could miss: users required more recognizable routes into content, more explicit navigation, legible and forgiving interaction, and clearer opportunities to hear from and contribute to living cultural practice.

The resulting design direction used layered information, consistent controls, visible feedback, practitioner context, attribution, and guided contribution. These choices did not treat older adults as a single group in need of a reduced interface. They recognized older participants as varied users and possible holders of cultural knowledge. Their involvement improved the account of what the application needed to make accessible and what it needed to represent responsibly.

Digital heritage design is therefore more than the conversion of cultural materials into interface content. It distributes attention, establishes relationships between records, and defines who can participate. A participatory process cannot settle every cultural or technical question, but it can make those decisions more grounded, reviewable, and open to the people most affected by them.

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