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Designing a mobile digital application for the Museum of Asia Minor Culture: Enhancing intangible cultural heritage through digital storytelling

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Abstract

The Asia Minor Catastrophe of 1922 constituted a major rupture in cultural continuity, leading to forced displacement and the fragmentation of both tangible and intangible cultural heritage. In this context, the Museum of Asia Minor Culture in Aigaleo seeks to preserve and communicate the traditions, memories, and lived experiences of Asia Minor refugees. This study investigates the design and development of a mobile application that employs interactive digital storytelling to document and disseminates Intangible Cultural Heritage (ICH) linked to displacement and refugee memory. A mixed-methods approach was adopted, combining qualitative materials such as oral histories, archival photographs, and museum artifacts—with the design and prototyping of a mobile application using contemporary development frameworks. Digital storytelling techniques guided the integration of multimedia elements, including audio narration, visual content, and interactive pathways, while user-centered design and usability testing involved museum visitors and cultural experts. Evaluation results indicate that the application enhanced visitor engagement, supported contextual understanding of exhibits, and strengthened connections between tangible objects and intangible traditions. The study concludes that mobile digital storytelling can function as an effective interpretive tool for museums, contributing to the preservation, accessibility, and communication of ICH, particularly in institutions with limited resources and audiences seeking more experiential forms of engagement.

Keywords: Intangible Cultural Heritage; Digital Storytelling; Mobile Application Design

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1. Introduction

The Asia Minor Catastrophe of 1922 represents a traumatic episode in modern history, resulting in the forced displacement of approximately 1.5 million people from Asia Minor to Greece and beyond. This event disrupted the continuity of cultural traditions, collective memory, and heritage practices. Refugees carried fragments of both tangible and intangible cultural heritage (ICH)—including religious artifacts, household objects, culinary traditions, oral histories, and songs—which over time have been integrated into modern Greek identity, reflecting resilience and the challenges of safeguarding ICH after conflict and displacement (Smith, 2020).

Defined by UNESCO as "the practices, representations, expressions, knowledge, and skills that communities, groups, and, in some cases, individuals recognize as part of their cultural heritage" (UNESCO, 2003), ICH poses unique challenges for museums. Unlike tangible artifacts, intangible traditions are dynamic, context-dependent, and vulnerable to erosion. Displacement further disrupts continuity across generations, requiring museums to balance the preservation of physical objects with meaningful transmission of intangible practices to contemporary audiences.

The Museum of Asia Minor Culture in Aigaleo, Greece, exemplifies this mission by preserving photographs, textiles, religious items, and oral testimonies that narrate both displacement and cultural endurance. As a small, community-based museum, it faces challenges related to limited staff, restricted physical space, and a traditionally object-centered exhibition approach, which complicate efforts to communicate the experiential and emotional dimensions of ICH. Younger, digitally literate audiences increasingly seek interactive, immersive, and personalized engagement, and this trend is directly relevant to the museum, which has expressed a need to better engage school groups, descendants of refugees, and local visitors. These conditions highlight the museum's need for innovative interpretive solutions that can support both accessibility and experiential learning. Consequently, this study focuses on the Museum of Asia Minor Culture as a representative example of small museums seeking meaningful, scalable digital mediation strategies for ICH.

Within this context, the study aims to explore how digital storytelling, implemented through a mobile application, can support the interpretation and transmission of ICH linked to Asia Minor refugee memory. To guide this inquiry, the following research questions were formulated: (RQ1) How can digital storytelling be designed to connect tangible exhibits with intangible cultural narratives in a small community museum? (RQ2) What needs, expectations, and interaction preferences do museum visitors express regarding digital tools for ICH interpretation? (RQ3) To what extent can a mobile application enhance engagement, accessibility, and comprehension of ICH within the Museum of Asia Minor Culture?

Research in digital heritage highlights the potential of mobile technologies, immersive media, and participatory storytelling to enhance visitor experiences (Cameron & Kenderdine, 2008; Konstantakis, 2022; Konstantakis, 2018; Nikolarakis, 2024). Mobile applications contextualize and personalize museum content, linking tangible exhibits to intangible traditions, while digital storytelling integrates multimedia—audio recordings, video testimonies, 3D reconstructions, and interactive pathways—conveying complex histories of displacement, resilience, and identity (Vosinakis, 2025).

However, implementing digital tools in ICH preservation involves challenges, including risks of oversimplification, capturing performative dimensions, and balancing innovation with curatorial authenticity. Small museums often lack resources or expertise for large-scale projects, highlighting the need for scalable, participatory, and user-centered approaches that combine technical development with stakeholder engagement and iterative evaluation (Konstantakis, 2022).

This study, which was developed within a master's thesis, addresses these challenges by designing a mobile application for the Museum of Asia Minor Culture, leveraging interactive digital storytelling to document and disseminate ICH related to Asia Minor refugees. Using a mixed-methods approach—including oral histories, archival material, and participatory feedback from visitors and cultural experts—the project connects tangible artifacts with intangible traditions, enhancing accessibility, engagement, and pedagogical value.

By situating this case study within broader debates on digital heritage, storytelling, and refugee memory, the article demonstrates how mobile applications can mediate between past and present, fostering empathy, understanding, and cross-generational dialogue. The rest of the paper is structured as follows: Section 2 provides a literature review, Section 3 examines the state of the art of interactive heritage applications, Section 4 outlines the methodology, Section 5 details the development process, Section 6 presents the evaluation, Section 7 describes the final product, and Section 8 concludes with a discussion of findings, implications, and future directions.

2. Literature review

Section 2 presents the literature review, focusing on three interrelated areas: intangible cultural heritage, digital storytelling and interactive media, and mobile architecture.

Intangible Cultural Heritage (ICH) constitutes a fundamental element of global cultural identity, encompassing living traditions and practices transmitted across generations. The concept gained formal recognition through the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage (2003), which linked ICH with cultural sustainability and emphasized its role in preserving community identity. Cultural heritage is generally categorized into tangible heritage, including monuments, objects, and architectural works (Ahmad, 2006), and intangible heritage, which encompasses traditions, rituals, knowledge, and social practices that shape cultural identity (Aikawa, 2004). The distinction between tangible and intangible heritage is often fluid, as intangible expressions may be embodied in physical objects (Bortolotto, 2007). UNESCO (2003, Ch. 2.1) defines ICH as "the practices, representations, expressions, knowledge, and skills – as well as the instruments, objects, artifacts, and cultural spaces associated therewith – that communities, groups, and, in some cases, individuals recognize as part of their cultural heritage."

UNESCO (2003, Ch. 2.2) further identifies five key domains of ICH: oral traditions and language, including narratives, myths, and songs; performing arts, such as music, dance, and folk theater; social practices, rituals, and festive events, including life-cycle ceremonies and seasonal customs; knowledge concerning nature and the universe, such as traditional agriculture, ethnobotany, and folk meteorology; and traditional craftsmanship, including weaving, pottery, and woodworking. These categories provide a framework for understanding and safeguarding ICH, linking communities with their history and culture (Lenzerini, 2011).

ICH plays a vital role in identity formation, social cohesion, and sustainable development. Properly managed cultural heritage can enhance social integration, intercultural dialogue, and economic growth (Lekakis & Dragouni, 2020; Dümcke & Gnedovsky, 2013). Austria, for instance, leverages its intangible heritage—through festivals, musical events, culinary experiences, and cultural infrastructure—to promote tourism and stimulate local economies (Petronela, 2016). Beyond its economic and social value, ICH is also linked to well-being. Participation in cultural practices such as music, dance, and traditional arts positively influences emotional states, self-confidence, and social support within communities (Liu & Li, 2020; Min et al., 2020; Caló et al., 2020). In the context of globalization, safeguarding cultural heritage is essential for maintaining cultural diversity and resisting homogenization (Kurin, 2004).

Nevertheless, challenges in safeguarding ICH remain significant. Protection requires active community involvement rather than top-down governance (Smith & Akagawa, 2009, p.45-73). The digital era introduces further complexities, such as data integrity, interoperability, long-term sustainability, and digital obsolescence (Wagner & de Clippele, 2023). Ethical concerns also arise regarding representation and ownership, particularly in cases of sacred or sensitive material (Peña et al., 2023; Markellou, 2023). National legal frameworks are often insufficient to implement international conventions effectively. In Greece, bureaucratic processes hinder protection, while commercialization risks undermining authenticity (Markellou, 2023; Dragouni, 2022). Furthermore, globalization can lead to cultural appropriation and dilution in the absence of adequate legal and economic mechanisms.

Within this broader context, digital storytelling (DST) has emerged as a powerful tool for safeguarding and disseminating ICH. Storytelling has long been a fundamental mode of human communication, encompassing telling, listening, and responding (Behmer, 2005; Ntagiantas et al., 2022). Traditionally conveyed through visual representations such as wall paintings, and later orally and in manuscripts, stories now extend into the digital sphere, where multimedia and interactive tools enable new forms of expression and cultural preservation (Robin, 2008). Digital storytelling combines narrative techniques with images, audio, and video to capture and share personal or cultural narratives (Lambert, 2013). Scholars emphasize its role in providing meaning to experiences (Behmer, 2005), transmitting knowledge (Bruner, 1991), and compactly conveying cultural values (Gershon & Page, 2001).

Applications of DST are wide-ranging. Museums and cultural institutions use it to enhance accessibility and engagement by incorporating multimedia, interactive experiences, and virtual reality into exhibitions (Burgess, 2006; Pujol et al., 2012; Caspani et al., 2017). These techniques foster emotional connections and personalized visitor experiences (Sadik, 2008). In education, DST promotes learning, critical thinking, and local identity (Yang & Wu, 2012; Couldry, 2008). Moreover, digital archives of stories ensure long-term cultural preservation (Lambert, 2013). Challenges remain, however, including technological dependency, accessibility barriers, and the difficulty of maintaining authenticity in digital representations (Lambert, 2013). Yet, advances in artificial intelligence and virtual reality suggest promising opportunities for future applications in cultural heritage.

The discussion of digital heritage naturally extends to the design of mobile applications, which increasingly mediate cultural experiences. While the proliferation of mobile apps highlights their potential, it also reveals inconsistencies in quality and purpose, underscoring the importance of well-

designed products. Central to this is user-centered design (UCD), which prioritizes user needs and involvement throughout the design process (Norman, 1988; Abras et al., 2004). Norman's principles remain influential, stressing affordances, conceptual models, visibility, feedback, constraints, error tolerance, and effective mapping between controls and outcomes.

Beyond usability, user experience (UX) captures the attitudes, behaviors, and emotions associated with interaction (Roto et al., 2011; Hassenzahl & Tractinsky, 2006). It is shaped by user state, system characteristics, and context, requiring both measurable evaluation and contextual sensitivity (Tullis & Albert, 2013). International standards emphasize meeting user needs with simplicity and elegance (ISO, 1998; 2018), while distinguishing UX from usability and interface design (Norman & Nielsen, 1998). Usability itself is defined by effectiveness, efficiency, and satisfaction (ISO 9126, 1991; ISO 9241-11, 1998; 2018), supplemented by learnability, memorability, and error tolerance (Nielsen, 2005; Weichbroth, 2019, 2020). Evaluation methods include surveys, observation, eye-tracking, and cognitive load assessment (Chynał et al., 2012), with mixed-method frameworks such as 3M4MAUME combining quantitative and qualitative insights (Weichbroth, 2019; Konstantakis, 2020).

Recent work in cultural heritage emphasizes context-specific evaluation. For example, Koutsabasis et al. (2021) propose "field playtesting with experts' constructive interaction" to evaluate mobile heritage games, focusing on usability, playability, and cultural content, supported by established instruments such as the System Usability Scale (SUS) (Lewis, 2018) and the User Experience Questionnaire (UEQ) (Schrepp et al., 2017). These approaches highlight the need to balance technological innovation with authenticity in heritage applications. Ultimately, the architecture of mobile heritage applications must embed UCD principles, prioritize usability and UX, and adopt adaptable evaluation methodologies to ensure that digital systems not only function effectively but also enrich visitor experiences and foster meaningful engagement with cultural heritage.

3. State of the Art

This section reviews existing interactive systems and applications that employ digital storytelling for the preservation and dissemination of cultural heritage, with a particular emphasis on intangible heritage, and whose design goals and implementation characteristics align with the specific needs of the Museum of Asia Minor Culture. These systems were selected because they address challenges similar to those identified in our case study—namely, the need to communicate intangible cultural narratives, enhance visitor engagement through meaningful interpretation, and support the transmission of memory and lived experiences through contemporary digital media. By analyzing both scholarly contributions and commercially available solutions, the study provides an overview of the current state of the field, identifying successful approaches, technological innovations, and recurring challenges. Eleven interactive systems were selected for analysis. Selection was based on three primary criteria: (a) the implementation of narrative-driven or otherwise experience-oriented interaction (e.g., digital storytelling), (b) thematic relevance to cultural or specifically Intangible Cultural Heritage, and (c) recency, requiring post-2018 publication for research prototypes or release/update within the last five years for commercial applications. Each system was subsequently evaluated according to key characteristics, including user experience type, thematic content, content

communication media, technological infrastructure, deployment context, platform type, required devices, and pricing model.

The comparative assessment reveals that interactive cultural applications can be broadly categorized according to their usage context: those requiring the user's physical presence at a cultural site, and those accessible regardless of location. This distinction is closely tied to the enabling technologies employed. Location-dependent systems often rely on augmented reality (AR), geolocation services (GPS), or site-specific installations, thereby fostering stronger engagement with exhibits and spaces. Conversely, location-independent applications typically prioritize accessibility and informational content, albeit with more limited interaction.

A further commonality concerns system type and supporting devices. Mobile applications dominate the landscape, offering accessibility and flexibility by leveraging personal smartphones and tablets. This reduces the need for institutions to provide dedicated hardware, although certain contexts, such as immersive installations or VR environments, still require specialized equipment. Finally, the study highlights that most systems are offered free of charge as part of the museum experience, though exceptions exist where additional fees are applied for specific interactive features.

Overall, the analysis underscores the diversity of technological and methodological approaches currently employed, while also identifying patterns that can inform the design of new applications. In particular, the interplay between narrative design, technological choice, and visitor accessibility emerges as a key consideration for the effective integration of digital storytelling into cultural heritage experiences.

4. Methodology

This study employs a case study approach to examine how digital tools can enhance access, storytelling, and the sustainability of intangible cultural heritage. The Museum of Asia Minor Culture in Aigaleo, inaugurated in 2010 by the Association of Asia Minor Refugees "Neas Kydonies" in collaboration with the municipality, was selected as the focus of this investigation. Housed in two preserved refugee dwellings, the museum functions as both a cultural repository and a space of memory, hosting over 150 donated artifacts, including textiles, household items, photographs, documents, and coins, which collectively narrate everyday life in Asia Minor and the resettlement of refugees in Greece. These tangible objects are complemented by archival material and temporary exhibitions that highlight broader intangible dimensions of refugee heritage, such as food culture, social practices, and collective memory (Daskalaki & Koutoulias, 2017).

Figure 1: Museum of Asia Minor Culture, Aigaleo

The museum's mission extends beyond preservation, actively promoting historical awareness and intergenerational dialogue through educational programs and community engagement. Operating largely on a volunteer basis, with limited staff and irregular opening hours, the museum exemplifies both the potential and the challenges small-scale institutions face in safeguarding and transmitting intangible cultural heritage. This context makes it particularly suitable as a case study for exploring the integration of digital applications to enhance visitor engagement and cultural sustainability.

Data collection followed a mixed-methods approach, combining qualitative and quantitative techniques to capture insights from both museum staff and potential visitors. Following an initial assessment of the museum's collection, two semi-structured interviews were conducted with the volunteers responsible for the museum's operations. Given that there are only four active volunteers, this sample represents 50% of the total personnel involved. These interviews sought to understand operational challenges, visitor behavior, and staff perspectives on enhancing engagement. Key findings revealed that the museum operates with a very small team and consists of only two rooms, with visits mostly arranged by appointment. Visitor attendance fluctuates depending on events, with schools comprising a substantial portion of the audience. Staff highlighted the difficulty of maintaining the interest of younger visitors due to the museum's focused theme and limited use of multimedia content. They suggested that a digital application could improve engagement by offering personalized tours, an interactive map with points of interest, and audio-guided narratives, while also conveying intangible heritage elements, such as music and personal stories, which traditional displays often fail to communicate.

To complement staff insights, a quantitative survey was administered to 33 potential visitors to identify challenges during museum experiences and opportunities for improvement. Participants were selected to represent the museum's target audience across three user groups: young adults

(18–34) with moderate museum-going frequency and high technological familiarity; adults (35–54) with higher museum engagement and moderate digital literacy; and older adults (55+) with frequent museum visits but lower familiarity with technology, where accessibility and usability were emphasized. Results showed that insufficient on-site guidance limited visitors' ability to engage deeply with exhibits, while time constraints, clarity of information, and opportunities for personalization emerged as critical factors influencing the overall museum experience. Survey data (N = 33) revealed that the majority of respondents were young adults aged 18–24 (60.6%), with 57.6% reporting rare museum visits and 30.3% frequent visits, indicating both interest and under-engagement among younger audiences. The primary motivations for visiting museums were personal interest in culture and history (81.8%) and entertainment (66.7%), with online search (75.8%) serving as the dominant information source. Interactive systems were identified as the most desirable enrichment medium (23 responses), and although 22 participants did not currently use mobile guide applications, most expressed willingness to adopt them. Preferred application features included audio storytelling (25 responses), personalized navigation (20), interactive mapping (17), and QR-based access to supplementary content (84.8%). Additionally, 90.9% valued the ability to plan their visit, and 75% preferred an application usable both inside and outside the museum. These findings informed the design specifications of the proposed application, emphasizing personalized, narrative-driven interaction supported by audio content, navigation assistance, and context-aware digital resources to enhance engagement and learning.

The requirements for the museum application were derived from both theoretical frameworks and primary research. The application is intended for use before, during, and after museum visits, fostering ongoing engagement and encouraging repeat interactions. It should enable users to plan and schedule visits, thereby enhancing preparation and time management, while also providing updates on upcoming events, museum news, and relevant articles to maintain engagement after the visit. An interactive museum map detailing the layout and thematic areas is essential to improve navigation and overall visitor experience, and digital guided tours with audio storytelling will present selected exhibits through narratives depicting daily life from the relevant historical period, aiming to convey the emotions and thoughts of the people associated with the objects. The application should also provide access to archival materials, allowing exploration of exhibits not on display along with their associated stories, thereby offering a more comprehensive understanding of the collection. Furthermore, AI-based personalization should recommend exhibits and stories aligned with individual visitor interests, ensuring a tailored experience. These requirements guided the design and development of the interactive application, ensuring that it addresses the needs of both museum staff and visitors while emphasizing the preservation and communication of intangible cultural heritage.

5. Development

The implementation of the application was a complex yet highly creative process, involving the integration of multiple tools and stages. After defining the application's specifications and developing the final user flow, high-fidelity wireframes were designed and reviewed with potential users and

museum staff. This iterative feedback enabled minor adjustments at the design stage, saving significant time before actual development.

Once the detailed design was finalized, it was transformed into a functional prototype using FlutterFlow. The use of FlutterFlow was chosen because it enables easy creation of fully functional prototypes without any coding, significantly saving time, which was essential for our project. The implementation process included creating and linking databases, finalizing content (titles, images, descriptions, and audio narrations), and connecting all components to ensure full functionality. Additional features, such as language switching (Greek–English) and theme selection (light–dark mode), were also implemented.

The overall process proceeded smoothly according to plan; however, challenges arose in two main areas: content limitations and technical issues. In both cases, solutions aimed to preserve the integrity of the initial concept. The resulting pilot version of the application meets the primary specifications, while allowing room for future improvements and the integration of emerging technologies.

With the prototype now operational, the next step focused on assessing its effectiveness and usability. This involved evaluating how well the application engages visitors, communicates the cultural context of the exhibits, and supports an immersive experience with the museum's intangible cultural heritage. The following chapter presents the methodology and findings from this comprehensive evaluation.

6. Evaluation

The evaluation aimed to investigate the overall user experience of the application, focusing on its cultural impact and usability. Specifically, it sought to assess how effectively the application enhances visitors' engagement with the museum's Intangible Cultural Heritage (ICH), conveys information clearly, supports navigation, and adds value to the museum visit. Users' perceptions of usefulness and their intention to reuse or recommend the application were also examined.

A mixed-methods approach was adopted, combining qualitative and quantitative methodologies to capture both objective and subjective insights. Task-based evaluations were conducted, in which participants completed predefined tasks while being observed, and were encouraged to verbalize their thoughts to capture difficulties, reactions, and navigation strategies. Post-test questionnaires incorporating items from the System Usability Scale (SUS) were administered to collect structured quantitative data on usability and satisfaction. This integration of observation, performance metrics, and standardized questionnaires allowed for a comprehensive understanding of the application's effectiveness.

The participants in the evaluation process were chosen using the same criteria as those selected for the quantitative survey in the "Methodology" section. Nine participants in total took part, including two museum volunteers to provide insights from staff familiar with the exhibits and user needs. The evaluation sample partially overlapped with the initial survey sample, with five participants taking part in both phases, with two of them being the museum volunteers. This overlap reflects the small scale of the museum and its visitor community. Participants who had been involved in the initial stage were included intentionally, as their familiarity with the museum context enabled

more informed feedback during evaluation, while this overlap may introduce limitations related to sample independence, it was considered acceptable for an exploratory pilot study.

Figure 1: Field user-testing

Tasks were designed to reflect realistic interactions with the application, covering core functionalities with increasing complexity. Participants were asked to explore exhibits, navigate thematic sections, use the audio narration, access archival materials, plan a museum visit, and review museum news. These tasks ensured comprehensive coverage of the application's features without being overly prescriptive.

The evaluation process consisted of three stages. Preparation involved deploying the prototype via web hosting for easy access, developing participant instructions, observation forms, and post-test questionnaires. During the evaluation, participants interacted individually with the application, performing tasks sequentially while the evaluator recorded observations. Debriefing followed, including a discussion of participants' experiences and completion of the questionnaire.

Results indicated that participants found the application's content presentation clear and effective in supporting understanding of the cultural and historical context of the exhibits, with the "Content & Aesthetics" dimension receiving an overall score of 4.6/5. Usability was also positively evaluated, as the application scored 4.4/5 in the usability section, with users reporting that it was easy to use (M = 4.5/5), quickly learnable (M = 4.4/5), well-organized (M = 4.4/5), and supported clear and consistent navigation (M = 4.5/5). The design was also considered helpful for understanding functionality (M = 4.5/5), while system performance was rated highly (M = 4.7/5). Aesthetic aspects and clarity of information were similarly rated, with content judged interesting and useful (M = 4.8/5), visually appealing (M = 4.6/5), and beneficial in enhancing the overall museum experience (M = 4.7/5) and exhibit comprehension (M = 4.6/5). User acceptance was strong, as nearly all participants stated they would use the application again and recommend it to others (both 8/9 strongly agree). Finally, qualitative comments highlighted positive perceptions regarding audio storytelling, content organization, and visual design, while suggestions for improvement included refining iconography, enhancing map-based navigation, and adding additional presentation media such as 3D and AR elements. Collectively, these findings demonstrate the application's potential as an effective tool for cultural mediation and experiential engagement with intangible heritage.

7. Final Product

After completing the evaluation process with users in the field of interest and analyzing the results, certain improvements were made to the application based on feedback to improve the user

experience. Initially, the distribution of information and navigation within the application was reviewed. Thus, the final product is configured as follows:

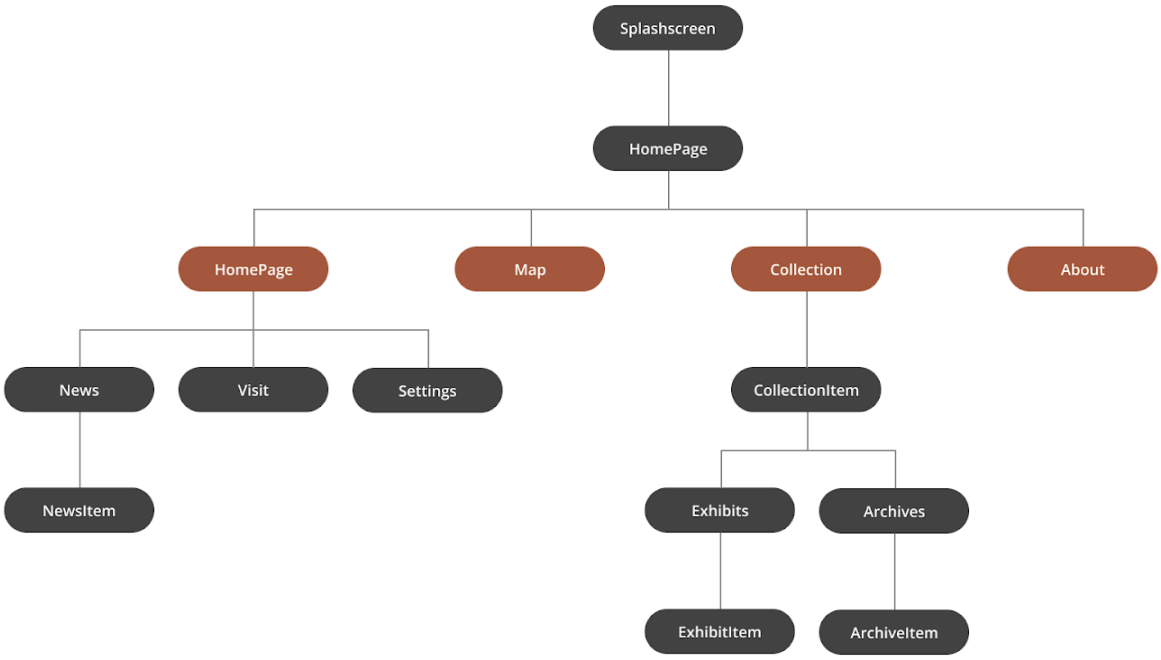

Figure 3: User flow

Upon launching the application, users encounter a splash screen displaying the museum's logo through a short animation, serving both as a loading interface and a branding element. They are then directed to the Home screen, which provides access to the main features. A welcome graphic introduces the user, followed by a News section presenting updates on museum activities, upcoming events, and related articles. By selecting More, users can view the full list of news items in chronological order and access individual pages containing the article's title, image, publication date, and detailed description.

Beneath this section, the Visit feature offers practical information, including the museum's address, transportation options, parking availability, and a static map marking its exact location. Navigation across the application is facilitated by a bottom menu comprising four core sections: Home, Map, Collection, and About. This menu remains fixed for ease of access, while a burger menu in the upper left corner allows functional settings such as language selection (Greek/English) and theme switching (light/dark).

The Map section provides a 3D interactive plan of the museum, highlighting the entrance and a suggested visitor route. Marked points correspond to the eight thematic areas of the collection;

tapping on each reveals its title, brief description, and representative image. This feature is designed to enhance spatial orientation and support self-guided exploration.

The Collection section enables users to explore the museum's exhibits, organized into the eight thematic categories. Each theme page presents two subcategories: stories linked to objects currently on display and those related to archived items. Within each, users can access audio narratives, which may be listened to in any order or following the recommended sequence aligned with the physical exhibition. Story pages include an image of the artifact, an audio player emphasizing its intangible cultural heritage dimension, and a More Information section with contextual and technical details. The prototype was populated with a total of nine digitized exhibits, including oral narratives and archival photographs, reflecting the currently available digital material of the museum's collection. Although limited in scale, this sample was sufficient to evaluate the application's core functionalities, identify usability limitations, and explore its potential for supporting digital storytelling of Intangible Cultural Heritage.

Finally, the About section provides background information about the museum, its mission, and its people, thereby situating the digital experience within its broader institutional and cultural context.

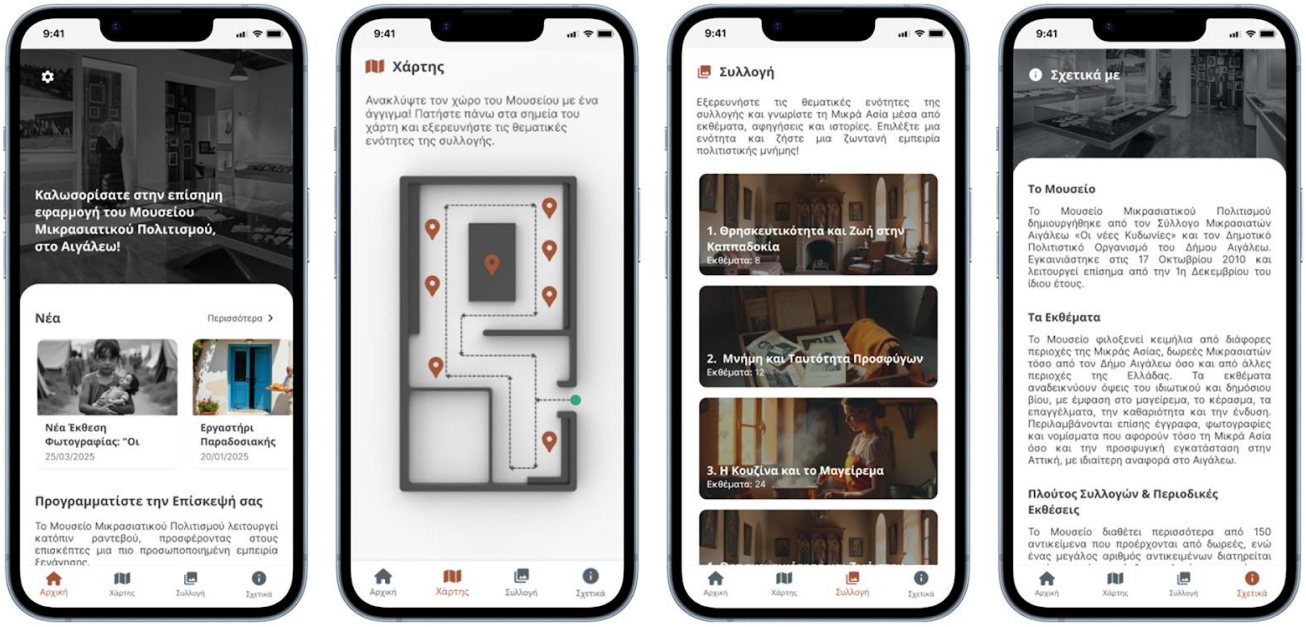

Figure 4: App's main screens

8. Discussion

This research largely followed the Double Diamond model (Design Council), which consists of four stages: Discover, Define, Develop, and Deliver. During the first stage (Discover), secondary research highlighted the importance of Intangible Cultural Heritage (ICH), Digital Storytelling, and principles of interactive application design. Findings showed that ICH extends beyond traditions, songs, or rituals, and significantly contributes to individual well-being, social cohesion, and identity

formation. Its preservation is therefore essential on both personal and collective levels. Storytelling, as a timeless method of knowledge transmission, fosters empathy and emotional engagement. In the digital age, digital storytelling emerges as a powerful tool, not only for safeguarding ICH but also for enhancing accessibility and interactivity within cultural experiences. The analysis of state of the art applications revealed that while most excel in presenting exhibits, they often fail to foster deeper connections with them, focusing primarily on factual information rather than the intangible cultural dimensions that enrich understanding and experience. These insights informed RQ1 regarding the design of digital storytelling to connect tangible exhibits with intangible cultural narratives, which the prototype aimed to address.

In the second stage (Define), application requirements were established through both secondary and primary research, ensuring alignment with user needs, museum priorities, and digital heritage objectives. Survey and evaluation results, as presented earlier in the study, indicated that visitors valued audio storytelling, personalized navigation, and interactive mapping, and expressed strong interest in planning features. These findings provide preliminary evidence for RQ2, highlighting the needs, expectations, and interaction preferences of museum visitors regarding digital tools for ICH interpretation.

The third stage (Develop) involved the design and implementation of the prototype, incorporating user-centered design, usability principles, and overall user experience (UX) considerations. Evaluation results suggested that participants generally found the application clear, usable, and engaging, with high scores for content, aesthetics, and usability. Although these outcomes indicate potential for enhancing engagement, accessibility, and comprehension of ICH—addressing RQ3—these findings remain exploratory and are based on a small sample, which limits their generalizability.

Several limitations emerged during the design, implementation, and evaluation of the application. First, as the project was developed within the scope of a master's thesis, constraints in time and resources were inevitable, leaving some technical challenges unresolved, such as the inability to automatically translate database content and the incomplete development of a digital assistant (AI chatbot). Second, the application was deployed as a functional prototype rather than a fully published product on official platforms. User testing was conducted via FlutterFlow's web deployment, which, although suitable for piloting, presented technical constraints such as reduced performance and occasional text rendering issues. These limitations restricted evaluation under fully realistic conditions. Third, the number of participants in both the primary research (33) and the evaluation (9) was relatively small. Despite ensuring diversity in age, technological familiarity, and museum interest, the limited sample constrains the generalizability of findings. Lastly, content limitations affected the project, as the museum has digitized only a portion of its collection, necessitating placeholder material to demonstrate app functionality. Despite these limitations, the research provides preliminary guidance for design considerations and identifies opportunities for iterative improvement. More broadly, the adopted workflow—from contextual needs analysis and content selection to prototype development and user evaluation—offers a transferable framework that can be adapted by other small museums or institutions working with refugee-related or intangible cultural heritage under comparable resource constraints.

Several opportunities exist for further development and enhancement. Introducing a brief walkthrough for first-time users would provide step-by-step guidance, helping visitors navigate the

app's main functions and reducing the learning curve. Integrating a digital assistant (AI Chatbot) could offer personalized support by directing visitors to relevant exhibits and responding to queries about both the museum and the application. The inclusion of Augmented Reality (AR) would further increase engagement, allowing interactive 3D visualizations of exhibits, including those not physically present, improving understanding and communication of the collection. Accessibility enhancements, such as adjustable font sizes, screen reader support, audio descriptions, and captions, remain a priority to ensure all visitors can engage fully with the content. Expanding the app's content to include a complete list of digitized exhibits and conducting testing in the museum under real-world conditions are essential next steps to verify functionality and enhance user experience.

In conclusion, this study provides exploratory evidence that digital storytelling, when combined with user-centered design, can support meaningful connections between tangible and intangible heritage in small community museums. While results suggest potential benefits for engagement, comprehension, and accessibility, claims have been presented cautiously in line with the pilot nature of the study.

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Conflicts of Interest

The authors declare no conflicts of interest.

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