PUBLIC REPORT EDITION

PARM

User-centred design report

This public edition retains the project context, aggregate findings, design rationale, prototype development, conclusions and limitations.

Individual participant records, interview extracts, verbatim research responses and research-derived persona records are excluded. No filled participant consent forms are included.

Original printed page numbers are retained. Selected sections and appendices are intentionally omitted, so numbering is not continuous. Some references to the original academic appendices remain; the individual records are not part of this public edition.

The report describes exploratory student design research. Its findings should be read with the sample and prototype limitations stated in the report.

PARM

Portsmouth Augmented Reality Museum

User Centered Design - Design Deck

Module

User Centered Design (M34185)

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Executive Summary

This study examines the potential of Augmented Reality (AR) to improve visitor experience at the Portsmouth Museum and Art Gallery, with a particular focus on the Sherlock Holmes Gallery. A survey of 19 adults showed that the Sherlock Holmes Gallery and the Portsmouth FC Gallery were frequently rated as "neutral," whereas other galleries received more favourable ratings. This showed that the Sherlock Holmes area has potential for improvements.

We followed a user-cantered design approach to identify visitor needs, discover primary issues, and develop an augmented reality experience which works with the current Sherlock Holmes exhibits. The gallery mainly consists of glass displays featuring Sherlock-related artifacts and other minor interactive elements. Based on our observations, visitors were not using these areas much or remain for longer periods; therefore, we opted to incorporate a digital layer onto what was already there instead of completely revamping the space.

The result is PARM: Portsmouth Augmented Reality Museum, with a test run centred on the Sherlock Holmes Gallery. Visitors can use:

- **PARM Glasses** - augmented reality glasses designed for museums that transmit audio through the arms and display minimal visual overlays, triggered when the visitor approaches exhibit.

- **PARM Companion** - a mobile application enabling visitors to use their personal devices to scan QR codes or manually choose exhibits, thereby accessing augmented reality overlays and audio content.

PARM Glasses uses proximity for triggering content, whereas PARM Companion uses QR codes or manual selection. In both instances, visitors receive brief narratives, additional details, and multilingual audio option.

"Portsmouth Museums" is a fictional client for this assignment. The project is not an actual commission, but it is intended to simulate realism and apply user-cantered design methodologies in practice.

We communicate the concept with three primary artefacts:

1. An AI-generated video demonstrating the functionality of PARM Glasses, which also serves as a "How to use" instructional guide.

2. A video prototype of the PARM Companion app using QR codes throughout the museum.

3. A simple website that highlights PARM, with videos and introducing the student team and supervisor.

This design deck provides the research, key findings, concept, interaction flow, prototypes, user testing, and reflections.

1. Introduction and Project Context

1.1 Module and Brief

This project is a component of the User-Centered Design module at the University of Portsmouth. The brief requires us to create an interactive product, service, or experience for a specified client, using user-centered design methodologies.

We selected Portsmouth Museums as a hypothetical client and focused on enhancing the visiting experience in the Sherlock Holmes Gallery. The objective is to provide a digital or hybrid solution to improve the engagement and impact of visits, while adhering to practical limitations and without revamping the entire museum.

1.2 Objective of the Project

Our primary objective is to design an augmented reality-enhanced visitor experience at the Sherlock Holmes Gallery, using a mobile application (PARM Companion) and augmented reality glasses (PARM Glasses).

1.3 Why the Sherlock Holmes Gallery

An online survey conducted with 19 participants indicated that the Sherlock Holmes Gallery and the Portsmouth FC Gallery were frequently rated as "neutral." Local history, art, and temporary exhibitions were typically rated more favorably. This suggests that the Sherlock Holmes Gallery is not among the most prominent attractions in the museum for many visitors.

The Sherlock Holmes Gallery mostly features glass displays with Sherlock-themed artifacts and props, along with a few interactive elements, such as a miniature hourglass

timer and a memory-based activity involving materials within a case. Our observations indicate that individuals typically merely glanced at the glass cases before swiftly proceeding onward. Several visitors manipulated the hourglass timer but did not engage with it for an extended duration. There is some interaction; nonetheless, it fails to effectively engage visitors' attention.

Survey respondents indicated a preference for coherent narratives, distinctive presentations, and interactive features. Consequently, given the robust narrative universe of Sherlock Holmes, this gallery appeared to be an appropriate venue for an AR-based design intervention.

1.4 Target Audience

Our focus was on:

- Primary audience: Adult visitors (18+) which includes both casual visitors and enthusiasts.

- Secondary audience: Families with adults and children. We did not do direct research with children; instead, we observed familial behavior within the museum.

1.5 Platforms and Devices

The design involves two interconnected products to accommodate various visitor types:

- **PARM Companion** - a mobile application for visitors who choose to use their personal mobile phones.

- **PARM Glasses** - Augmented reality glasses provided by the museum, with sound being transmitted through the arms of the glasses.

In the expected future iteration:

- PARM Glasses use proximity sensors and computer vision technology to identify when a visitor comes near an exhibit, thereby triggering audio and basic visual overlays automatically.

- PARM Companion allows visitors to scan a QR code next to an exhibit or to pick it manually within the app itself. After that, the phone displays augmented reality overlays in the camera view and emits audio.

In the existing prototype:

- The functionality of the PARM Glasses is demonstrated in an AI-generated conceptual video. The PARM Companion app uses QR codes as a practical way for triggering content.

Both options provide audio in many languages, enabling visitors with limited English proficiency to understand and appreciate the narratives.

1.6 Project Parameters

This research primarily focuses on the visitor experience within the museum. The hypothetical client (Portsmouth Museums) could also need staff tools or internal systems; however, they are beyond the defined scope. Our research, concepts, and prototypes target visitors within the gallery space.

2. Research Methodology

2.1 Ethical Considerations

Our research exclusively involved people aged 18 and older. Children were neither interviewed nor surveyed. We observe families in a subtle manner focusing on general behavioral patterns rather than individual actions.

All participants participated voluntarily. No personal data was collected, and the data utilized in this document is anonymous.

2.2 Employed Methodologies

We used three primary research methodologies in addition to secondary research.

Semi-structured interviews (n = 3)

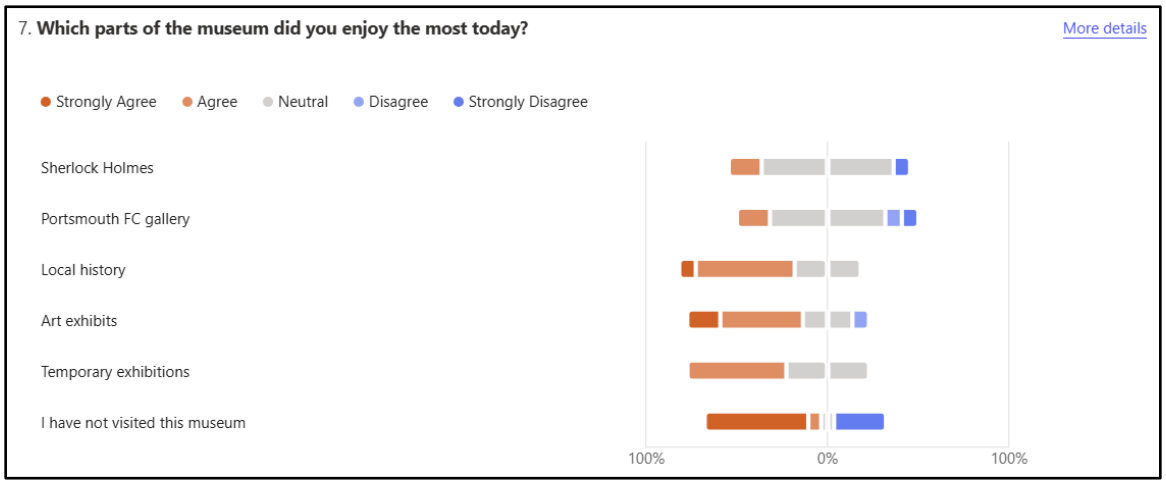
Online survey (n = 19)

Nineteen individuals concluded an online survey. All individuals declared to be 18 years of age or older. The survey asked about:

- How often they visit museums.
- What makes museum visits enjoyable or boring.
- How they see different galleries (for those who knew Portsmouth Museum).
- How they feel about digital and interactive experiences.

A few people had never been to Portsmouth Museum; hence their responses related to museums in general. Others were familiar with the museum and rated all the galleries.

Sherlock Holmes and Portsmouth FC were frequently regarded as neutral, whereas local history, art, and temporary exhibitions received more favourable evaluations.



Observations within the museum

We observed the Sherlock Holmes Gallery, the art gallery, and adjacent areas. We investigated the movement behaviours of visitors and their families, the duration of their stays, the areas they explored, and the things that seemed to either bother or attract them. We noticed:

- Grandparents visiting with their grandchildren. The children often did not seem interested in the exhibits and sometimes ran around or disturbed others, while the adults tried to look at displays.

- Enthusiastic visitors who stopped at certain exhibits engaged in lengthy discussions, occasionally blocking sightlines or disturbing the silence for others.

- A drawing activity in which guests could draw the tree visible from a window. A teenager used this and seemed highly concentrated, showing that straightforward, interactive activities might be effective.

- The art gallery was quiet. Visitors sat on benches and enjoyed the peaceful, calm atmosphere.

- In the Sherlock Holmes Gallery, most visitors quickly skimmed the glass displays before moving on. Some examined the hourglass memory activity, but it failed to engage them.

Secondary analysis

We researched articles and case studies involving augmented reality in museums, digital storytelling, audio guides, and visitor engagement. This enabled us to observe the initiatives of other museums.

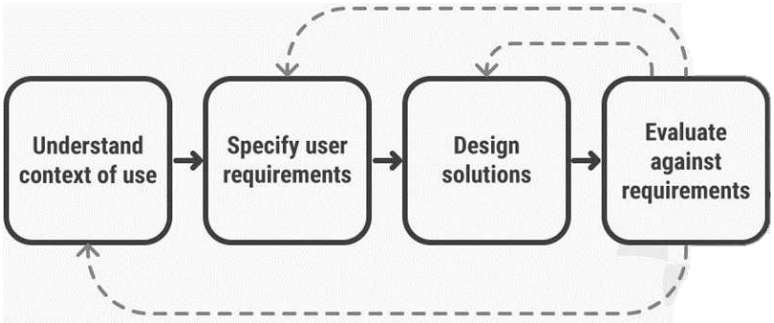
2.3 Justifications for These Methods

Interviews provided deeper understanding of individual motivations and dissatisfaction The survey provided us with a broader view from a larger population. Observations revealed real behaviours inside the museum environment that visitors may not communicate, such as how quickly they move on or how they react to noise and crowds. Secondary research helped us to determine the compatibility of our ideas with current practices in museums.

2.4 User-Centered Design Process

We followed to a straightforward User-Centered Design cycle:

- **Understand** - clarify the brief, visit the museum, run the survey, interviews and observations.
- **Define** - group findings into themes, write visitor needs, create personas, and define the main problem.
- **Create** - sketch ideas, storyboard the experience and build low, mid, and high-fidelity prototypes for both PARM Companion and PARM Glasses.
- **Evaluate** - run a small round of user testing using the concept, the mobile prototype, and the glasses video.



3. Research Synthesis

3.1 Main Themes

From the survey, interviews, and observations, we identified some recurring themes:

- Many exhibits do not feature enough interactivity and appear somewhat uninteresting.
- Lighting, layout, and visibility influence visitors' engagement and duration of stay.
- Exhibits may become boring in the absence of an integrated story or diversity.
- In certain areas, the text is overly extensive or lacks visual appeal for visitors seeking straightforward information.
- Families with children sometimes struggle to keep kids interested and calm.
- Visitors appreciate areas that provide calm and quiet, such as the art gallery section.

Observation provided further details:

- Some highly enthusiastic visitors engage in long conversations about a particular exhibit, which may disrupt others.
- Children in static areas can quickly become bored.

- A simple drawing activity next to the window was effective for a teenager.

- Visitors to the Sherlock Holmes Gallery primarily observed the glass cases before moving on.

3.2 Requirements of Visitors

We identified key visitor requirements from these patterns:

- Short, coherent narratives delivered through audio and visual formats, rather than lengthy paragraphs of text.

- Basic activities, such as scanning or selecting an exhibit, which provide visitors with a sense of engagement rather than just observation.

- Improved support for adults with children, in order not to disturb the other visitors.

- An improved sense of continuity, ensuring activities such as the documentary areas are not seen as separate from the rest of the tour.

- Additional in-depth information for enthusiasts, without overwhelming casual visitors or consuming too much physical space.

These requirements influenced our user personas and our concept for PARM.

3.3 Digital and Augmented Reality Opportunities

Most survey participants have previously engaged with various forms of digital or interactive exhibits, such as screens, applications, and audio guides. They showed interest in:

- Audio or visual storytelling
- Augmented Reality views or 3D models
- Behind-the-scenes details
- Guided digital tours.

Interviewees shared a positive view of digital aids, including audio tours and apps, provided they were user-friendly and did not interfere with the viewing of exhibits.

Most participants stated a desire to find additional stories or contextual information. Very few said “no” to this. They also rated the importance of sharing digital experiences with others to be in the mid to high range.

This supports an augmented reality solution that incorporates storytelling components, optional additional information, and shared experiences, rather than maintaining a purely static gallery.

3.4 Design Specifications (summary)

Our survey, interviews, observations, and secondary research resulted in a summary of the main design requirements for PARM:

- **Short, story-based content** - Provide short audio/video stories linked to Sherlock exhibits instead of long text labels.

- **Easy to start and use** - The experience should be understandable within a few seconds, with a simple start flow and clear language selection.

- **Works for solo adults and families** - Support adults visiting alone and adults with children, without adding extra effort for parents or grandparents.

- **Multilingual access** - Offer content in different languages, so visitors who do not speak English well can still follow the experience.

- **Exhibit-first, screen-second** - Keep the focus on the physical glass cases and objects and use the screen only as support.

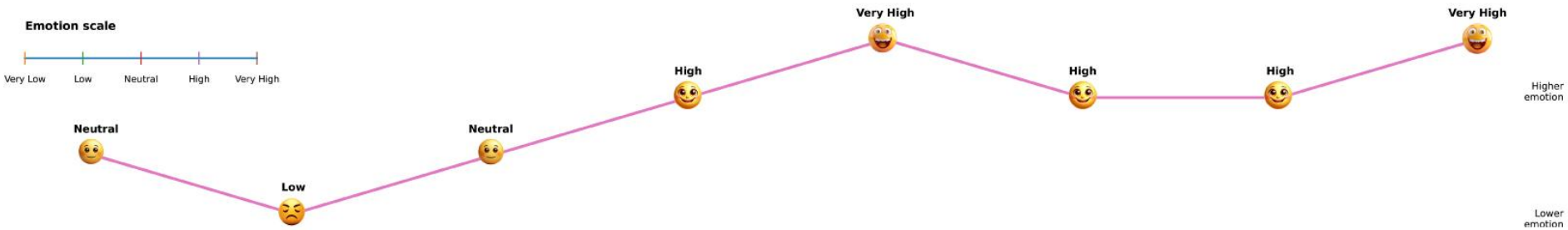
- **Simple physical interaction** - Use light gestures (scan, look, listen) that work while standing, often with one hand free.

- **Scalable across the museum** - The same pattern (start - trigger - story) should be easy to reuse in other galleries in the future.

These requirements guided our decisions about interaction, visual design and what to include in the prototype.

4.2 Journey Map

We mapped a simple user journey of an adult visiting the museum and the Sherlock Holmes Gallery:



1 Before I go	2 I arrive	3 I get the glasses	4 Sherlock is right there	5 First AR moment	6 I explore more	7 I finish + return	8 After the visit
What I do I check what s inside, opening times, and what to see first.	**What I do** I enter the museum and look for the AR start point / info desk.	**What I do** I choose language, wear the glasses, and do a quick setup..	**What I do** I turn left and I m already at the Sherlock collection.	**What I do** I look at the artefact and start the AR story.	**What I do** I try more items, choose extra info, and keep the story going	**What I do** I end the experience, then return the glasses at the right place.	**What I do** I want a recap of what I saw and something easy to share.
What I feel Neutral (not sure yet)	**What I feel** A bit stressed	**What I feel** Okay but cautious	**What I feel** Relieved (easy to start)	**What I feel** WOW / excited	**What I feel** Interested (can get tired)	**What I feel** Satisfied if it s smooth	**What I feel** Happy if I have a recap
Pain points Not clear what s best. AR feels confusing before I try it.	**Pain points** Signage not clear. I don t want to ask for help too much.	**Pain points** Fit/comfort (over my glasses). Too many steps to start	**Pain points** I m there fast, but I m not sure which artefacts support AR (no clear markers).	**Pain points** Trigger fails / slow start. Audio hard to hear in the gallery.	**Pain points** Too much text. Controls not obvious. My eyes get tired.	**Pain points** Ending feels sudden. Return point not clear.	**Pain points** No saved highlights or summary. I forget details later.

5. Problem Definition

Based on the research, we defined the primary issue as follows:

Adult visitors often fail to connect fully with the Sherlock Holmes Gallery due to this because the experience is mostly built around glass showcases with limited interactions. The story seems broken, and there are few opportunities for visitors to engage or participate in the experience more actively.

Related issues:

- Parents lack sufficient resources to engage youngsters without causing disturbances.
- The documentary area is a compelling segment, yet it exists in isolation and lacks a clear connection to the remainder of the museum.
- Enthusiasts want additional detail and context beyond what is presently accessible on the site.
- The Sherlock Holmes Gallery lacks a distinct feeling of development or "journey."

This issue drove our ideation and helped in refining the concept.

6. Ideation and Opportunity Framing

6.1 How Might We Questions

We converted the issues into "**How might we...**" questions to help with ideation:

I. How might we use AR to make the glass showcase-based displays feel more alive and story driven?

II. How might we support both casual visitors and enthusiasts with layered storytelling and optional deeper content?

III. How might we create simple shared focus points for adults and children that are engaging but not too disruptive?

IV. How might we extend the feeling of the documentary room into other parts of the visit?

We considered additional concepts, like dedicated family modes, unique detective-style "cases," and mini-games, but we ultimately opted to retain the initial version in a simpler and more realistic form.

6.2 Conceptual Exploration

We explored multiple possibilities:

- A basic QR audio guide with some text and images.
- Pure AR overlays that appear when visitors look at objects, with no extra control.
- A strict linear AR tour that reuses the documentary content in other rooms.
- A flexible AR layer that adds short stories and extra details to selected Sherlock objects and props.

The most promising concept was a system in which:

- PARM Glasses automatically trigger audio and overlays when visitors approach key exhibits.

- PARM Companion uses QR scanning or manual selection to trigger similar content on a phone.

6.3 Final Concept

PARM: Portsmouth Augmented Reality Museum - Sherlock Holmes Gallery Experience

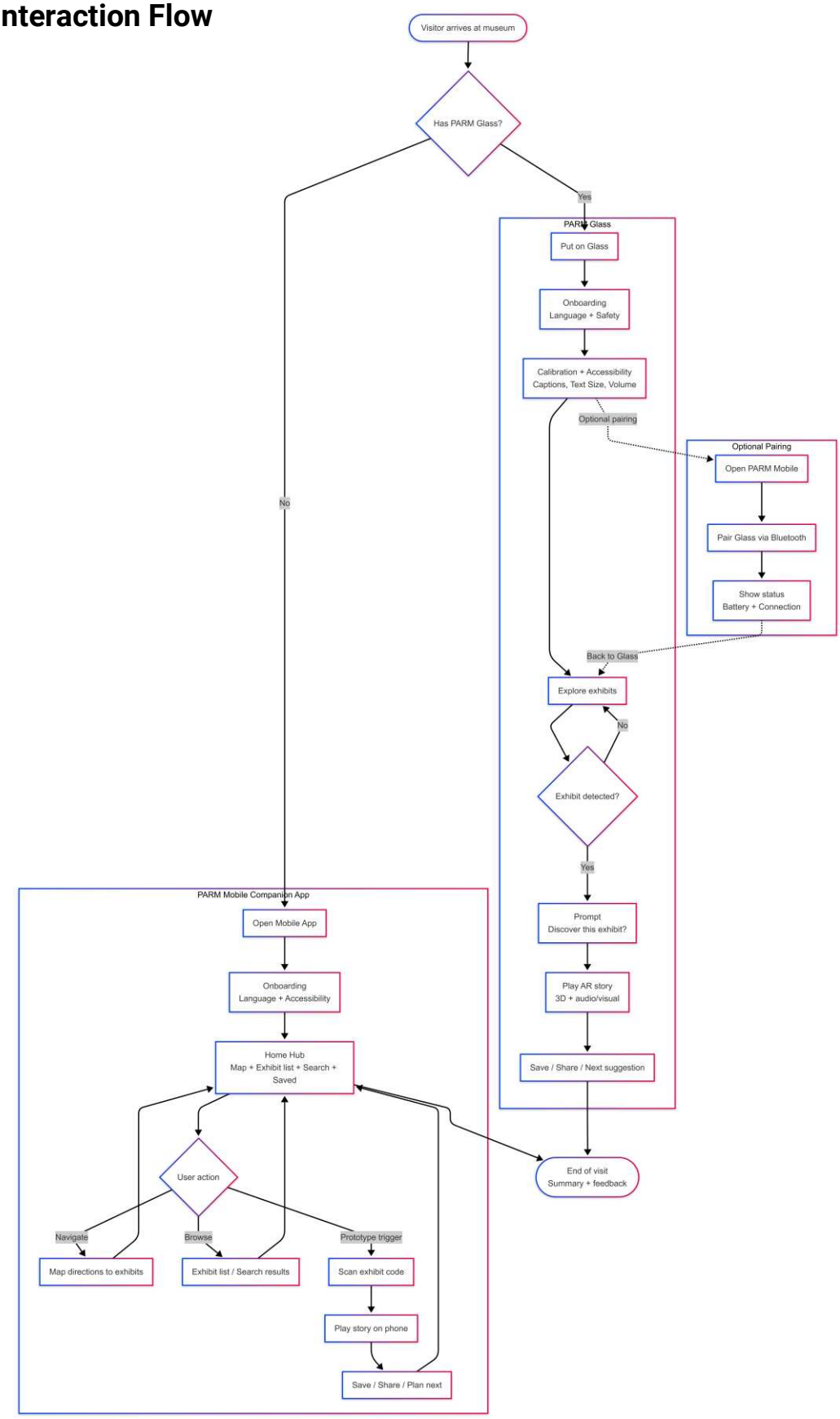
The idea is to maintain the physical gallery in its current state while integrating a digital overlay. In response to many visitors expressing that they skim lengthy texts and prefer auditory storytelling, we designed PARM to have short audio and video stories triggered at each case, rather than lengthy on-screen paragraphs.

I. Visitors using PARM Glasses receive automatic, proximity-based audio and video overlays when standing near specified glass showcases.

II. Visitors using the PARM Companion can scan a QR code or select an exhibit on their mobile phones to access augmented reality overlays and listen to relevant audio content.

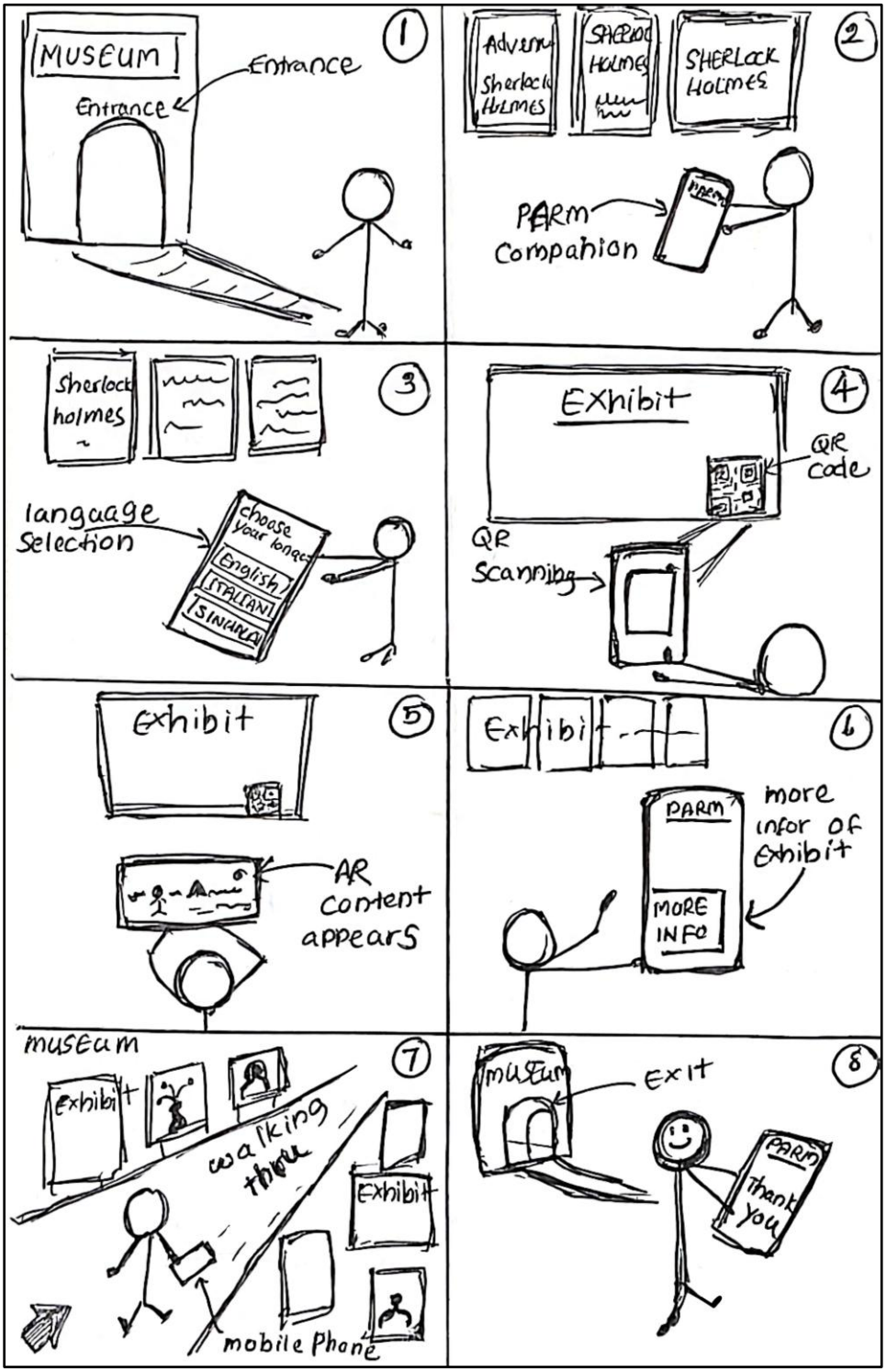
In this initial version, the interaction is straightforward: approach or scan, followed by listening and observing. We regard features such as extensive detective "case solving" or gamification as potential enhancements rather than essential components of this prototype.

7. Interaction Flow



8. Storyboard of the Experience

The storyboard shows a simple visit using PARM Companion to the Sherlock Holmes Gallery:



1. **Arrival**
   The visitor walks up to the museum and goes inside.

2. **Finding PARM**
   Near the Sherlock area, they see information about PARM Companion and take out their phone.

3. **Choosing a language**
   They open the app and pick their language before starting.

4. **First scan**
   In front of a Sherlock glass case, they use the app to scan the QR code next to the exhibit.

5. **Story starts.**
   The app recognizes the exhibit and plays an AR-style video with audio while the visitor looks at the real objects.

6. **Extra detail (future idea)**
   The storyboard also shows a possible “More info” style screen as an idea for a later version with deeper content, even though this is not part of the current prototype.

7. **Moving on**
   The visitor walks to the next case and repeats the same scan-and-listen pattern around the gallery.

8. **End of visit**
   When they are finished, they get a simple “Thank you” message and leave the museum.

9. Interface Design and Visual Language

9.1 Design Objectives

Throughout the development of the PARM interface, we maintained certain key considerations.

- The focus should always be the real museum exhibits, not the app or the glasses.
- People should be able to understand what to do in a few seconds, even if they have never used it before.
- Text on screen should be short and simple, with audio carrying most of the explanation.
- The mobile app and the AR glasses should feel like one system, not two unrelated products.
- Screens should only show a small number of choices at a time, so visitors do not feel overwhelmed.
- The app should be easy to use with one hand, because visitors might be holding a bag, a coat or something else.

These objectives guided our arrangement of screens, selection of colors, and placement of buttons and labels.

9.2 Visual Languages

To facilitate these objectives, we used a uniform visual language throughout the app and the glasses. Our survey and interviews showed that cluttering layouts and heavy text can discourage users; therefore, we adopted a calm, minimalist design that clearly highlights the most critical tasks.

Backgrounds

- We use dark backgrounds, so text and images are easy to read and see.
- The screens are kept clean, without patterns, so they do not compete with the physical space.

Color

- We use one main accent color for important actions and interactive elements.
- A second accent color is used for supporting actions.
- Other elements use neutral tones, so the important parts stand out clearly.

Typography

- Headings use a serif font that feels appropriate for a museum context.
- Body text, labels, and buttons use a sans serif font that is easier to read on screens.
- We keep a clear hierarchy with different sizes and weights so people can quickly see what a title is and what is normal text.

Components and layout

- Buttons and cards have rounded corners and clear shapes, so it is obvious what can be tapped.
- Icons are simple and always paired with short text labels.
- There is enough space between groups of elements to avoid clutter and make it easier to scan the screen.

Feedback and States

- Interactive elements change state when they are tapped or selected, so visitors know something has happened.
- Short messages appear when content is loading or playing, but they do not cover the main view.

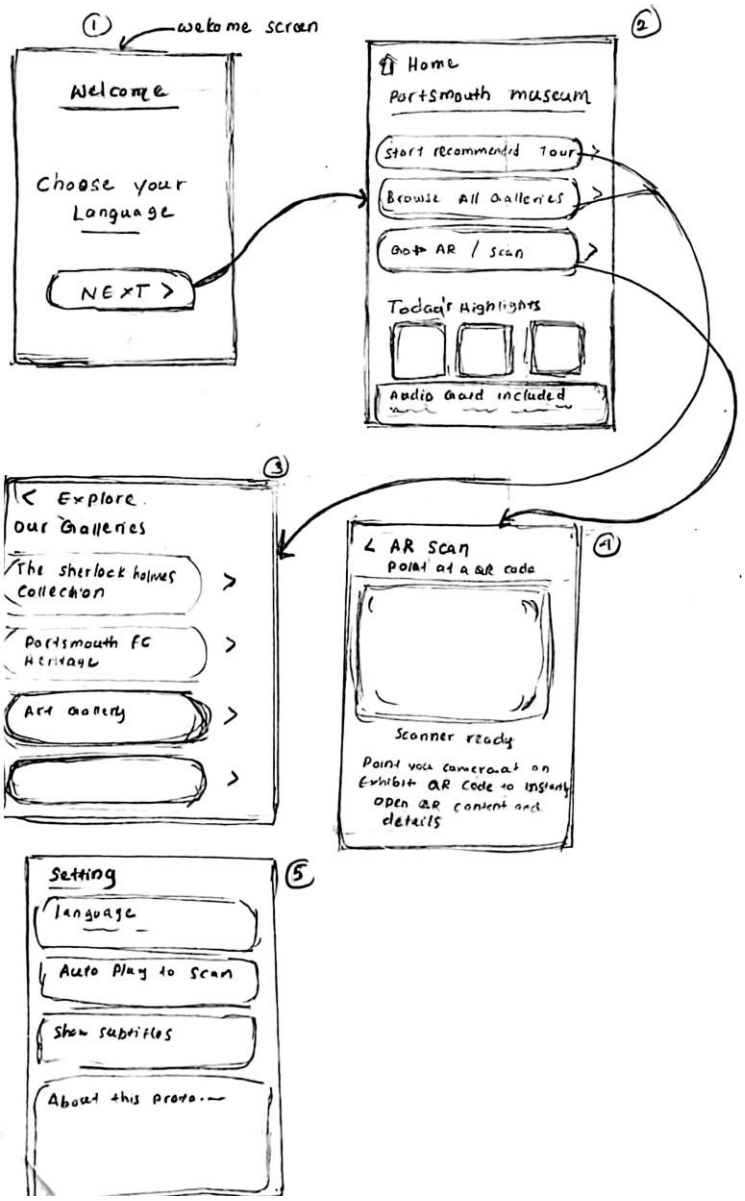
10. Prototyping

We used different levels of prototypes to shape and show the concept.

10.1 Low Fidelity Prototypes

We started with low-fidelity sketches:

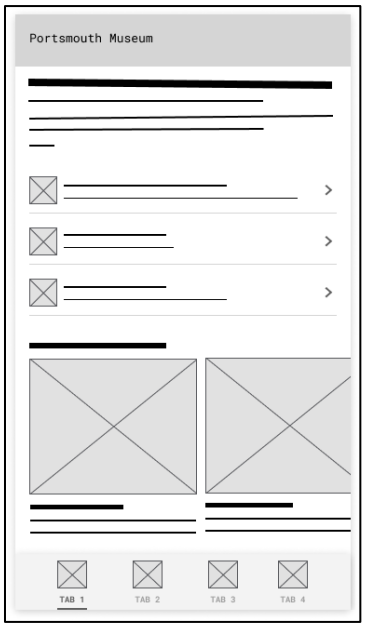
- Hand-drawn screens for the mobile app and glasses views.
- Quick flows to evaluate the order of screens and actions.
- Simple clickable mockups to check basic navigation.

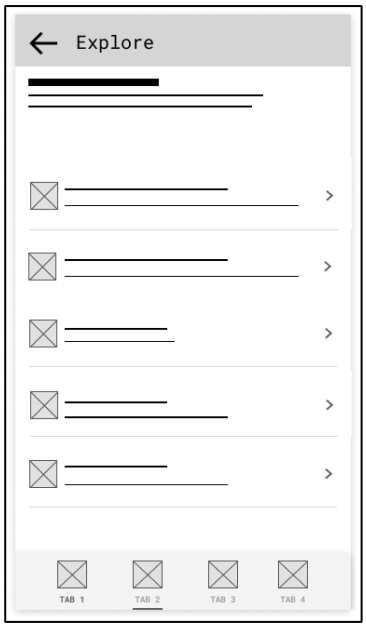


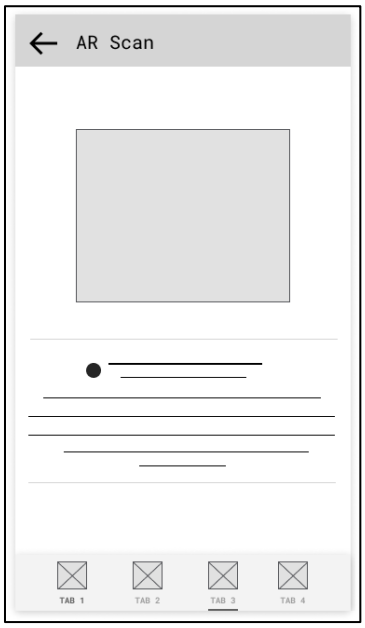
10.2 Mid Fidelity Prototypes

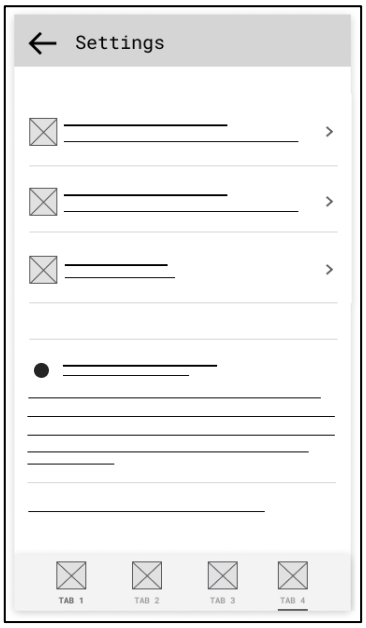
Next, we made mid fidelity digital wireframes:

- Grey box layouts to organise content and UI elements.
- Early camera views with placeholder overlays.
- Testing of where buttons and text should go before adding visual style.





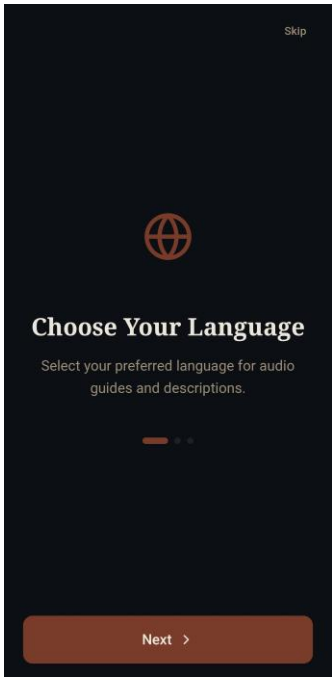


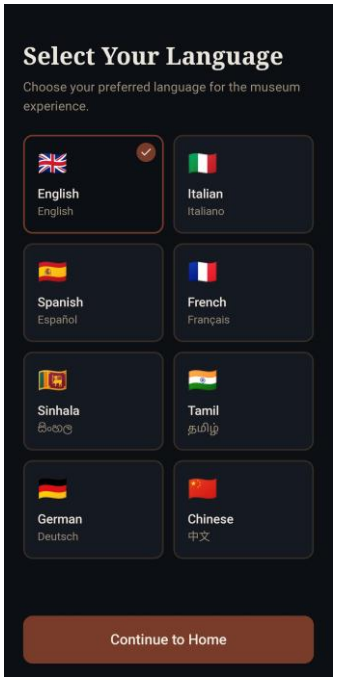


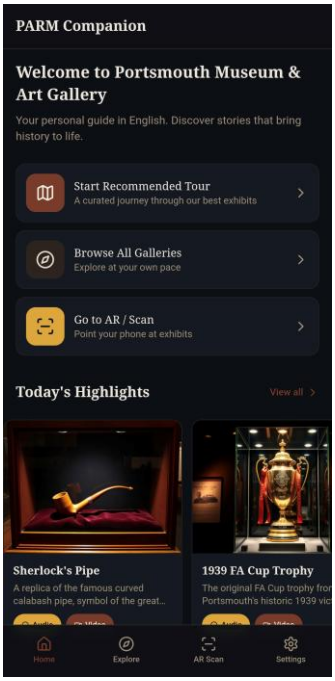
10.3 High Fidelity Prototypes and Videos

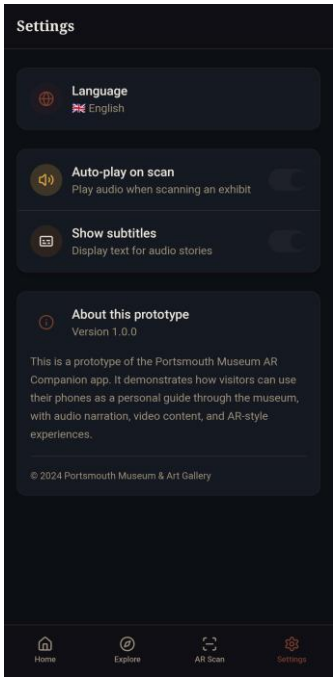
We then moved to high fidelity prototypes and videos:

- Final visual style for PARM Companion screens.
- Simulated AR overlays on top of museum photos or mockups.
- Simple representations of what the PARM Glasses view would look like.









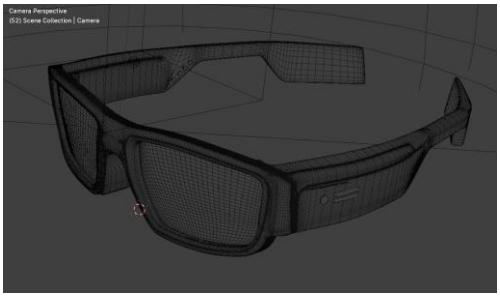
We created two main videos:

- **PARM Glasses concept and tutorial video (AI-generated)** - Shows a person putting on the glasses, adjusting them, choosing a language, and walking through exhibits. As they approach certain glass cases, content is triggered automatically and plays through the glasses.

- **PARM Companion video prototype** - Shows a visitor scanning QR codes with the app and seeing AR-style video and audio content for each exhibit.

These videos help people quickly understand how PARM would feel in the real museum.

10.4 PARM Glasses (3D Model Renders)

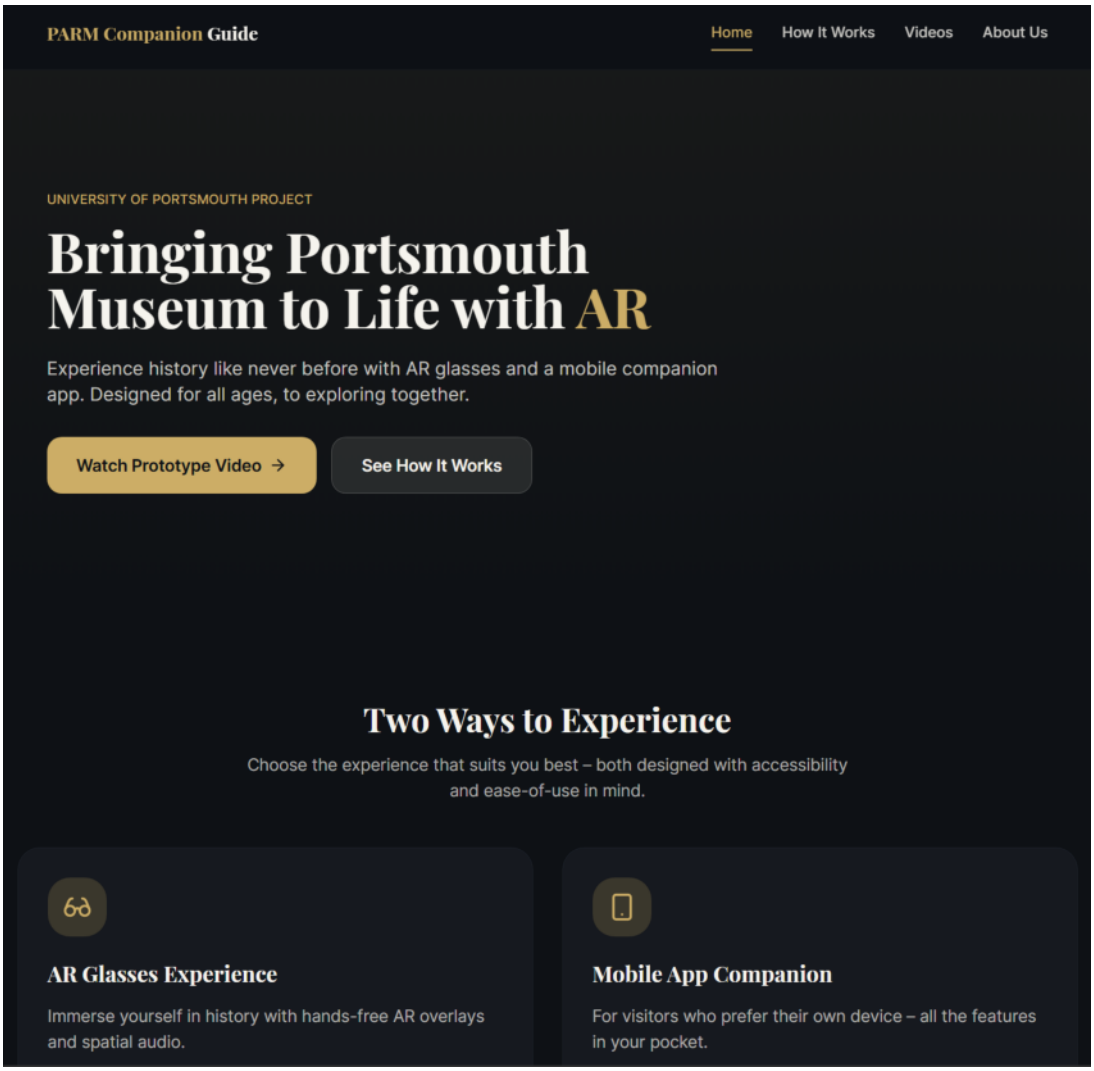


10.5 Communication Website

We also built a small website for PARM. The website:

- Presents PARM Glasses and PARM Companion as products.
- Embed both prototype videos.
- Includes an “About Us” section with details of the team, module, fictional client, and supervisor.

The website is not part of the actual museum experience, but it is useful for explaining the concept and presenting the work in a way that feels professional.



11. User Testing and Quick Evaluation

11.1 Approach

We planned and performed a brief session of user testing to determine whether the fundamental interaction with PARM was understandable to individuals unfamiliar with it. The main focus was on the simplicity of the experience, how easy it was to start, and the effectiveness of integrating augmented reality with the physical exhibits.

We evaluated PARM with **two adult volunteers** who had previous experience in visiting museums.

Our focus was on:

- Whether participants understood the intended purpose of PARM.
- Whether they could start the experience without an extensive explanation.
- Whether the QR scanning and AR video/audio flow felt clear and simple.

11.2 Materials

We used the following for the session:

- The PARM Glasses concept video, to show how the glasses work with proximity-based triggers.
- The PARM Companion mobile app prototype, running on a phone.
- A printed QR code, which we asked participants to treat as if it was on a real Sherlock Holmes exhibit label in the museum.

This setup helped us to replicate the experience of standing before an exhibit and using PARM, even though we were not physically in the gallery.

11.3 Responsibilities

Each participant was instructed to do a brief series of tasks:

- **Start the experience.**
    - Open PARM Companion, select a language and find the Sherlock Holmes experience.
- **Scan a "real" exhibit.**
    - Use the app to navigate to the scan option and scan the printed QR code, imagining it is next to a Sherlock Holmes glass case.
    - Let the AR experience load and start playing.
- Understand the glasses.
    - Watch the PARM Glasses video and explain, in their own words, how the glasses would work when walking around the gallery.

While they were doing this, we took short notes about where they hesitated, what they tapped first, and any comments they voiced.

11.4 Results from quick user testing

From this quick round of testing (observing the tasks and then asking participants about their experience), a few clear points came up:

- **Onboarding felt straightforward.**
  Both participants understood that PARM is something you use together with the real exhibits. The Sherlock Holmes start screen and language choice were easy to follow.

- **QR scanning felt natural.**
  Participants immediately held the phone up to the QR code and were able to trigger the content without extra instructions. After scanning, the AR experience was launched on the phone and a short video related to the exhibit played in an AR - style view.

- **Audio / video combination worked well.**
  Both said they liked that the explanation came through a mix of audio and video in the AR view, while they looked at the real objects in the glass case. They felt it was more engaging than just reading labels.

- **Flow made sense as a simple loop.**
  The loop of "start - scan - AR video + audio - move to the next exhibit' was easy to understand. Participants said they could imagine repeating this around the gallery.

- **Glasses concept was understood but feels like a future step.**
  After watching the video, participants could describe the main behavior of the glasses (proximity triggers, audio in the frame, light overlays). They also commented that trying them in the real space would help them picture it even more clearly.

Overall, these findings suggest that the main flow of PARM is understandable for first-time users.

11.5 Potential Future Design Improvements

Based on this evaluation, the next changes to the design we would consider are:

- **Improved scan feedback**

  While scanning was successful, we believe it would be good to have a brief "scanning…" state and a visible "Exhibit found" confirmation before launching the AR Experience, so visitors are consistently aware of the QR code's recognition.

- **Minimal audio/video controls and popup**

  Make sure that the play/pause controls are clearly visible in the AR view and display an estimated duration for the video or audio (e.g., "approximately 1 minute"), allowing visitors to figure out the time they will spend at each exhibit.

- **Consistent navigation to the homepage**

  Provide an easy way to return to the home screen, preventing visitors from feeling stuck to a single page of the prototype.

This quick test does not replace full in-museum evaluation, but it already gives us concrete ideas to make PARM clearer and more comfortable to use.

12. Reflection on Process and Solution

12.1 Reflection on Process

Using a user-centered design approach enabled us to avoid creating just based on our own preconceptions. The survey, interviews, and observations provided us with a greater understanding of adult engagement with the museum, including their frustrations and preferences. Tools such as affinity maps, personas, journey maps, and storyboards helped our development from data to a clear concept. The different stages (understand, define, create, evaluate) helped the justification of our choices in design and showed the relevance of each step to real visitor insights.

12.2 Reflection on Solution

The PARM Sherlock Holmes experience:

- Adds a digital layer on top of the glass showcases instead of replacing them.
- Offers short audio / video stories and optional extra depth in the overall concept.
- Gives adults with children a shared focus (looking at the same case while audio and video play), which may reduce running around and disturbance.
- Extends interpretive content beyond the documentary room into other parts of the visit.
- Let visitors choose between their own phone or museum glasses.

However, there are limitations:

- PARM depends on working hardware and networks.
- QR and proximity detection must be dependable, or visitors will get frustrated.
- Some visitors may not want to use any technology at all and should still be able to enjoy the gallery.
- We have only evaluated the experience in a small way, not with real visitors in the actual space.

12.3 Implications, Challenges and Limitations

For the (fictional) museum client, PARM implies:

- A move towards a more digital, hybrid museum experience.
- They need to maintain hardware, update content and support visitors who use the system.
- Coordination between curators, designers, and technical partners.

Challenges include:

- Cost and maintenance of AR glasses.
- Dependable QR and proximity tracking in a changing physical space.
- Supporting visitors who are less confident with technology.
- Keeping content accurate, accessible, and aligned with museum goals.

13. Future Opportunities

We see this prototype as the first version. If PARM was developed further, there are two main directions: growing it across the museum and making it more inclusive.

13.1 Growing PARM in the museum

In the future, PARM could:

- Extend to other galleries and themes in the museum, not only Sherlock Holmes.
- Offer seasonal or rotating AR stories, so there is a reason for people to come back at different times of the year.
- Include simple analytics, so the museum can see which exhibits people trigger most and where they drop off and then improve those areas.
- Add light gamification for children and families, such as small AR mini games, stamp collecting, or points for scanning certain exhibits.
- Be used with school groups, by working with museum educators to design content that fits school visits and specific learning goals.

13.2 Accessibility and inclusive design

We also see future opportunities to make PARM more accessible for different kinds of disabilities. Later versions could include:

- Audio descriptions for visual content, so blind and low-vision visitors can still follow what is happening in the AR stories.

- Captions and a transcript toggle for every AR and video moment, so Deaf and hard-of-hearing visitors can read what is being said.

- Text size and high contrast mode in the app, to help people with low vision and to make reading easier for people with dyslexia.

- BSL video summaries for key exhibits, which would fit well in a UK museum context.

- A “quiet mode” or sensory-friendly route, with fewer sounds and clearer pacing for visitors with autism or sensory sensitivity.

- Step-free route guidance in the app, highlighting lifts, ramps and accessible toilets for wheelchair users and visitors with mobility needs.

- A one-tap “Need help?” button, with simple instructions on how to get staff support quickly, so visitors feel more confident and safer while using the system.

This shows how PARM could grow over time, both across the museum and for a wider range of visitors, not just the “average” visitor.

14. References (Harvard Style)

[1] Cuseum (no date) Results from augmented reality museum visitor impact study. CultureHive, Arts Marketing Association.

[2] Gong, Z. (2022) 'Augmented reality (AR) as a tool for engaging museum visitors', Heritage, 2(1).

[3] International Organization for Standardization (2019) ISO 9241-210:2019 ergonomics of human - system interaction - human-centered design for interactive systems. Geneva: ISO.

[4] Interaction Design Foundation (no date) 'User-centered design (UCD)'.

[5] MuseumNext (2024a) 'How museums are using augmented reality', MuseumNext Advisor.

[6] MuseumNext (2024b) 'How can audio guides transform your museum experience', MuseumNext Advisor.

[7] Museums + Heritage Advisor (2018) 'Digital Museum guides: audio, apps and augmented reality'.

[8] Sycomore (no date) 'Why multilingual audio guides are essential for attracting international audiences'.

[9] Userfocus (no date) 'ISO 13407 is dead. Long live ISO 9241-210'.

[10] Wong, A. (2015) 'The whole story and then some: digital storytelling in evolving museum practice', in Museums and the Web 2015.

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