STONE SEEKERS - The Design Brief -

A personalized museum experience for the Mineralogical Collection “Luigi Bombicci Museum”

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Introduction

This design brief presents the project “Stone Seekers”, an installation of a digital interactive experience designed for the Mineralogical Collection “Luigi Bombicci Museum” in Bologna. The project aims to create a personalized, memorable experience of the visit of the museum through digital interactions using touch screen kiosks installed in the exhibition space. The experience is composed of a series of events in which each will feature interactive activities including personality tests, fun fact quizzes, and photographic booths. The development of these activities is based on established theoretical concepts, such as the 10 Cognitive Goals in Digital Heritage. The process of shaping the concept was guided by the CoDesign framework. A simulated user journey was created using Twine, and a prototype of the application was developed with Figma.

1. The Context

1-1. The museum and its content/collection

The Mineralogical Collection “Luigi Bombicci Museum” is a part of the SMA (Sistema Museale di Ateneo), a museum network of 15 different museums and collections owned by the University of Bologna. The network covers a wide range of disciplines, representing rich cultural heritage deriving from research of both scientific and historical viewpoints since the university’s foundation in 1088.

The museum exhibits approximately nine thousand specimens, mostly mineral samples of various geo-mineralogical aspects. Their major feature is the systematic mineralogical collections, which displays over three thousand specimens organized according to the chemical-structural classification. Additional highlights include a rare meteorite collection, an amber collection consisting of over four hundred Sicilian specimens, and showcases of precious stones including a beautiful gold nugget and some diamonds. The museum also features ancient scientific instruments and tools such as microscopes, protractors and spectroscopes. One attractive exhibition is a small booth showcasing a selection of fluorescent minerals, allowing visitors to observe their glow-in-the-dark properties in a controlled, darkened environment.

The museum is named after its founder Luigi Bombicci, a prominent mineralogist and geologist appointed as a full professor of mineralogy at the University of Bologna at the age of 27. His research primarily focused on the origin and evolution of Italian minerals, with a particular emphasis on those from Emilia Romagna and Tuscany. His interests extended to terrestrial physics, meteorites, meteorology. He was also recognized for his educational passion, deeply invested in educational reform and left a remarkable production of scholarly works.

The establishment of the museum traces back to 1862, when Luigi Bombicci was appointed as the first holder of the Chair of Mineralogy at the University of Bologna. The current building of the museum was completed in 1907 after his death.

1-2. The location and its map/plan

The Mineralogical Collection “Luigi Bombicci Museum” is situated in the historical center of the city of Bologna, in Piazza di Porta San Donato. The location of the museum is on the first floor of the building of the Department of Earth Sciences of the University of Bologna.

The exhibition space occupies 850 square meters, and layouted as represented in the image.

On the left side of the image, the orange-marked area (#1–10) represents the main systematic mineralogical collections, which features a wide variety of minerals from around the world.

The green-marked area on the right (#20–29) highlights minerals sourced from different regions across Italy.

The pink section (#18–19) focuses specifically on specimens originating from Bologna. At the top of the image, the area numbered 13–17 showcases a selection of petrological samples. In addition to these major sections, smaller display cases throughout the exhibition feature minerals of various types and sizes, enriching the overall diversity of the collection.

1-3. Institutional goal

After conducting an on-site visit and observing the museum environment, we identified three institutional goals for our project:

- Use existing assets in new ways
- Change visitor attitudes
- Increase visitor numbers and outreach

Among these, our project primarily focuses on **using existing assets in new ways**. Even to a non-expert, it was evident that the collection is remarkable; it is well-preserved, abundant, and high quality. However, the accompanying labels and texts seemed minimal, giving the impression that the exhibits have been placed on display without any kind of narrative. Therefore, our first objective is to enhance the appeal of these rich collections.

The second goal is to **change visitor attitudes, from passive observation to curious exploration**. As the museum focuses on the specialized fields of mineralogy and geology, potential visitors may assume the content is somewhat unapproachable, difficult or irrelevant. However, from our visit we saw the museum's potential to overturn these preconceptions.

The last goal is to **increase visitor numbers and outreach**. According to a census survey conducted by ISTAT[1], the museum had 2,568 visitors in 2022, which ranks 31st out of 43 museums in the municipality of Bologna. The most visited museum in Bologna is the Museo Civico Archeologico with 128,351 visitors in 2022. Even within the SMA network, the Collezione di Geologia “Museo Giovanni Capellini” received 19,817 annual visitors, roughly eight times more than the mineralogy museum. We therefore aim to increase the museum’s visibility and attract a broader audience through our project.

1-4. Cognitive goals

The primary cognitive goal we aim to bring to the audience is to **boost enchantment**. We have adopted this because of the enchanting quality that minerals have in their nature. Minerals have captivated humans of different cultures and generations, whether as gemstones, sacred artifacts, protective charms, or symbols of wealth. In this sense, aiming to enhance enchantment aligns naturally with the very essence of minerals. Moreover, enchantment is a universally acknowledged concept that does not require prior knowledge and can be felt intuitively. As noted by Perry(2019), enchantment is “a state of wonder”, and can be “generated by emotive engagement,” suggesting that small emotional triggers can effectively spark this state. Thus we sought to create experiences that evoke subtle emotional responses to boost enchantment for visitors.

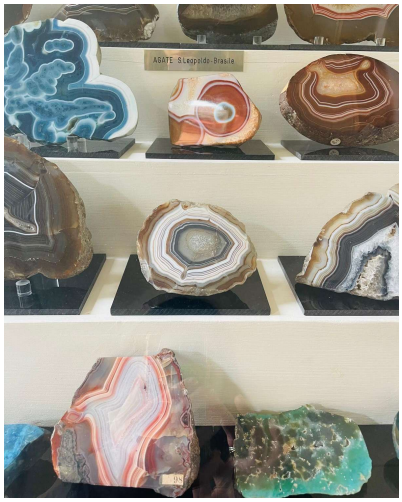
Another cognitive goal we chose to include is to **extend knowledge**. Given that the museum is a part of a university network, we believe it is essential to retain an academic dimension in our approach.The International Council of Museum’s (ICOM, 2022) latest definition states that a

[1] Istituto Nazionale di Statistica (ISTAT), *Survey on Museums and Other Cultural Institutions: Microdata for research* (2024), https://www.istat.it/en/microdata/survey-on-museums-and-other-cultural-institutions/.

museum is a space that offers “varied experiences for education, enjoyment, reflection and knowledge sharing,” with education being the first purpose listed. Rather than targeting only a scholarly audience with educational purposes, we broadened our goal to the concept of “knowledge” for the wider public, with an aim to deliver it in a way that is both engaging and meaningful.

1-5. Star assets

We have identified **the exhibits** as the star assets of the museum, with reference to the richness in quantity and quality in the collections itself. The minerals, densely arranged within the display cases, are individually striking in their form, color, and texture, each offering a unique visual experience. Other features include a massive amethyst, locally sourced stones from Bologna, and polished precious minerals, all distributed across various sections of the exhibition space. These distinctive pieces contribute to the overall richness and appeal of the collection.



1-6. Target audience

Currently, the museum's audience is largely composed of students and experts, followed by tourists. The museum regularly offers laboratory-based educational activities mainly aimed at engaging children and family groups.

2. The Audience

The target audience identified for this project falls under the category of **citizens**, and we have further defined it to be **people interested in minerals**. While the museum has the potential to reach a wider population, its relatively low visitor numbers suggest limited public recognition. For this reason, we have chosen to first focus on local citizens and students, particularly those who have some degree of curiosity towards the subject. In this context, "interest" does not refer to strong expertise or academic engagement with mineralogy or geology, but rather to a more casual or indirect interest. We consider them a light-interest segment, with whom the museum could build meaningful initial engagement.

2-1. Motivations

We have presumed the motivations of the target audience to be **curiosity** and **aesthetic pleasure**. As we have identified, our experience is intended for those with a light-interest in minerals; individuals who are drawn to beautiful jewelry, have an interest in power stones, or who merely appreciate earth and nature. They may not actively seek for geological knowledge, but possess a curiosity, with potential to be captivated by the aesthetic and emotive aspects of minerals.

2-2. Barriers

One significant limitation for visiting the museum is its **restrictive opening hours.** The Luigi Bombicci Museum is currently open only in the mornings from Tuesday to Friday, and only during the month of July is it accessible on weekends. This schedule makes it difficult for a large portion of workers and students to visit the museum, as they are typically occupied during weekday mornings. In order to engage the identified target audience more effectively, an adjustment to the opening hours is essential. While it is understandable that staffing constraints may currently pose challenges, ideally, the museum could consider opening on at least one weekend day and to possibly extend its hours into the afternoon on certain days. Such changes would greatly enhance accessibility and inclusivity for a broader public.

The second barrier is perceived **irrelevance**. Even if people have a latent interest in minerals, they may feel the museum is not for them. This perception is also likely shaped by various external factors, such as the limited opening hours or the lack of accessible information online,

which make it difficult for visitors to derive any kind of relevance to themselves with the museum.

2-3. Capabilities

The experience is designed not to require advanced technical skills. It is assumed that users possess basic digital literacy, such as browsing **websites** to search for necessary information or installing and using **mobile applications.** While the usage of **social media networks** is not essential, it is already a familiar tool for most of our core target visitors, and the act of sharing experiences through social media could be favorable in terms of enhancing outreach and promotional impact.

2-4. Devices

In relation to the capabilities mentioned above, the expected devices that the target audience is likely to use include:

- Smartphone
- Tablet
- Camera

Since our experience involves touchscreen interaction on displays, it will be similar to using a tablet. Therefore, a basic level of comfort with widely used digital devices should be sufficient to engage with the experience. The user's own device will not be used throughout the experience.

3. Concept

3-1. Problems facing the project

Despite its rich mineralogical collection, attractive location in the historic center of Bologna,and free admission, the Luigi Bombicci Museum has low public recognition. Notably, while the museum holds a high rating on Google (4.8 stars based on 33 reviews), the low number of reviews indicates limited visitor engagement and awareness.

Additionally, there are few materials and resources for both physical and digital formats that explain or promote the museum. For example, there are only a few available physical pamphlets to navigate the museum, and digital resources such as maps or catalogs are often only available in Italian, which restricts accessibility for non-Italian speakers. The museum does not seem to be engaged in any kind of promotional or marketing activities, which result in the lack of contact points with visitors.

We have identified that these issues addressed are connected to the **lack of an initial "hook"** to attract potential visitors. Without a clear, effective entry point or connection, potential audiences may fail to see the relevance of the museum to their own lives. Furthermore,

because there are few opportunities for initial contact or engagement, the museum continues to feel overly academic and inaccessible, even for those who could potentially be interested.

In response to such challenges, we sought to design an experience with the possibility to change the current relationship between visitors and the museum.

3-2. How the project will face the problems

To address the problem of lacking relatable contact points with the visitor, our project proposes an interactive, storytelling-based experience designed to foster **a personal and familiar connection** between visitors and the museum's mineralogical collection.

We aim to encourage visitors to explore minerals not only as scientific objects but as objects that are relevant to each individual's interests and their perception of their lives and culture. The objective of this project is to make the museum and the field of mineralogy feel more relevant and approachable.

To achieve this, we plan to install a storytelling experience using a touch-based digital interface, placed inside the exhibition space. The experience includes a series of short interactive activities, in which visitors are invited to engage in freely while viewing the physical collections. The activities are saved internally in a machine readable card with memory which is given to the users upon entrance, making it a personalized experience. To make the visit a lasting memory, visitors receive a take-away element at the end of their journey.

3-3. Museological approach

In the museological context, the project is rooted upon the **audience-centered approach**, with a particular emphasis on **active participation and engaging visitors.** The approach aligns with ideas such as John Dewey's theory of experiential learning, which emphasizes that knowledge is best acquired through active involvement and personal discovery. It also draws on Nina Simon's concept of the participatory museum, which advocates for museums to become platforms for collaboration, community engagement, and co-creation.

The project is designed to be **phygital**, a hybridization between physical presence in the museum and usage of digital devices and interfaces. The focus however, remains on the in-person museum visit, to enhance but not to distract the original exhibition. The aim is to deepen the visitor's memory and emotional connection to the museum itself, not to replace or overshadow it.

3-4. Specific themes and topics you have selected as case study for your PW

The central concept of this project revolves around designing an experience that creates a connection with humans and nature, by fostering a relationship between the individual and the mineral. We have developed interactive activities within the experience to serve as engaging entry points for visitors. Below are the activities and the order the visitor will experience them.

1. A personality test linking mineral traits with human characteristics.
2. A narrative of the mineral's origin with historical and cultural context, with fun-fact quizzes.
3. A photo booth in which visitors can reflect themselves through their linked minerals.

The first part of the experience was intended to catch the visitor's initial attention by adding **meaningful content**. To strategically enhance this by including a sense of individuality, the experience begins with the visitor entering their name, which will be displayed throughout the interaction. We chose a personality test as the starting activity, as it creates a light and engaging dialogue with the visitor, effectively connecting them to the subject of minerals.

Once the user is matched with a mineral that reflects aspects of their personality, this personal connection serves to stimulate **curiosity** and deepen emotional engagement. This stimulation of curiosity triggers **information-seeking behavior**. The visitor will have options to freely explore the actual mineral specimens on display, where they can actively fill knowledge gaps and explore further.

The second activity presents scientific, historical, and cultural information that are not available in the physical exhibition. This content is structured in an approachable narrative format, designed to lower the barrier to entry while preserving academic value. With this we aim to activate a **positive feedback and reward loop**, as theorized by Maruyama, which encourages knowledge extension.

Finally, the third component invites users to reflect on their journey by visualizing their connection with minerals. This serves as both a **personal memento** and a means of boosting the enchantment of minerals, enhanced through the use of digital graphics. In doing so, the visitor not only leaves with new knowledge but also with an emotional and memorable imprint of the experience.

4. Requirements

4-1. Must

- The installation should be entirely accessible and usable without asking users to download an app or even use their own devices; any interaction may be only through touch screen kiosks that are museum-owned.
- Use scannable QR badges (no app download) for customized experiences and souvenir access.
- Material should be offered in Italian and English to serve both local and foreign visitors.
- The experience should have value added to the underlying assets (the mineral collections) and not detract from the physical exhibits, strengthening a narrative approach that increases enchantment and comprehension.
- The system should be easy to use and accessible to visitors with little digital literacy, for example, children and older adults

4-2. Should

Major requirements that offer a lot of added value but are not strictly obligatory:

- The experience should offer customized experiences (e.g., personality tests, interactive stories) that connect visitors' interests to a specific mineral or topic.
- The experience needs to include a take-home element (e.g., a customized "mineral seeker" card or certificate) to reinforce memory and sharing.
- The experience should make sharing easy (e.g., through QR codes for digital keepsakes or emailing digital certificates and portraits), amplifying the museum's reach.
- The system should be simple to update by museum staff for keeping the experience up-to-date and current.
- Visual and sensory interaction must be part of the installation, such as interactive quizzes, fun facts, and photo booths.

4-3. Could

Desirable aspects that would make the experience even better if feasible:

- The installation can be provided with voice instructions for greater accessibility, especially for visually challenged visitors.
- It may be able to be extended to support other languages than Italian and English for more international scope.
- The system could include gamified elements like scavenger hunts, achievement badges to attract kids and families even more.
- The installation could collect anonymous usage statistics (with clear permission) to inform future development and measure engagement.

4-4. Won't

Features that will not be included in the current project scope:

- There will be no requirement for users to log in or register to use the installation and thus the museum will not process or store any personally identifiable information.

5. Ideation

5-1. Experience (from the user's perspective)

- Arrival- Visitors are provided with a **smart card or QR badge** bearing their name and session ID, welcoming them to begin their personalized experience.

- Personality Test- They take a **short quiz** at the first kiosk to discover their mineral identity and view a 3D model along with facts and symbolic meaning.

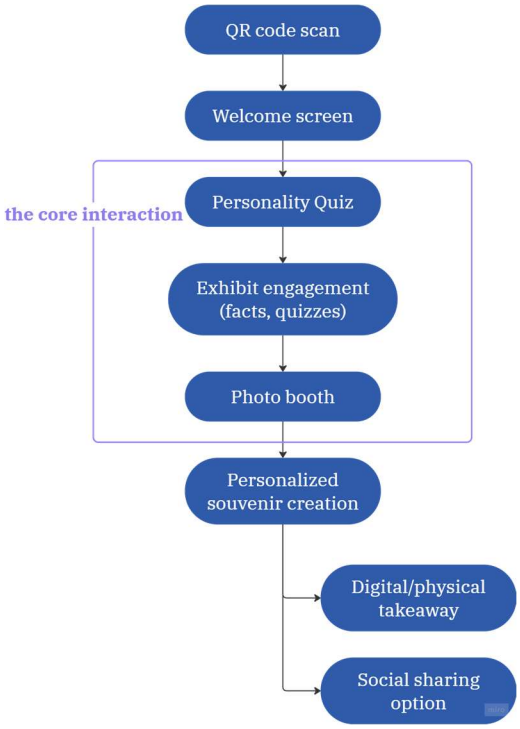
- Crystal Journey - Guests learn where their mineral is created, learn about its historic and cultural uses, and engage in an interactive "**Two Truths and a Lie**" game with real and imaginary stories.

- Reflection Core- An AR station allows them to see themselves with a **crystal overlay**, take a themed photo, and create a digital postcard to send or email.

- Memory Vault- At the final stop, they receive a personalized **Crystal ID Card** with their name and mineral, as well as the option to save a digital memory.

Throughout the experience, each station develops knowledge, emotion, and interactivity, creating a memorable connection to Earth's minerals and a personal individual story.

5-2. Conceptual Map



5-3. The Story (Interactive Narrative Example)

Narrative Arc: "You are a Stone Seeker. Today, you'll discover which mineral resonates with your personality and unlock hidden stories behind the stones." Visitors go on a branching story tour that interweaves factual information in imaginative narratives. Each choice establishes a unique path within the mineral exhibit, encouraging individual interest and participation.

Branching Choices:

- Visitors answer a personality quiz that assigns a "mineral twin" to determine which stories and exhibits are highlighted.

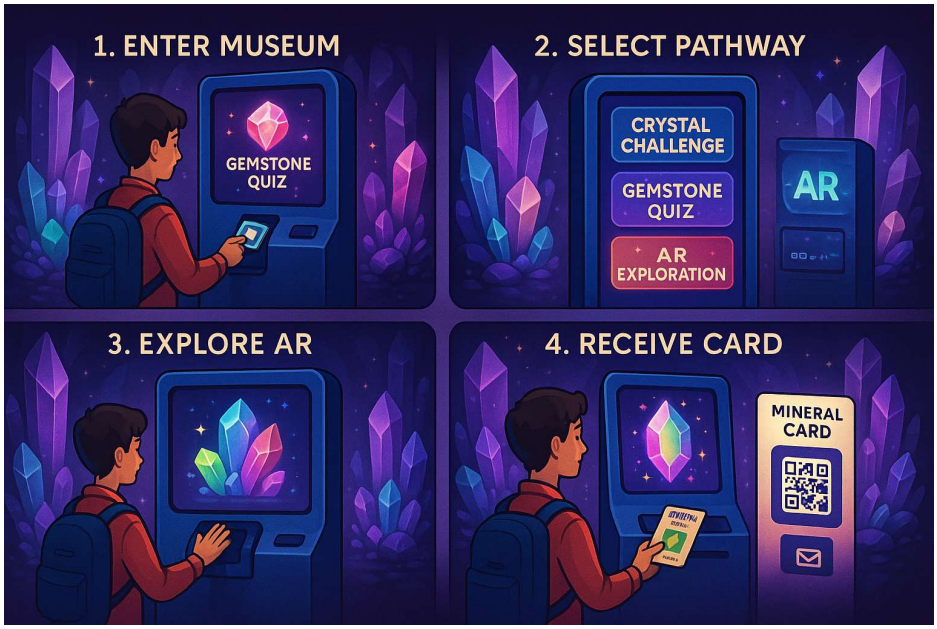
- Each response personalizes future content, emphasizing different minerals, historical facts, or interactive puzzles.

- Real vs. Fiction (Two Truths and a Lie) is a voluntary game that encourages critical thinking and playfulness by challenging visitors to distinguish accurate mineral lore from myths.

This approach utilizes gaps in interactivity and storytelling to inspire imagination and prolonged engagement, as with more advanced digital storytelling techniques in museums

5-4. Description of Interaction (Interaction Diagram)

This interaction sequence ensures a seamless, engaging, and personalized visitor experience, balancing digital and physical museum elements.



- Visitors start by scanning their QR code or smart card at the kiosk in order to activate their experience. They select their interests and answer a brief personality test that reveals their mineral persona.
- The kiosk then continues to guide them through an experience with interactive pieces including stories, images, quizzes, and optional augmented reality. Along the way, they can answer questions, figure out fun puzzles, and even engage in the "Two Truths and a Lie" game for an immunity challenge. At the AR station, they see special mineral effects come to life.
- When finished, the kiosk produces a customized keepsake— a printed mineral card they can take home—and offers options to easily share their experience through QR code or e-mail link.

5-5. Foreseen Workflow

1. **Onboarding:** Visitor activates session by scanning QR code or smart card; greeted with a welcome screen and invited to take the personality quiz.

2. **Exploration:** a tailored journey map guides visitors through selected exhibits, unlocking interactive content and AR visualizations.

3. **Engagement:** Visitors complete quizzes and the Two Truths and a Lie challenge; optionally take themed photos or record short video reflections.

4. **Closure:** The kiosk generates a personalized “Stone Seeker” card (both digital and printed). Visitors access their Memory Vault online and can share their experience via QR code.

This workflow promotes active learning and emotional connection, enhancing visitor satisfaction and repeat engagement.

5-6. Set-Up: Hardware, Software, Media

- Hardware:
    - Touchscreen kiosks for onboarding and exploration.
    - AR-enabled camera stations for immersive mineral visualizations.
    - Optional tablets for supplementary interactive modules.
    - Photo printers for personalized mineral cards.

- Software:
    - An operating system (such as Windows, Android, or Linux) for the foundational environment, configured in kiosk mode
    - Develop the main application functions and interface design using HTML, JavaScript, applying content management systems for interactive display.
    - Use Blender for applying high resolution 3D images
    - Security tools, and remote controls can be added for updates or fixes.

- Digital Assets:
    - Comprehensive mineral database including text, images, and metadata.
    - High-quality 3D models of selected minerals.
    - Audio and text-based narratives available in Italian and English.

This technical setup supports a rich, multimodal storytelling experience aligned with current museum digital innovation trends.

5-7. Further Development and Maintenance

- **Content Updates:** Modular content structure allows museum staff to easily add or modify quizzes, mineral profiles, and stories without advanced technical skills.

- **Technical Support:** Scheduled maintenance ensures hardware and software stability; clear troubleshooting protocols empower on-site staff.

- **User Feedback:** Integrated feedback tools collect visitor impressions and suggestions; optional anonymous analytics (with consent) track engagement to inform iterative improvements.

- **Analog Backup:** Printed maps and quiz cards provide a fallback to maintain experience continuity during technical outages.

These provisions ensure sustainability, resilience, and continuous enhancement of the visitor experience.

6. Disruption

6-1. Environment

In order to complement the mineral collection, and not to overpower it with other activities. The kiosk installations help in transforming the museum environment into an interactive one. The experience becomes dynamic, memorable and personally meaningful.

- **Active engagement rather than passive viewing-** The installation transforms the museum experience into active engagement with the mineral collection through digital stories, quizzes, and personality tests.
- **Seamless digital-physical integration-** Interactive kiosks complement and support the physical exhibits without overwhelming them, creating a seamless visitor journey that integrates digital and physical elements cohesively.

6-2. Engagement

To solve the issue of losing engagement from visitors some loyalty building initiatives could be implemented that helps the visitor to remember the visit. Currently the implemented solution includes - Customized take-home documents (“Stone Seeker” cards) with inspirational messages such as *“Just like minerals, you evolve”* build emotional connections and encourage repeat visits.
Other possible actions that could help in increasing the user engagement are-

- **Tiered recognition and rewards-** Tiered badges or certificates for returning visitors foster a sense of belonging and ongoing engagement with the museum.

- **Loyalty codes-** Unique loyalty codes on smart cards motivate repeat visits and the discovery of new mineral identities, deepening visitor involvement over time.

6-3. Resilience and Sustainability

Resilience and sustainability are central to a system's design. And certain solutions have been implemented to reduce the technical barrier and ensure operational reliability even in events of technical outages.

- **Low-maintenance design-** The system is designed to be easily updated by museum staff without reliance on visitor devices or continuous internet access, reducing technical barriers.

- **Analog fallback-** Printed maps, quizzes, and kits serve as resilient alternatives to maintain engagement in case of technical issues or outages, ensuring uninterrupted access to the experience.

- **Energy-efficient hardware-** Low-power devices and green technologies could be used to promote environmental responsibility and operational reliability.

6-4. Accessibility

Accessibility is fundamental to increase the outreach of any museum and since this museum is not accessible to people who don't understand Italian so in order to make it accessible to a wider population and all age groups while maintaining a simple user interface which is intuitive and does not require any assistance to move through. The steps implemented are

- **Barrier-free interaction:**
  All interactive content is provided via museum kiosks, removing the need for personal devices or app downloads and ensuring accessibility regardless of visitors' digital literacy or device ownership.

- **Enhanced accessibility features:**
  Optional voice assistance and tactile models support visitors with visual or motor impairments, broadening inclusion.

- **Multilingual accessibility:**
  Multilingual audio commentary and subtitles can help bridge language gaps and make the experience welcoming to a wider audience.

6-6. Data and Ethics

The approach to data and ethics is rooted in privacy and transparency. The system is designed to operate without collecting personally identifiable information, instead relying on anonymous session tokens that are automatically deleted after each visit.

- **Ethical data use-** Only anonymized, aggregated data are collected to analyze visitor flow and exhibit popularity, with no individual tracking or profiling.

- **Transparency and consent-** Visitors are clearly informed about data practices and can opt out of any optional data collection, fostering trust and compliance with data protection principles.

7. Team Role

To start, we decided to collaborate more tightly in order to comprehend each phase and ensure the quality of our output. We collaborated to perform the ideation process, combining our ideas to form the concept and objectives of the project. In the following phase of this project the major division of responsibilities looked like

Shiho Nakamura- UX Designing on Twine, Personality Quiz on the Figma Prototype.
Rumana Mehboob - Figma Prototyping and Content handling and Creation.

This division is suggestive and not exhaustive and towards the end of the project, we had both been actively involved in all stages, right from conceptual development to testing, so that our ultimate product was a result of collaboration and complementary expertise.

8. UX Scenario

The link to the Twine user scenario:
https://samuraimasala.github.io/StoneSeekers/TwineScenario.html

Our GitHub repository:
https://github.com/SamuraiMasala/StoneSeekers

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