

Alma Mater Studiorum - Università di Bologna  
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**Museum Explorers:**  
**A gamified experience of the treasures of Museo Civico**  
**Archeologico of Bologna**

Design Brief

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## INTRODUCTION

*Museum Explorers* is a gamification project in which the user engages in a quest for archeological treasures from the History of Bologna. It is based on some of the collections of the *Bologna Civic Archaeological Museum (Museo Civico Archeologico di Bologna)*. Walking through the Prehistoric, Etruscan, Celtic, and Roman collections of the Museo Civico Archeologico of Bologna, the user finds some of the most interesting objects to understand the material culture that survived until today.

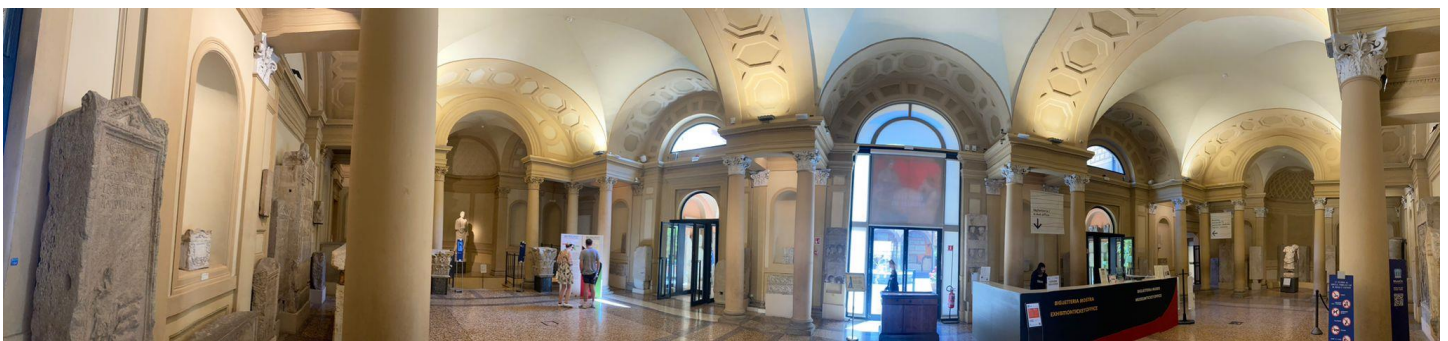
### 1. THE CONTEXT

#### 1.1 Bologna: a city with layers of history

Bologna is full of history, which started even before the invention of writing. The first inhabitants must have arrived in the territory around the 3rd millennium BCE, with notable settlements emerging around the 9th century BCE during the Villanovan Etruscan culture. The Etruscan civilization extended its influence on the region between the 7th and 6th centuries BCE, leading to the establishment of the Etruscan city of *Felsina* at what Bologna by the end of the 6th century is now. By the 4th century BCE, the *Gaulish Boii* occupied the site, which later became a Roman colony.

Roman *Bononia*, established in 196 BCE, was strategically located along the *Via Aemilia*, facilitating trade and military movement. *Bononia* thrived economically, benefiting from fertile lands and a robust trade network, particularly in wool and textiles. The legacy of Roman *Bononia* is still evident in the archaeological remains found in modern Bologna. Like the Etruscans and Gauls, these remains are in the *Bologna Civic Archaeological Museum (Museo Civico Archeologico di Bologna)*.

#### 1.2 Museo Civico Archeologico: a museum full of treasures



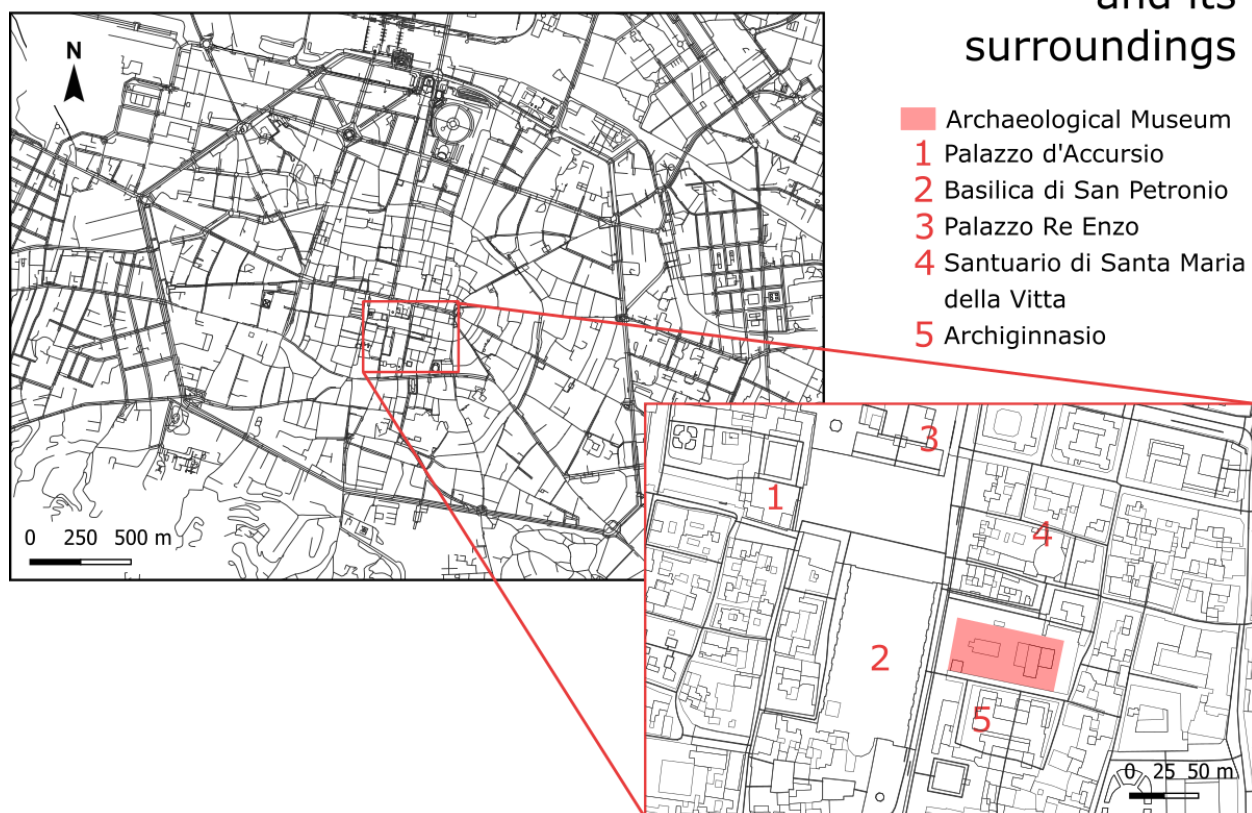
*Panorama of the Museum's entrance hall*

The *Museo Civico Archeologico* (Civic Archeological Museum) of Bologna is one of the museums held by the *Comune* (Municipality) of Bologna. It was founded in 1881 as the city's first historical museum. Initially, it was divided into two sections: an archeological section and one medieval and modern section. In 1985, the second section was transformed into another museum, the Museo Civico Medievale, located in the Palazzo Ghisilardi Fava.

The museum's collections combine material owned by the University of Bologna in the old Museo di Antichità, the material owned by Comune di Bologna in the Biblioteca dell'Archiginnasio, the collection of the artist Pelagio Palagi, and archeological finds made after the museum's constitution.

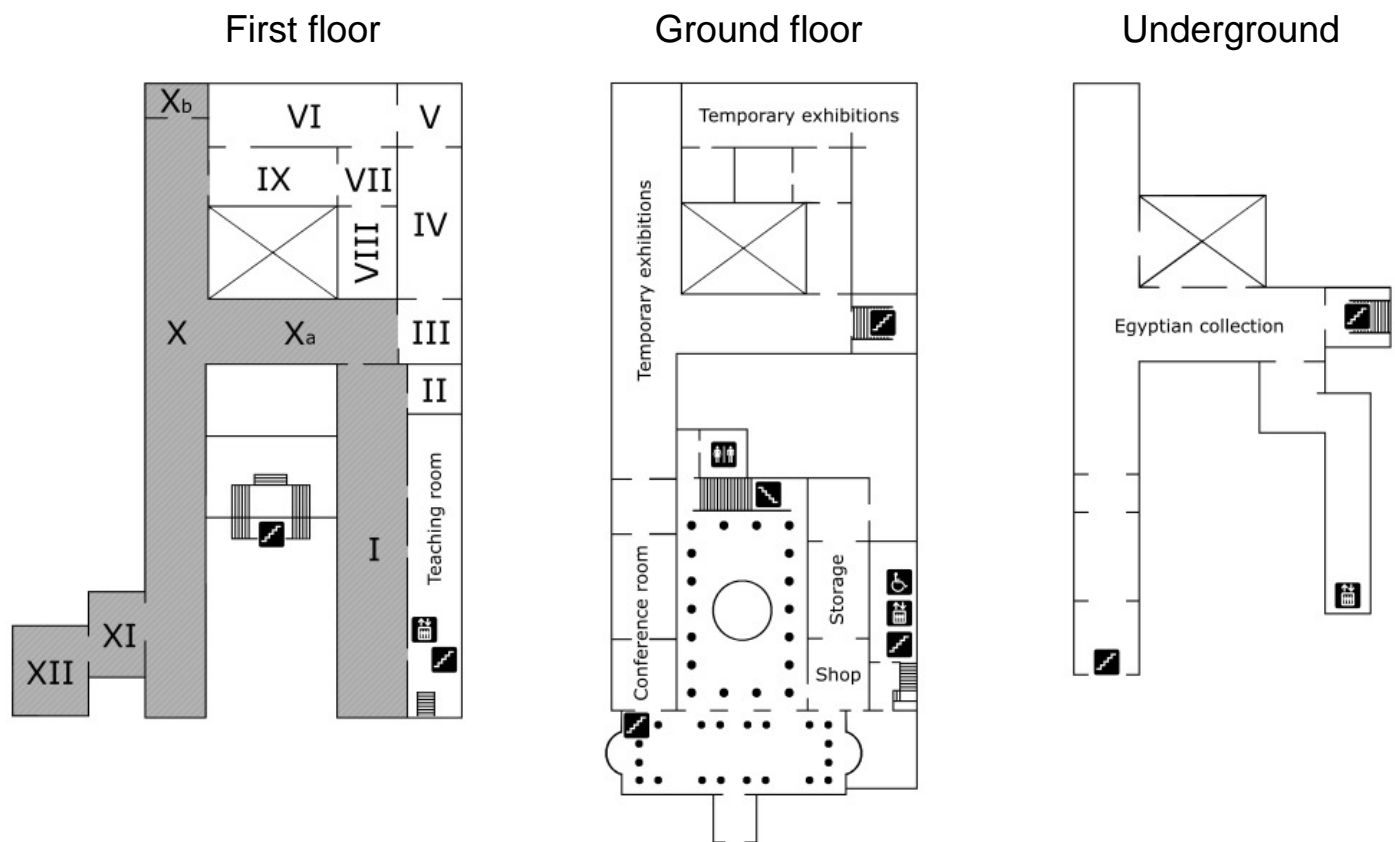
In the second half of the XIX century, Bologna experienced a great deal of archeological discovery in its territory, some of which were motivated by pioneers of the field and some due to the growth of the Bolognese urban area. Bologna remodeled itself and discovered its ancient past, populating mostly the Etruscan and Roman collections. The history of the Museo Civico Archeologico's first decades is entangled with these pioneer explorers' discoveries. Some dedicated their whole lives to searching for archaeological sites in the *Bolognese* area.

## The museum and its surroundings



*Location of the Museo Civico Archeologico of Bologna.*

Located in the fifteenth-century Palazzo Galvani building at Via dell'Archiginnasio 2, once known as *Ospedale della Morte* (Hospital of Death), the Museum is on the hearth of the city, adjacent to the Archiginnasio building, and next to the Basilica of San Petronio. This location makes this museum one of the favorites for the excursions of local schools and tourists. The different gratuities and discounts offered contribute to the participation of an audience of students of all ages, the elderly, and archeology and museology scholars, besides the tourists who arrive in the city.



*Map of the three floors of Museo Civico Archeologico in Palazzo Galvani  
with the areas used for the project, in gray.*

The Museum's collections (with some of the star assets) are:

### Prehistoric Collection

Displays materials from the Lower Paleolithic Age (~7.000 years ago) until the Late Bronze Age (10<sup>th</sup> century B.C).

Must see:



*Artifacts from Bronze Age*

## Etruscan Collection

Displays material from diggings done within the Bolognese area between the 19th and mid-20th centuries and reconstructs the development of the ancient settlement of the Etruscan civilization from its origins (9th century B.C.) to the founding of the city of Felsina (the settlement of Bologna during Etruscan times) between the middle of the 6th and 5th centuries B.C.

Must see:



*Etruscan Tombstone*

## Celtic Collection

Displays the most important kits of the Celtic necropolises in Bologna, characterized by traditional trans-Alpine iron weapons and Etruscan-made fine utensils for banquets.

Must see:



*Celtic Sword*

## Greek Collection

Most pieces are of Attic make and, along with others, of Magna Graecia make. It is composed of marble, ceramic, and valuable finds of jewelry and antique and modern gems.

Must see:



*Magna Graecia Statue*

## Lapidarium

The larger part of the contents in this section are Roman tombstones coming from Bologna and its surroundings dated between the 1st century B.C.

Must see:



*Roman Tombstone*

## Roman Collection

This one is a large collection of glass tableware, shaped bronzes, and domestic instruments such as keys, pots, needles, spoons, bells, weights, scales, and more fine utensils. There is also a section for roman objects found in Bologna (Roman Bononia)

Must see:



*Roman Headless Statue*



### **Egyptian Collection**

Must see:

With 3,500 objects on display, the museum's Egyptian collection is among the most important in Europe. The sarcophagi, the stele, and the ushabti all document three thousand years of a society. The modern staging of these makes for a chronological order, starting from the Old Kingdom to the Ptolemaic period.

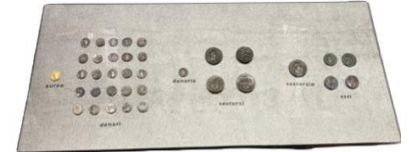


*Egyptian Sarcophagus*

### **Numismatic Collection**

Must see:

A wide numismatics collection of 100,000 coins, medals, and other coinage specimens. Among the most important collections noted are the consistent cores of the Roman samples (from the republican and imperial times), samples from Italian coin-making factories, and the cores from papal medallions.



*Roman Coins*

### **Gipsoteca**

Must see:

A collection of plaster copies of celebrated Roman and Greek sculptures.



*Afrodite Statue*

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## **1.3 Institutional goals of the Museo Civico Archeologico.**

As described in the mission of the museum, *the institution aims to represent the history of the city since its origins* in Roman times and testifies to ancient civilizations through objects that make up the Egyptian, Etruscan-Italic, Greek, Roman, and numismatic collections, collections that are also witnesses of the history of collecting from the sixteenth century to today. Also, the Institution researches material and immaterial testimonies of man and his environment, acquires them, and preserves, communicates, enhances, and displays them for study, education, and pleasure.

## **1.4 Target Audience**

The Archaeological Museum targets a diverse audience, ranging from tourists who choose to visit due to its proximity to Bologna's central square, schools that participate daily as visitors, and specialists who seek to access the museum's library or participate in the museum's events.

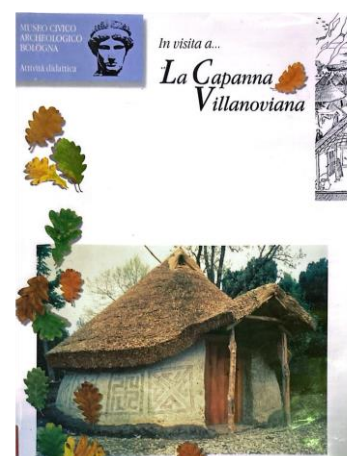
## 2. THE AUDIENCE

School students, especially teenagers between 10 and 16 years old, form the target audience of this project. As said before, they are a constant audience in the museum due to the location and the subject of the museum. As they are the future active citizens of Bologna, increasing a **sense of care for their Cultural Heritage** is one of the **main goals** of this project. We understand that making these students more acquainted with these objects can also give this population a closer relationship with the city's past and present. For this, the principal strategy adopted is the commitment to **stimulate personal and individual memories**. However, boosting the enchantment with the objects and their history is fundamental to achieving this goal. As a desirable consequence, we believe that an **extended knowledge** of prehistoric and ancient times would be gained from the activity participants.

In the previous decades, especially in the 1990s, the museum published a series of educational materials that were crucial for understanding various didactical approaches and offered critical perspectives on narratives for children and teenagers. These materials are valuable for understanding existing historical narratives in local imagination, which we aim to expand while connecting different generations of museum visitors. By leveraging gamification, we propose an updated approach to communicating with a young audience, creating a shared culture and sense of belonging.

One of the most essential concepts in developing this project is to increase curiosity about the museum and its objects. We understand that the school's students have limited knowledge about archeology when it is not absent. Another important observation is that, for some of these students, the notion of the past time is a vast abstraction that is partially formed. So, increasing curiosity, highlighting some objects, and inserting those in a narrative can collaborate in stimulating this construction in children and teenagers. These **motivations** are closely connected with the construction of Historical Empathy, one of the most desirable goals in History education. We understand that increasing curiosity can lead to a more prolonged interest in the theme or even in the past.

One of the probable **barriers** to implementing the project is the flow of students. Considering the number of students per class and an average gameplay time of one hour, which can eventually



One of the previous educational publications of the Museum



exceed the expected duration, we propose the possibility of creating pairs or trios. This approach would optimize the search for items in the museum, ensure schedules are adhered to, and allow the maximum number of classes to participate.

Other **barriers** are the accessibility conditions in the building. As an XIV-century building remodeled in the XIX century, the space needed adaptations for people with different disabilities. We will list some considerations below that need to be observed:

Regarding people with motor disabilities: To access the first floor, there is a lift option, but that means that the visitor will enter Room I from the opposite side than the other visitors. Another important consideration is the visualization of the objects, which is not easy for people in wheelchairs in some areas.

Regarding people with visual impairments: the museum has some tactile objects. However, an application must consider possible voice descriptions to include this group.

Another significant **barrier** is the lack of access to technology. To participate in this project, the user must have a smartphone. Some kids are not able to use this kind of device. For very young age groups, the company of an adult may be required, diminishing the individual experience of the game as a projected outcome. An alternative that provides the best scenario for children is the museum installing tablets with the app and providing those to the kids. This situation reflects the necessary **capabilities** for access to the project's product: teenagers will probably be capable of downloading and installing the app on their **devices**, smartphones. At the same time, children will be more comfortable using tablets with the already installed app, which the museum could provide. It is possible to encounter the problem that the network does not pick up well in some rooms, but the Museum has WIFI connections in the exhibition rooms and the library. To surf, simply connect to the BolognaWIFI network, which is open and does not require authentication.

### 3. THE CONCEPT

Developing a project for teenagers is always challenging in capturing their attention. In our time, where social media is a common mediator of our relationships with the world, **positive intermittent reinforcement** is a reality in how our brains work. It is even more critical for digital natives as teenagers, leading to a permanent search for fast and easy rewards. The challenge has intensified due to the social distance due to the COVID-19 pandemic, which has led to a **lack of socialization** at an essential moment in the development of children worldwide. Even though we do not entirely understand the

implications of this second phenomenon, teachers report the consequences in their classrooms as an acute ***difficulty of concentration*** and ***impairments in a collectivity sense***.

To overcome these difficulties, the game is developed so that the narrative is tested by clues, requiring the user's attention to mobilize previous knowledge, like the locations of the city where the archeological artifacts are found, and to acquire information from the museum collections involved in the hunt. We combine the interaction in the game with the offer of extended information about every object and its relation to the city's past in a linear narrative. With this combination, we expect the user to improve in ***retrieving spatial information*** and ***acquiring casual knowledge*** (Pescarin; Pandianni 2022a, 104). Mobile applications are essential to guarantee that we are using digital media. This responds to the audience's familiarity with the dispositive and the access to information.

### 3.1 The Project

This project aims to create a ***TREASURE HUNT GAME*** via Mobile Application using ***Twine*** as structural base, with the Prehistoric, Etruscan, Celtic, and Roman Collections located on the museum's first floor. The use of these specific collections has two interconnected motivations. The first one is to construct a narrative of Bologna's prehistoric and ancient history, ensuring that the artifacts brought to light belong to this specific time and place. This approach helps even very young audiences understand the city's history by featuring recognizable locations, making it accessible to children as young as ten. The second motivation is logistical: since the game is designed for kids and teenagers and aims to be accessible, using collections located on the same floor provides greater security for the participants.

### 3.2 Museological approach

The project aims to align the museum experience with the latest definition of museum approved by ICOM (International Council of Museums). Therefore, it is not merely a design communication project but is shaped by the new conception of these cultural institutions.

*A museum is a not-for-profit, permanent institution in the service of society that researches, collects, conserves, interprets and exhibits tangible and intangible heritage. Open to the public, accessible and inclusive, museums foster diversity and sustainability. They operate and communicate ethically, professionally and with the participation of communities, offering varied experiences for education, enjoyment, reflection and knowledge sharing. (ICOM, 2022)*

The last official definition of ICOM underlined the importance of communication and the participation of communities. In this view the goals are: education, enjoyment, reflection and knowledge sharing. In fact, museums should be labs of knowledge and education (Weibel, 2021). Many studies highlight the need to modernize strategies to preserve heritage. The development of narrations through digital means can bring universal accessibility and participation in heritage.

The project fits perfectly into this line of thinking. It would never replace the exhibits, but it means to amplify the visiting experience. Moreover, several scientific, psychological and pedagogical theses demonstrate that storytelling and gamification are two key concepts for learning and engagement. Learning by doing is the thesis that the cognitive process takes place through experience. The re-contextualization is particularly important in the Archaeological Museums, in which the artifacts were necessarily removed from their original contexts, making their understanding more difficult. This is why storytelling could be a solution to unify all the fragments of heritage scattered around.

This is the reason why the project selected the Prehistoric, Etruscan, Celtic and Roman Collections on the museum's first floor. In fact, most of the cultural objects of these collections come from the city of Bologna and its surrounding. In this way it's possible to reconstruct the history of the city and understand that the city is the result of continuous stratification over time. The gaming experience aims to link between fun and emotion, which helps people to create memories. Play excites us and consequently emotions create memories. Learning through play is, therefore, a possible form of learning. The gamification and the narration created aims to develop the sense of place and the sense of belonging of children to their hometown.

The treasure hunt, which aims to locate these artifacts in the museum and discover where they were found, features 12 objects from these collections. To immerse our audience in the narrative, they will choose a specific character when they open the application. These characters are not chosen at random; they represent significant figures associated with the museum and its collections. Moreover, we choose these figures as a metaphoric connection with the archeologist explorers.

The objects were identified through multiple museum visits, bibliographic research, and an interview with Federica Guidi, an archaeologist in the museum staff. The latest Museum Guide (Govi, 2009) provided photographs when the project team couldn't obtain them due to display conditions, such as glass cases hindering good photography. This guide was instrumental in quickly finding information about objects and offering summarized details on each collection and period of Bologna's Prehistoric and Ancient History.

For the development of the characters, two main sources have been used: the catalog of the exhibition at the Bologna Civic Archaeological Museum opened in March 2018, “Ritratti di Famiglia. Personaggi, oggetti, storie del Museo Civico fra Bologna, l'Italia e l'Europa” (Family Portraits. Personalities, objects, stories from the Museo Civico between Bologna, Italy and Europe), and the web site about the itinerary route dedicated to Luigi Fantini.

The exhibition catalog highlights the history of 18 figures connected to the museum's cultural heritage, mainly through objects they collected, donated, or mediated.

For the project, six of these eighteen personalities were transformed in characters (accompanied by images created using OpenArt IS to make them more appealing to a young audience) were selected due to their strong connections with some of the chosen items:



*Images of the explorers in the game, in sequence: Maffei, Allighieri, Gozzadini, Zannoni, Brizio and Fantini.*

**Scipione Maffei**, an aristocratic intellectual man of the 18th century. His historical studies were focused on Italian antiquities and in fact a large part of the Etruscan artifacts comes from his collections.

**Giovanni Gozzadini**, renowned in the archaeological circles after discovering with his wife, Maria Teresa, the Villanova di Castenaso necropolis in 1853. **Maria Teresa di Serego Allighieri**, a skilled draughtsman, meticulously documented and restored the findings from their excavations. One notable item from their work is the Etruscan limestone sculpture known as the “Gozzadini Head.”

**Antonio Zannoni**, 19th cent., whose engineering career in Bologna, brought him closer to archaeology. His notable discoveries include the Etruscan Certosa Necropolis and the San Francesco repository, a Villanovan phase deposit with over 14,000 bronze pieces.

**Edoardo Brizio** played a crucial role in opening the new Civic Museum in 1881. His excavations, such as Giardini Margherita Necropolises, were extremely important for Bologna studies. One significant artifact from his work is the sandstone sculpture of a lion from the Giardini Margherita Necropolis.

**Luigi Fantini**, 20th Cent. made significant archaeological and paleontological discoveries in the caves of Parco Regionale dei Gessi, and he is well known as the bike explorer. The Museo Civico di Bologna's prehistory hall showcases several artifacts collected by Fantini over the years.

The selected items are:

### **Roman Mosaic Roman Bononia**

Bichromatic mosaic from Bologna, an area among Via Montebello, Via del Porto, and Via dei Mille, was excavated in 1914. Mid-2nd century A.D. Very little is known about the suburban dwelling because the excavation was so small that it brought to light only two environments. But the beauty of the mosaic is given by the Gorgon's head in the center of the decoration.



Photo taken by Virginia d'Antonio.

### **Cup with bird's head handle Prehistoric collection**

Cup with waterfowl head loop pottery, Bologna, Borgo Panigale Recent Bronze (1330-1170 BC) Between 1950 and 1959, some excavations were conducted in the area of Borgo Panigale (Bologna), revealing portions of a vast settlement from which this cup came. The decorative motif of the handle is a bird's head, a widespread figurative element of the Recent Bronze Age and characteristic of sub-Appenninic type ceramics.



Photo taken by C. Morigi Govi.  
Edited by Guida al Museo Civico  
Archeologico di Bologna, Bologna,  
Editrice Compositori.

### **Tomb of the two horses Etruscan collection - Villanovian and Orientalizing phase**

In the early 2000s, the Superintendence for Archaeological Heritage of Emilia Romagna unearthed a great patrimony that update the oldest knowledge of Bologna and its territory. From the burial ground in Via Belle Arti, in the city center, comes the exceptional discovery of two horses, a cast of which is exhibited in the Museum, perfectly reproducing the original. This tomb is linked to ritual motives. In fact, the ritual use of sacrificing and burying horses has already been attested in this period in Italy.



Photo taken by Carla Menegat.

### **Gorgon head antefix Roman Bononia**

Clay, Palazzo Comunale, ex Sala Borsa (Bologna), excavation 1920, early 1st century BC. This antefix, together with others, were found in the area where the Roman basilica stood and are all referable to the same series, characterized by a Gorgon's head with a hanging tongue. They belong to a central-Italic tradition, but of local elaboration. Belonging to the Republican age, it is plausible that they were part of the first construction phase of the basilica.



Photo taken by C. Morigi Govi.  
Edited by *Guida al Museo Civico  
Archeologico di Bologna*, Bologna,  
Editrice Compositori.

### **Statue of nymph Roman Bononia**

Parian marble, Via Orefici (Bologna), Palazzo Ronzani, 2nd century A.D. The figure was part of the apparatus of a fountain or nymphaeum, in fact from the vase on which the nymph rests, water must have leaked out, as it was perforated. It was, with high probability, a work of public commission, made during a period of infrastructure renovation.



Photo taken by C. Morigi Govi.  
Edited by *Guida al Museo Civico  
Archeologico di Bologna*, Bologna,  
Editrice Compositori.

### **Sandstone sculpture of a lion Etruscan collection - Felsina Phase**

From grave no. 192 at the Etruscan Giardini Margherita Necropolis, Bologna Felsina Phase, around 500 BC. This area was excavated by Edoardo Brizzio between 1887 and 1889, after the first research of Antonio Zannoni in 1876. The necropolis of Giardini Margherita is one of the most important Etruscan ones. This lion was found with the head detached from the body and was restored in 2019 due to its differentiation from the regular iconography where the horses are predominant.



Photo taken from the website of the  
Civic Archeological Museum of Bologna

### **Etruscan limestone sculpture Etruscan collection - Villanovian and Orientalizing phase**

Known as the "Gozzadini Head", from via San Petronio Vecchio, Bologna Orientalizing Phase, beginning of the 7th century BC. Probably with funerary purposes, this head is interesting for the realistic representation of a man's head, including a tick beard, not so common in the Orientalizing phase.



Photo taken from the website of the  
Civic Archeological Museum of  
Bologna.



## **Tintinnabulum**

### **Etruscan collection - Villanovan and Orientalizing phase**

Bronze foil, Bologna, necropolis of Military Arsenal, tomb n.5 known as “of the Golds”, 630 BC. Trapezoidal pendants, typical of Etruria Padana, take their name from the early excavators' belief that they were musical instruments. They are actually objects of the female set, a sign of prestige, and are in fact found in tombs of women of particular wealth. In this Tintinnabulum there is an elaborate decoration of women preparing yarn, in fact usually they were decorated with scenes of female's activity.



Photo taken by C. Morigi Govi.  
Edited by Guida al Museo Civico  
Archeologico di Bologna, Bologna,  
Editrice Compositori.

## **Anthropomorphic figure**

### **Prehistoric collection**

Pottery, Villa Cassarini, Final Bronze Age - 10th century BC. Among the materials found at Villa Cassarini, several objects referable to the Protovillanovan period have been identified, which are very scarce in the Bolognese territory. This is why these materials are so important. This anthropomorphic figure is very similar to the figurines found in the Latium context between the end of the Bronze Age and the beginning of the Iron Age.



Photo taken by C. Morigi Govi.  
Edited by Guida al Museo Civico  
Archeologico di Bologna, Bologna,  
Editrice Compositori.

## **Large earthenware pot (Dolio)**

### **Etruscan collection - Villanovan and Orientalizing**

“The San Francesco repository”, from St. Francesco Basilica, First quarter of the 7th century BC. Antonio Zannoni during the excavations of 1878 found a big earthenware pot (dolio) that contained 14.838 bronze pieces. It is interpreted as a smelter's deposit, due to the presence of broken objects intended for remelting. The vase offers a very valuable documentation for ancient studies because high probability this material was imported, as no mineral deposits are attested in the area. It is an indication of intense trading activities related to metallurgical activity.



Photo taken from the website of the  
Civic Archeological Museum of Bologna

## Bronze helmet Gallic Bologna

Bologna, Benacci Necropolis, tomb 953, early 3rd century B.C. The tomb is distinguished by its wealth, such as the golden crown and the banquet outfit. Ideology of the symposium, the game and the gymnasium combine with the use and display of weapons. This tomb is an example of the Etruscanization of the upper echelons of Gallic society, which must have belonged to one of the Gallic principes conquerors of Felsina and can be dated to around 300 BC. The Etruscanization of the Gallic aristocracy is evidenced by diadems and bronze suits, typically Etruscan.



Photo taken by C. Morigi Govi.  
Edited by Guida al Museo Civico  
Archeologico di Bologna, Bologna,  
Editrice Compositori.

## Burial kit Prehistoric collection

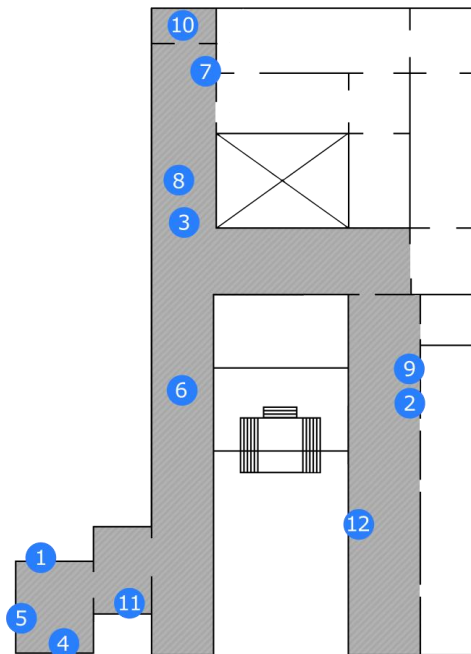
Guglielmo Marconi' Airport, Bologna Tomb 4, Eneolithic.

The tomb, found with three others of the same period, is characterized by the rite of lying inhumation; the deceased was probably an adult male facing west.



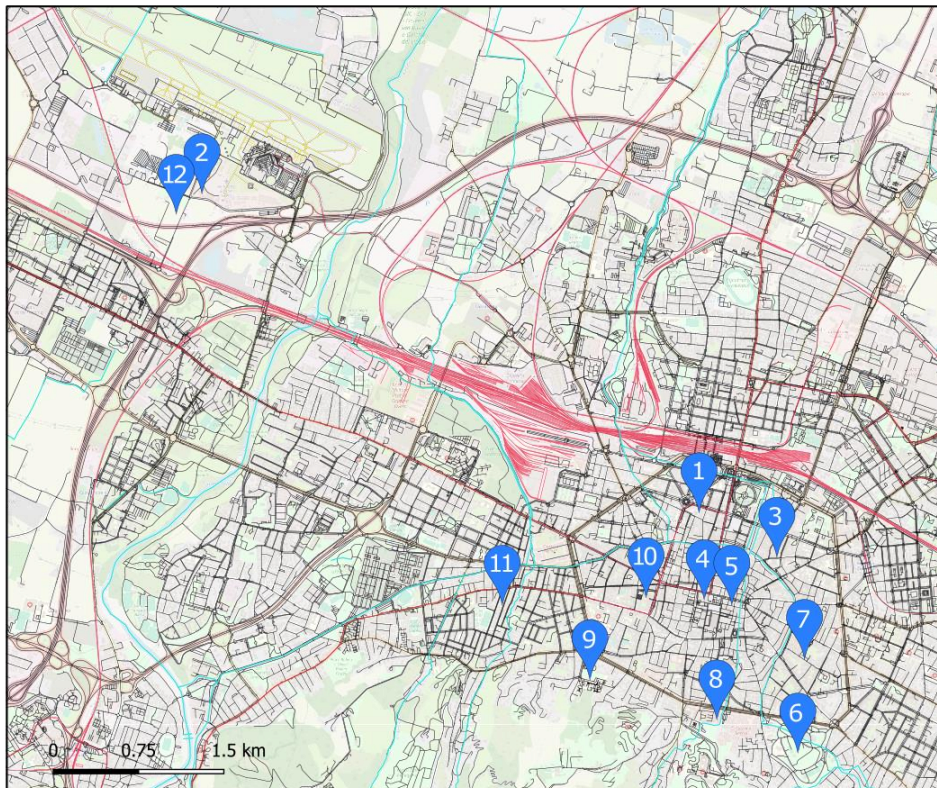
Photo taken by Carla Menegat.

All the items are displayed in the following locations:



1. Roman Mosaic
2. Cup with bird's head handle
3. Tomb of the two horses
4. Gorgon head antefix
5. Statue of nymph
6. Sandstone sculpture of a lion
7. Etruscan limestone sculpture
8. Tintinnabulum
9. Anthropomorphic figure
10. Large earthenware pot
11. Bronze helmet
12. Burial kit

The search for the place where the artifacts were retrieved in the city can produce a **sense of meaning**, contributing to creating a **responsibility for cultural heritage** and **historical empathy** through the perception that some of the objects carry similarities in their functions with others from the present (Pescarin; Pandianni 2022b, 11).



1. Roman Mosaic
2. Cup with birds head handle
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*Artifacts' discovery sites in the city of Bologna*

The selected objects relate to familiar themes of life, such as funeral practices, housing in historic Bologna, relationships with nature and domestic animals, and workspaces. These themes help users connect with distinct aspects of life in Bologna across various periods.

This concept was developed using the Co-DesignTool, which Project Perceive developed to evaluate cultural heritage projects (Pescarin; Massida; Travaglini; Spot; Veggi, 2024). The cards presented themselves as a test for the project, introducing relevant questions from its conception to its implementation, serving as a guide and point of reflection for necessary decisions and adjustments.

In conclusion, the option for a game accessed via a mobile application meets the necessity of providing an experience that reaches actual teenagers' expectations. Gamification is a well-known

concept for engaging attention and gaining empathy because it allows for an experience where the user can immerse themselves and participate, in this case, get in touch with their *historical imagination*.

#### 4. REQUIREMENTS

Throughout the MoSCoW method, several key requirements have been identified to achieve the project's goals of being both educational and engaging for children and teenagers.

**MUST** - The experience's essential requirements:

- Establishment of rules to ensure the smooth running of the activity, such as prohibiting running between objects, shouting, and disorganizing spaces;
- Organization of a specific day for the event to minimize disturbance to other visitors;
- Access to devices for the application, whether personal or provided by the museum, such as tablets and smartphones;
- Internet connectivity, considering that many teenagers may not have access to 4G internet.

The mobile app's essential requirements:

- Intuitive and user-friendly, enabling teenagers to navigate it easily without extensive instructions;
- A simple yet engaging interface with good visuals and straightforward navigation tailored to the target age group;
- Integration of educational content into the gameplay, aligning with the historical and cultural heritage of Bologna, including interactive narratives, puzzles, and challenges directly tied to artifacts and their contexts;
- Compatibility with devices provided by the museum and commonly used personal devices, and it should include offline capabilities for essential features to ensure continuous functionality even during connectivity issues;
- The narrative, considering the cognitive aspect, binding users to familiar places, generating recognition and stimulating their curiosity.

**SHOULD** - The experience's important requirements:

- Establishment of contact with schools to act as facilitators and intermediaries is important, ensuring student safety and responsibility during the event;

- Implementation of diverse accessibility options in the application and during the experience to reach specific audiences, especially those with communicated needs by the school.

The mobile app's important requirements:

- Incorporation of engaging and interactive elements to maintain the interest of younger users and enhance their learning experience;
- Provision of clear, concise instructions, tutorials, and FAQs to help users navigate and use it effectively;
- Scheduling regular updates to introduce updated content, fix bugs, and improve functionality based on user feedback.

**COULD** - The experience's possible requirements:

- Enlistment of schools and teachers before the event to recommend students installing the application and address any questions about procedures and schedules;
- Additional museum staff support to assist users and provide on-site technical support during peak times;
- Fulfillment of a small survey or questionnaire for participants to provide feedback at the end of the experience;
- The mobile app's possible requirements:
  - Implementation of additional functions, such as integration with external applications like Google Maps for an interoperable interface or educational platforms and resources to offer a more comprehensive learning experience;
  - Virtual guides, using augmented reality to insert the city as part of gamification to make the game more relatable and immersive;
  - Rewards such as museum-themed merchandise for completing challenges to enhance motivation and engagement.

**WON'T** - The experience will not require:

- Changes in the museum's physical structure or operating hours;
- Imposition of additional costs on the museum or schools, except for individual student transportation and snacks;
- Profit or financial purpose associated with;

The mobile application will not require:

- Advertising or promotional content to prevent distractions from the educational objectives;
- Creation of accounts or provision of personal information, ensuring privacy and ease of use;
- Complex features that could overwhelm users or require extensive training;
- Investment in high-maintenance or expensive hardware that could complicate the deployment and ongoing support of the app.

## 5. IDEATION

### 5.1 The Twine Story

This game is designed within the structure of the Twine application. However, given its limitations in implementing some features, our hypothetical mobile application will complete these functionalities.

#### Introduction

You are a *Museum Explorer*, called to the Archaeological Museum of Bologna to solve an intriguing mystery: a series of valuable artifacts have disappeared without a trace. The only clue is an enigmatic message that mentions the 12 Gates of Bologna as the key to discovering the whereabouts of the artifacts.

#### Game Mechanics

- **Initial Steps:** The player accesses a brief tutorial and character selection. All characters are based on and named after real archaeologists who contributed to the acquisition of these pieces.
- **Visiting the Gates:** The player virtually explores the 12 Gates of Bologna within the application, where they will find puzzles and items. Each gate can be chosen on Twine's main page, the Archaeological Museum page.
- **Puzzle Solving:** Each gate offers a simple puzzle, essential for the game's progression. Upon solving it, the player receives the location where one of the real artifacts was actually discovered in the city and, eventually, items needed to explore other gates.
- **Identification in the Museum:** Once the virtual artifact is found, the player must find (or return, using the game's term) the actual artifact within the Archaeological Museum, obtaining the display number of the item. The game only progresses with the correct insertion of this number. A 1-minute time penalty is applied if the player enters the wrong number (This penalty cannot be implemented in Twine).
- **Artifact Details:** After identifying the artifact in the museum and entering its number, the player has access to a section that presents the archaeological context of the item, including its origin, historical significance, and the explorers who discovered it. The information about the artifacts



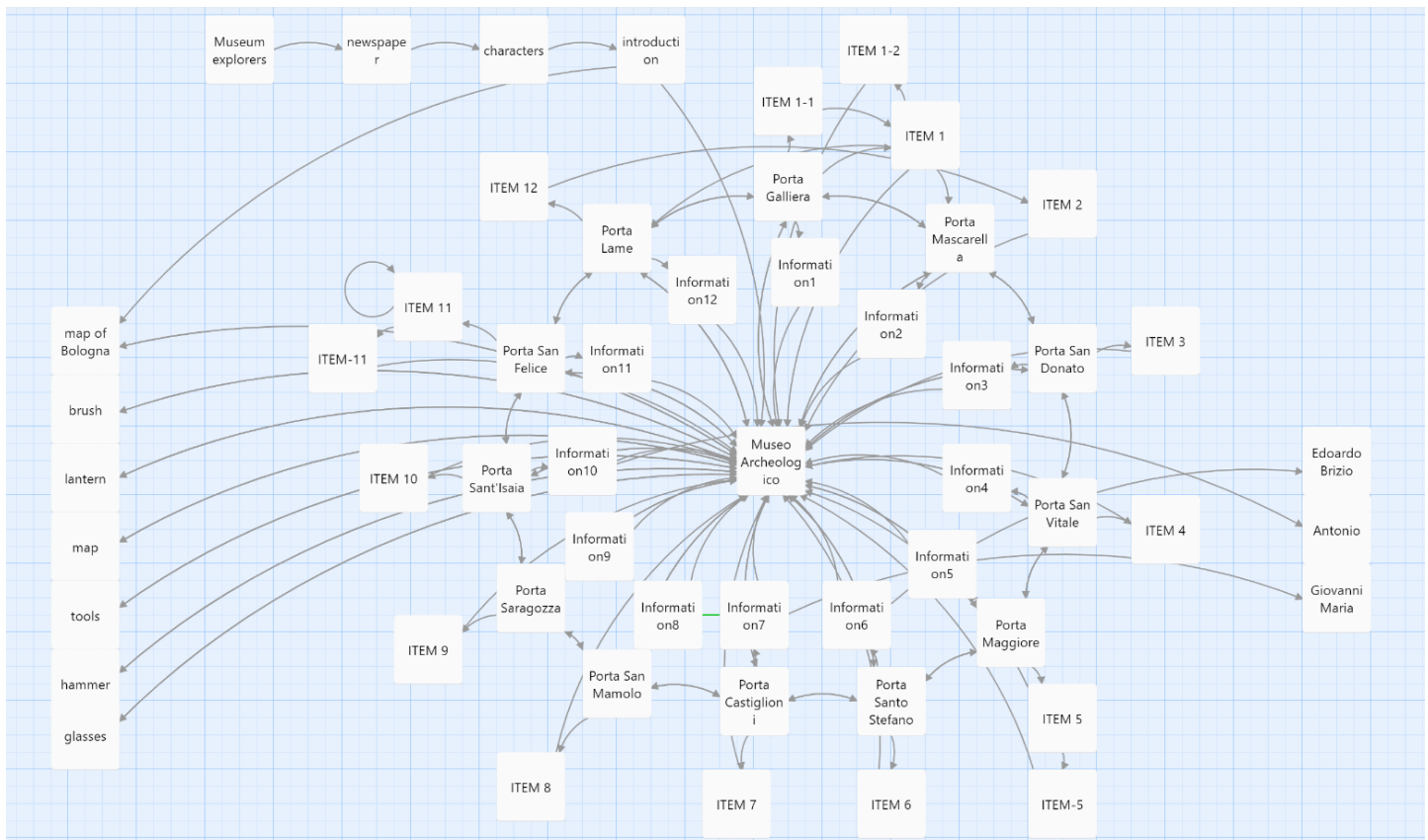
and their historical contexts will be permanently available for consultation, allowing players to revisit the data outside the museum environment.

**- Game Progression and end:** After collecting all the items, the player gains access to a vault where they can enter a password. The password is the display numbers of the artifacts organized by the order of the gates, as presented on the game's main page. If the password is correct, the user receives the reward.

## Conclusion

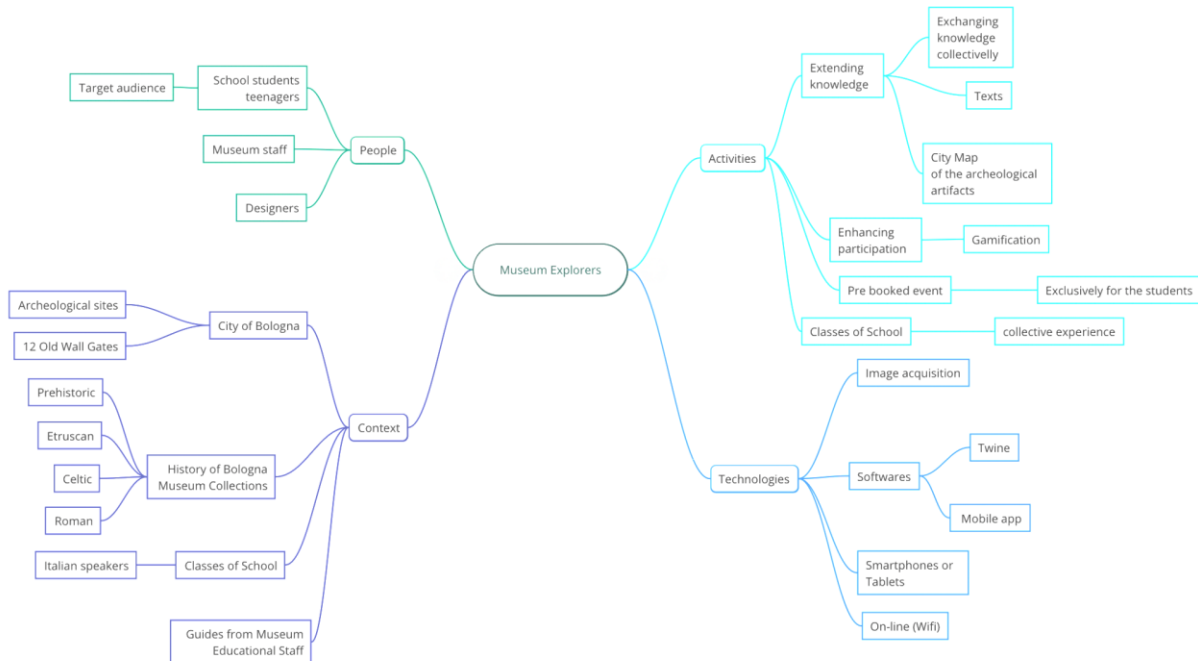
The game creates a connection between the urban geography of Bologna and its rich archeology, using the city's gates as a metaphor for discovery and knowledge of the past, from its primitive occupations to ancient Rome.

By completing the quest for all the artifacts, the player will not only solve the mystery of their disappearance but also gain an in-depth understanding of Bologna's history and the artifacts that make up its archaeological collection. The journey connects the present with the past, bringing the city's rich historical tapestry to life through an engaging process of discovery and learning within the Archaeological Museum environment.



The twine file can be accessed in: <https://github.com/Museum-Explorers/InteractionMediaDesign>

## 5.2 The Conceptual Map



*Conceptual Map of the game in PACT Framework*

## 5.3 The User's Experience

To illustrate the user experience during the Treasure Hunt event, the team created fictional personas, which are concrete representations of the different types of people that the game is being designed for, accompanied by their experiences.

## Marco Santini



"The school could have video games".

Marco is more interested in video games and technology than in his schoolwork. He often spends his free time playing strategy and building games like Minecraft and Fortnite or tinkering with gadgets. While not very engaged in his academic subjects, he has a passion for science and technology, dreaming of becoming a game developer or tech engineer one day. Despite his academic challenges, Marco is optimistic and resourceful, seeking ways to turn his interests into a future career.

He has a close-knit group of friends who share his interests in video games and soccer. They often hang out after school, playing games online, or meeting at the local park for a match. He is active on social media, connects with friends, and follows tech and gaming influencers.

### Social Media



### Goals

Marco dreams of becoming a game developer or a tech engineer, inspired by his love for video games and gadgets. Although he knows he needs to improve his school performance to achieve these goals, he struggles with staying motivated in his current academic environment. He hopes to find a way to channel his interests into a future career.

### Frustrations

Matteo faces the challenge of staying motivated in school. His lack of interest in traditional academic subjects often leads to mediocre grades, which could hinder his future opportunities. Additionally, balancing his gaming time with other responsibilities is an ongoing struggle. Despite these challenges, Matteo remains optimistic, relying on his resourcefulness and passion for technology to guide him forward.

Age: 14

**Student** of 9 grade in Scuola Media Statale Enrico Fermi

### Family

His mother is a supermarket cashier; His father works in an auto repair shop; He also has a 10-year-old sister.

He lives in **Bologna**.

**Digital native.**

**Interests:** Video Games and soccer.

**Most frequently technologies used:**



## Maria Rossi



"Bringing the past to life with passion and purpose."

Born and raised in Bologna, Maria developed a love for history early on, inspired by the city's rich cultural heritage. She pursued her education at the University of Bologna, earning both her Bachelor's and Master's degrees in History.

She believes history is about memorizing dates and events and understanding the narratives connecting us all. She employs various teaching methods to engage her students, including storytelling, interactive projects, and field trips to historical sites around Bologna. Her goal is to make history relatable and exciting, encouraging her students to think critically about the past and its impact on today's world.

Maria fosters an inclusive and dynamic learning environment in her classroom. She uses technology thoughtfully, incorporating multimedia presentations and online resources to enhance traditional teaching methods.

### Social Media



### Goals

Maria aims to continue growing as an educator and hopes to eventually write a book on Bologna's history for young readers, reflecting her involvement with the community. She dreams of developing a comprehensive history curriculum that can be used in schools across Italy, inspiring future generations to appreciate and learn from the past.

### Frustrations

Maria Rossi aims to navigate her professional and personal life adeptly, striving to avoid overreliance on technology in her teaching while keeping students engaged and avoiding administrative burdens and burnout. Personally, she seeks to balance independence with social connections, manage her time effectively, maintain a healthy relationship with technology, keep up with its rapid changes, and prioritize her health and well-being.

Age: 32

**History teacher** in Scuola Media Statale Enrico Fermi

### Family:

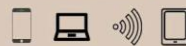
Her parents are both retired school teachers; she has a brother who is married and has two kids.

She lives in **Bologna** with her cat "Leonardo," named after Da Vinci.

**Digital Proficient.**

**Interests:** Literature and cooking, besides history.

**Most frequently technologies used:**



*Personas' definition*

## PERSONA EXPERIENCE 1 – MARCO SANTINI

Marco arrives at the museum with his school on the day of the event. He had already installed the mobile application as recommended by his teacher. He has been to the Archaeological Museum once, but doesn't remember many things, only some statues and Greek vases.

He is not paying much attention to the monitor's explanation, but that changes when he hears the word “prize.” Now he wants to show his mother that his abilities with video games can lead him to win something. He is also aware that his sister is coming to the event in the afternoon and wants to help her.

He opens the application and chooses the least old character, Edoardo Brizio, but doesn't notice that he is an actual person. Marco skips the introduction without reading it and goes to the main “hub” of the game, the “Museo Archeologico,” which allows him to choose which gate of Bologna he wants to explore. He chooses Porta Galliera and reads that it requires an item. He opens a notepad on his smartphone and writes: Galliera > Gentle Tool. He does this for every door that requires a special item.

Then he reaches the first door without requirements and needs to find the physical object inside the museum. He knows it is in the Etruscan section.

He passes by his friends and starts to look for the artifact quickly, but then notices that it would be harder than he thought. After spending 7 minutes looking for the item, he takes it seriously and starts to read all the information in the game.

After almost an hour, he gets all the items and has all the information to collect the reward.

At home, he opens the application again and searches on the internet if there are any games with Etruscans because he enjoyed learning about them.

## **PERSONA EXPERIENCE 2 – MARIA ROSSI**

Maria is one of the teachers in charge of taking the students to the museum, but fortunately, her class is the oldest one, so she doesn't need to take care of them so carefully. She is invited to play the game with the kids, and she laughs. She downloads the application and sees it as an opportunity to learn a useful feature for the classroom.

She misses the monitor's explanation by looking at her class. She starts the game, choosing Maria di Serego-Allighieri, and asks herself why the game producers included so few women. She begins to head to every Gate and thinks the game is not working. Then she heads to a Gate that refers to a Neolithic item that she remembers seeing just because it was from Bologna. She runs and is corrected by her students, who say that running in the museum is not allowed.

In the middle of the game, Maria stops to check on how her class is doing. When she comes back, she tries to find the items but feels a little lost.

Time passes, and it is lunch time just before heading back to school. Although she didn't complete it, Maria really enjoyed playing the Treasure Hunt and thinks she can come back to the museum another day, without the class, even without the event, to finish the game.

#### **5.4 The interaction between the application and the user**

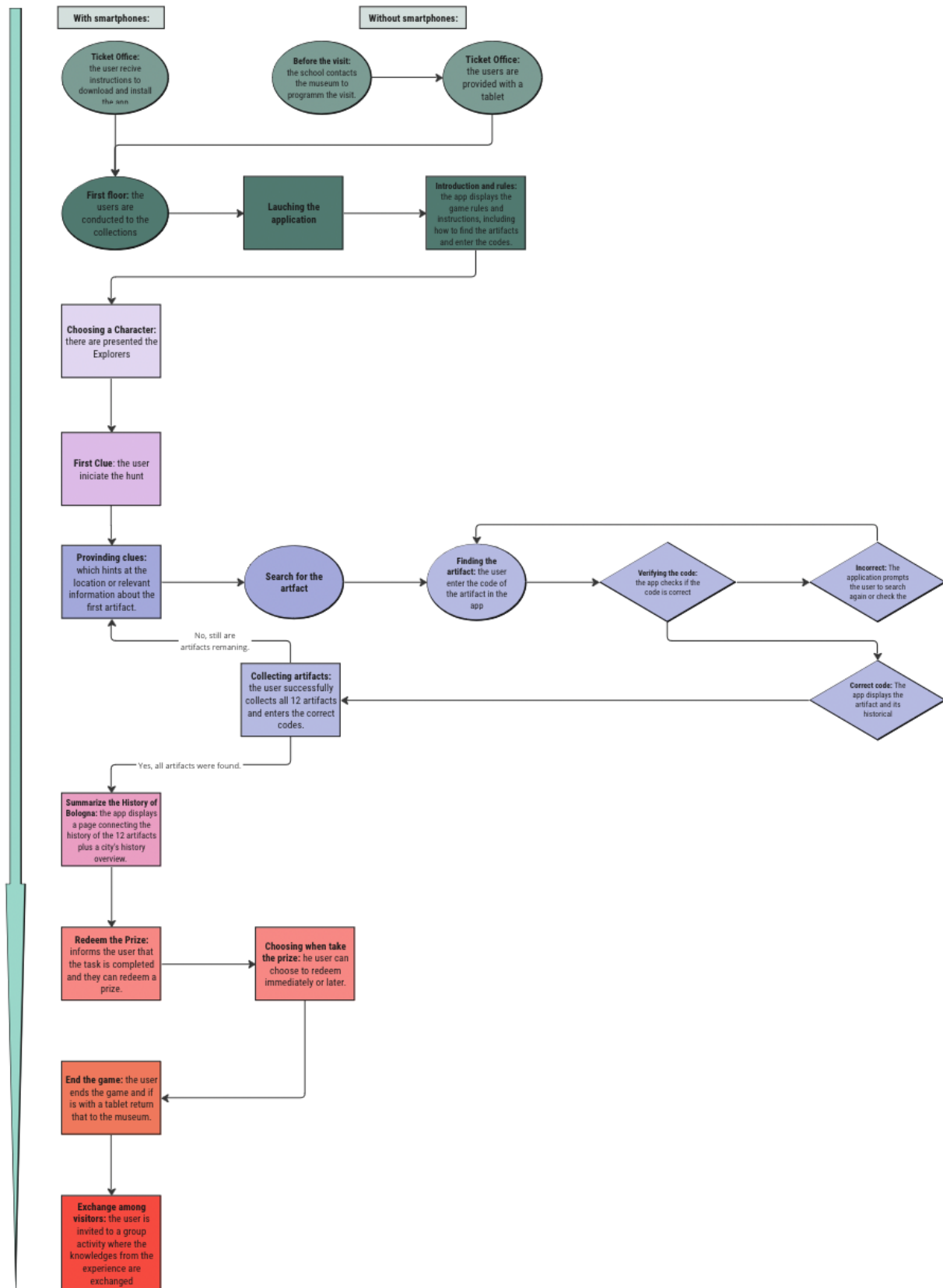
The application is designed to engage users by integrating the museum experience with a gamified treasure hunt. This approach ensures that users navigate through the museum, interact with artifacts, and complete challenges using the app, making their visit more interactive and immersive.

As users progress through the museum, they receive clues that guide them to the next artifact. Each successful discovery involves entering a code into the app, verifying the find. If correct, the app confirms the discovery and provides the next clue, driving the user forward in their quest. The anticipation of finding the next artifact and the sense of achievement upon each successful entry keep users motivated throughout the experience.

The primary educational goal of the app is to acquaint users, especially teenagers, with the museum's objects through an engaging narrative. This method aims to stimulate historical empathy and provide a deeper understanding of the exhibits. To address potential challenges such as noise and distractions, the app incorporates sounds that induce concentration. Accessibility is also considered, with surveys conducted to identify necessary adaptations and potential use of sensors or altered paths for individuals with mobility issues. Additionally, thorough testing and on-site technical support are planned to mitigate any technical issues.

Upon successfully collecting all the treasures, users are rewarded with a summary of the history of the collected artifacts and a comprehensive history overview, enriching their educational experience. The app then informs the users that they have completed the task and can redeem a prize. This final reward system not only serves as an incentive to complete the hunt but also heightens users' interest and engagement by offering tangible recognition for their efforts.

Overall, the application serves not only as a tool to enhance the museum experience but also contributes significantly to the educational and cultural enrichment of its users. By integrating a structured process of treasure collection and offering rewarding incentives, the app maintains high levels of user interest and engagement throughout the museum visit and beyond.



User's Interaction diagram



## 5.5 Foreseen Workflow

This experience is designed to be implemented in the Museo Civico Archeologico with teenagers as the primary audience. While it can also be used with children, the goals should be revised to account for the need for adult mediation, mainly when using personal devices like smartphones. Given that the primary target audience is Italian students, the app will be in Italian. Further versions may add English translations available. The project is designed as an experience in a particular event, which the Museum will be able to decide. It is possible to allow alone visitors to do the gamification while they visit the museum, but it is a museum choice.

The museum may provide tablets with the app pre-installed for children unfamiliar with downloading apps, which would involve additional device purchase and maintenance costs.

To enhance the collaborative experience, an exchange among visitors' session will be included at the end of the gamification activity, allowing participants to share their experiences.

The app should ideally be available on both Android and iOS platforms. The current prototype is designed in JavaScript, making it adaptable to any operating system or device.

## 5.6 Set-Up

The "Museum Explorers" project requires specific hardware, software, and digital media assets to ensure a successful implementation aligned with its interactive narrative approach.

**Hardware:** Essential hardware includes smartphones and tablets for users to interact with the app, with additional tablets available for those without devices. Reliable Wi-Fi coverage, supported by BolognaWIFI, is crucial for uninterrupted app use. Interactive display screens will offer supplementary information and assistance, while QR codes near exhibits will enable quick access to related app content. Providing headphones or audio guides that sync with the app will assist visually impaired users.

**Software:** The mobile application, compatible with Android and iOS, integrates Twine for interactive storytelling. The app, designed using Figma, features a user-friendly interface and engaging graphics. User analytics software will track engagement and performance. Ensuring app and data security through secure authentication and encryption is paramount.

**Digital Assets:** High-quality digital content, including detailed images, descriptions of artifacts, interactive maps, and educational videos, is crucial. Narrative content, created with historians, ensures accurate and engaging storytelling. Audio guides with soundscapes will enrich the experience, and supplementary resources like articles, quizzes, and links to further reading will be accessible through the app. Promotional materials, including posters, social media content, and a promotional video, will attract more participants and highlight the project.

By integrating these components, the "Museum Explorers" project will deliver an engaging and educational experience, bringing Bologna's history to life. The Twine-based narrative approach, combined with interactive and educational elements, will captivate users, encouraging exploration and learning in an immersive environment.

## **5.7 Further Development**

The experience can be promoted by visiting schools in Bologna and through social media on the museum's official pages, such as Instagram. The app can also be designed for post-visit engagement. QR codes would be placed around Bologna, at the sites where the treasure hunt artifacts were discovered, accompanied by explanatory panels that mention the gamification. This way, the treasure hunt can be extended throughout the city. Additionally, the app can include suggestions for nearby places to visit, such as the excursion dedicated to Luigi Fantini, "La via del Fantini," in the Monte Bibele Archaeological and Naturalistic Area, where an Etruscan-Celtic settlement was unearthed.

The prototype is designed for easy re-use and flexible setup in different contexts. Although the app was created for the Museo Civico Archeologico di Bologna, it can be adapted for use in other archaeological museums across Italy. By connecting the collections of various Italian museums, the app has the potential to foster a broader sense of care and appreciation for Italy's cultural heritage. This interconnected approach could help create a unified sense of stewardship for all Italian cultural assets, enriching the educational experience and encouraging a deeper connection with history among users nationwide.

## **6. Disruption: Potential Issues and Mitigation Strategies**

### *a. School appointment:*

Problem: the schools are not informed of the necessity of contacting the museum to plan the experience.

Solution: implement active dissemination of information of the experience including Museum contacts.

*b. Environmental concerns:*

Problem: Noise and other visitors' interferences can disrupt concentration and focus.

Solution: 1. Play sounds inside the museum that set a climate that induces concentration; 2. Too big classes of students can be divided into two and one part can enjoy the collections in the other floors while a first group do the experience, then the positions change and, in the end, all the students are regrouped to exchange knowledge.

*c. Accessibility adaptations:*

Problem: the app is not projected to change the paths due to disabled users.

Solution: a survey can conduct to best adaptations for every disability e.g. the use of sensors to activate the codes or a change of path for mobility problems.

*d. Technical Issues with the Application:*

Problem: The app may encounter bugs, crashes, or compatibility issues with museum-provided devices.

Solution: Implement thorough testing pre-deployment and have on-site technical support to address issues promptly.

*e. User Engagement and Understanding:*

Problem: Younger students may struggle to use the app or lose interest quickly.

Solution: 1. Design an intuitive interface with clear instructions, engaging elements, and provide staff assistance. 2. Access the experience with an adult mediation, as a teacher.

*f. Device Availability and Maintenance:*

Problem: Insufficient devices may affect availability.

Solution: Maintain an adequate device stock and implement a maintenance schedule.

*g. Network Connectivity:*

Problem: Wi-Fi issues could disrupt app functionality.

Solution: Ensure robust Wi-Fi coverage and incorporate offline capabilities for essential features.

*h. Cultural Sensitivity and Accuracy:*

Problem: Content must be culturally sensitive and accurate.

Solution: Collaborate with experts, review, and update content regularly.

By anticipating and addressing these potential disruptions, the Museum Explorers app can provide an engaging and seamless experience, enhancing visitors' connection to Bologna's historical heritage.

**7. Team and work roles:**

Carla Menegat	Bibliographical research Image acquisition Workflow design Development of personas Development of characters
Rubens Fernandes Jr	Image acquisition Workflow design Twine development Maps design
Virginia D'Antonio	Bibliographical research Image acquisition Workflow design Development of characters
Zizhe Li	Workflow design Figma application designs

## Bibliography

- Dore, Anna, and Cristiana Morigi Govi. *\*In visita a ... La capanna villanoviana\**. Bologna: Museo Civico Archeologico, 2003.
- Dore, Anna, Paola Giovetti, and Federica Guidi. *\*Ritratti di famiglia: personaggi, oggetti, storie del Museo Civico fra Bologna, l'Italia e l'Europa\**. Bologna: Museo civico archeologico di Bologna, 2018.
- Gee, J. P. *\*What Videogames Have to Teach Us About Learning and Literacy\**. New York: Palgrave MacMillan, 2003.
- "International Council of the Museum." Accessed June 5, 2024. <https://icom.museum/en/>.
- Guaitoli, Maria Teresa, Nicolò Marchetti, Daniela Scagliarini, Nicoló Scagliarini Corlaita, and Nicolò Marchetti. *\*Scoprire scavi del Dipartimento di Archeologia: catalogo della mostra Bologna, S. Giovanni in Monte 18 maggio-18 giugno 2004\**. Bologna: Ante Quem, 2004.
- "La via del Fantini." Accessed June 5, 2024. <https://viadelfantini.it/percorsi/luoghi-di-interesse-della-quarta-tappa/>.
- Mandarano, Nicolette. *\*Musei e media digitali\**. Rome: Carocci, 2019.
- Manferdini, Anna Maria, and Simone Garagnani. "Digital Fruition of Archaeological Finds. The Experience at the Archaeological Museum of Bologna." *\*DISEGNARECON\** 4, no. 8 (2011): 80-89. <https://doi.org/10.6092/issn.1828-5961/2572>.
- Marchesi, Marinella. *\*A passeggio per Bononia: alla ricerca della città romana\**. Bologna: Biblioteca Sala Borsa, Comune di Bologna, 2003.
- Morigi Govi, Cristiana. *\*Guida al Museo Civico Archeologico di Bologna\**. Bologna: Editrice Compositori, 2009.

- Morigi Govi, Cristiana, and Giuseppe Sassatelli, eds. *\*Dalla stanza delle antichità al Museo Civico: Storia della formazione del Museo civico archeologico di Bologna\**. Bologna: Grafis, 1984.
  
- Museo civico archeologico di Bologna. *\*In visita alla ... Collezione romana\**. S.l: s.n., 1900.
  
- Museo civico archeologico di Bologna. *\*In visita a... Gli etruschi a Bologna. 1, la cultura villanoviana e orientalizzante\**. S.l: s.n., 1998.
  
- Pescarin, Sofia, Marcello Massidda, Laura Travaglini, Samuele Spotti, and Manuele Veggi. *\*PERCEIVE Co-design Tool for Cultural Heritage Experiences (version 0.9.1)\**. Zenodo, April 30, 2024. <https://doi.org/10.5281/zenodo.11091235>.
  
- Pescarin, Sofia, and Delfina S. Martinez Pandiani. "The Impact of Story Structure, Meaningfulness, and Concentration in Serious Games." *\*Information\** 13, no. 12 (2022): 567. <https://doi.org/10.3390/info13120567>.
  
- Pescarin, S., and Delfina S. Martinez Pandiani. "Factors in the Cognitive-Emotional Impact of Educational Environmental Narrative Videogames." In *\*Extended Reality. XR Salento 2022. Lecture Notes in Computer Science\**, vol 13446, edited by Lucio Tommaso De Paolis, Pasquale Arpaia, and Matteo Sacco. Cham: Springer, 2022. [https://doi.org/10.1007/978-3-031-15553-6\\_8](https://doi.org/10.1007/978-3-031-15553-6_8).
  
- Simon, Nina. *\*The Participatory Museum\**. Santa Cruz: Museum 2.0, 2010.
  
- Vitali, Daniele. *\*Celti ed etruschi nell'Italia centro-settentrionale dal V secolo a.C. alla romanizzazione: atti del colloquio internazionale, Bologna, 12-14 aprile 1985\**. Italia: University Press, 1987.
  
- Weibel, Peter. "Il museo come assemblea." In *\*Museo. Teorie, Pratiche, Politiche\**, edited by Giorgio De Finis. Rome: Bordeaux, 2021.