CENA
(Capellini Encounters the Native Americans)

The Moomin
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Twine Interactive Narrative: https://giorgiacrosilla.github.io/cena/

1. The Context

(a) The museum and its content / collections

Capellini Museum was inaugurated in 1860 as the Museum of Geology and Paleontology of Bologna. Its story can be traced back to a few centuries before when Ulisse Aldrovandi started to collect items related to Natural History during the second half of the XVI century. Capellini was the first professor of Geology and Paleontology at the University of Bologna and his love and interest for the discipline led him to the reorganization of the already existing museum in a modern way, adding to the collection new fossils that were donated to him during his travels. The fossils collection offers a glimpse into the Earth's prehistoric past. Fossil specimens range from ancient marine creatures to dinosaur remains, providing a fascinating look into the evolution of life on Earth. For Capellini, the museum did not have only exhibition purposes, but also scientific and educational, an exchange of knowledge and personal experiences[1]. In fact, he used real fossils as concrete examples during the lessons he held at university.
The Museum contains more than 2 million specimens, displayed in 15 different rooms and in the archives of the museum. For this reason, it can be considered one of the most important collections of geology and paleontology in Europe. In the museum we can see not only fossils and skeletons, but also rocks which Capellini considered as a fundamental starting point for the correct study of fossils.

After the passing of Capellini in 1922, little was done to maintain and improve the museum. In the early 1960s, when the Institute of Geology and Paleontology was established, the museum building was physically divided, resulting in limited space for the collections. This relocation caused structural issues, leading to the closure of the museum for nearly 30 years. However, a significant renovation took place in 1988, funded for the University's ninth centenary celebration. This allowed for the installation of a new lighting and heating system, reopening the museum to the public. Since then, the museum has been receiving several thousand visitors each year. While the building itself has been stabilized, no further updates or improvements have been made, rendering the previous renovations outdated. The museum preserves most of the original wooden furniture, which, according to Sarti[2], is to be considered as an additional element of interest of the Museum. Despite its charming 19th-century ambiance, the museum faces challenges related to overcrowded showcases. The historical wooden cabinets are organized geographically, with rocks displayed on the upper shelves, fossils from the same locations in the middle, and various miscellaneous items stored in drawers at the bottom. Additionally, lighting remains an issue, as the diffuse light in the museum leaves many specimens in shadow[3].

[1] Fanti, *Life and ideas of Giovanni Capellini (1833-1922): a paleontological revolution in Italy*, p.3
[2] Sarti, *1860-2010: 150 years of the Capellini Museum (University of Bologna), The most ancient Italian Geo-Paleontological Museum*, p.6.
[3] ibidem

Interestingly, Capellini himself had expressed concern about this and would use oil lamps to illuminate the fossils when guiding visitors[4]. Furthermore, preserving the original labels and captions, many of which have been handwritten by Capellini and other prominent scientists of the time, is necessary while ensuring that the public can comprehend the displayed content. The museum also suffers from a century-old layer of dust that accompanies its artifacts. There is an ongoing debate on how to address the museum's overcrowding and make it more engaging for a 21st-century audience[5]. Some advocate for its preservation without making any alterations, emphasizing the significance of its historical layouts and unique features. They highlight the fact that the museum is one of the few in Europe, and perhaps the world, that has maintained its original furniture. On the other hand, many visitors desire a more interactive and contemporary approach that effectively communicates modern scientific knowledge to the community.About this point, we should also consider the possibility of using technology to transform the museum in a non-invasive way.

- Who is Capellini?

Capellini arrived in Bologna after the unification of Italy in 1860. He was a young, penniless bourgeois monarchist with big dreams of success and personal fulfillment. He studied geology in Pisa following the footsteps of the nobleman Giuseppe Scarabelli, a great pioneer of geological sciences who founded Italy's first Geological and Archaeological Museum. Capellini was impressed by Scarabelli's initiatives and throughout his life tried to equal and surpass him. For this reason, he immediately set himself the goal of creating a large museum of Geology and Palaeontology. A museum capable of training the new leaders of the newly united nation, to promote knowledge of soil types and the search for mineral resources such as iron and coal. It was during these years that the new disciplines (such as chemistry, geology, botany, astronomy, etc.) emerged from the bubble of Natural History and became autonomous towards the beginning of the 19th century, accompanying the arrival of the Industrial Revolution. Geology and stratigraphy invented the birth of geological maps, a great tool for progress and economic-colonial planning of the new nation states in search of new deposits of coal, iron and other industrial minerals. Capellini understood the importance of recovering the heritage of Bologna's natural history museums from the previous three centuries. He therefore began to recover from the basement the *fossilia* pieces by Aldrovandi, Cospi, Marsili, Monti and Ranzani and exhibited them together at the 5th International Congress of Prehistoric Palaeontology and Archaeology in Bologna in 1871 (the year the museum was built), then placed them in the "*Tribuna Aldrovandiana*" inaugurated in 1872 and incorporated into the museum for the second international congress in 1881.

- Capellini North America Journey

In 1863, amidst the American Civil War, Giovanni Capellini embarked on a scientific expedition to North America. He was invited by the French geologist Jules Marcou to participate in a journey that would explore Canada, Michigan, Illinois, Missouri, Iowa, and Nebraska[6]. Financially supported by Senator

[4] https://natsca.blog/2022/10/20/museo-giovanni-capellini-wunderkammer-or-modern-museum/ (visited on 16/06/2023)
[5] ibidem
[6] An high definition image of the map with Capellini's route in red: https://assets.culturabologna.it/fd78a8db-2e4d-4a18-a472-bc8cdf8acbb3-giovanni-capellini-relazione-di-un-viaggio-scientifico-fatto-nel-1863-nell-america-settentrionale-1864-3.jpg

Giovanni Gozzadini, Capellini departed from Liverpool on the steamship "Asia" on August 18 and arrived in Boston after twelve days at sea[7].

During his exploratory voyage, while crossing Nebraska, Capellini stopped at Blackbird, where the Omaha tribe resided. That year, the Ponca tribe had joined the Omaha tribe, both belonging to the Sioux family and facing various difficulties. It was during this stage that Capellini came into contact with the Native Americans, learning about their customs and level of civilization. He met Chief Omaha Joseph La Flesche, who, despite his Native American heritage from his mother's side, exhibited a civilized demeanor, likely influenced by his Canadian-French father. Capellini expressed positive opinions about La Flesche, primarily due to the chief's conduct during a challenging transitional period.

While encountering Native Americans was not the primary objective of his study trip to those remote and relatively unknown territories, Capellini managed to collect an extensive amount of data and materials on the geology and morphology of the regions he visited. He had traversed Vermont, parts of Canada, Ohio, Illinois, Indiana, Iowa, and, on the return journey, Missouri, Kentucky, Pennsylvania, and Maryland. He spent some time with the Omaha and Ponca tribes, observing their villages, engaging in conversations, documenting their customs, accepting their gifts, and acquiring "Indian curiosities" to bring back to Italy. However, the country's ongoing Civil War and the challenges posed by limited communication did not deter Capellini from amassing valuable information, as he had a brief glimpse into the world of the American frontier before the advent of railroads and the wave of colonization in the 1870s irreversibly transformed its landscape.

The country was in the midst of one of the bloodiest civil wars in history, with the North and the South engaged in relentless conflict[8]. Vast regions of recently formed Union states such as Iowa, Kansas, Minnesota, and Nebraska were battlegrounds for gangs of bandits, marauders, and criminals of all kinds, who tormented the colonizers moving into the so-called "no man's land," which was, in reality, seized from the Native Americans. Just a few months prior, a bloody uprising of the Dakota (Eastern Sioux) had taken place in the southwest of Minnesota. Over 450 settlers, mostly German immigrants, were massacred, and more than a thousand Native Americans lost their lives defending the last bastion of their reservation. The strip of land along the Minnesota River assigned to the Dakota continued to be invaded and expropriated. The government in Washington not only failed to enforce the treaties signed with the Dakota and contain the influx of settlers but also neglected to provide compensation to the Native Americans. Additionally, a despicable war among the destitute was underway, wherein the government promised to pay 10 cents per acre of "Indian land" on paper. However, the impoverished settlers resold the same plots for 40 cents to a dollar. While the Dakota had received no payments or promised rations in exchange for their hunting territories, the new colonizers were obliged to pay without hesitation. Following the revolt, another dark chapter unfolded in American history, with the largest mass execution on record. Thirty-two Dakota were hanged. Shortly thereafter, the body of their leader Taoyateduta, already slain by the settlers, was fed to pigs on July 3, 1863. However, the greatest risk for Capellini might have come from the Native Americans themselves. It should not be forgotten that due to the desperate depletion of their hunting grounds, both the Eastern Dakota and the Western Teton Dakota systematically raided the villages of other tribes. The last attack on an Omaha settlement, resulting in dozens of casualties on both sides, occurred in August 1859, just four years before the geologist's journey, in a location called Beaver Creek in present-day Boone County, Nebraska.

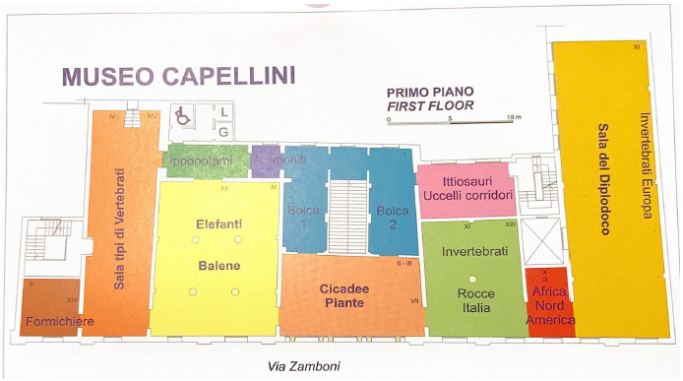
[7] Capellini, *Ricordi di un viaggio scientifico nell'America Settentrionale nel 1863*
[8] Piccioli, *I figli del vento: gli indiani delle praterie nelle collezioni ottocentesche*

Nevertheless, the Omaha and Ponca nations were among the few on the fringes of the Great Plains that had not taken sides in the Civil War.

(b) The location and its map/plan

The museum is located in via Zamboni, in the city center of Bologna. The museum is hosted in an historical building which previously was a hospital called “Ospedale dei Lebbrosetti”, and then “Ospedale Azzolini”[9].

The image shows how the ground floor of the museum is structured. Nowadays not all the rooms can be visited: the Archive, the Sancta Sanctorum room and a part of Sala Vialli are not accessible by the visitors. There should also be highlighted that Sala Vialli is used to hold temporary exhibitions, while the other part of the ground floor contains a permanent exposition of rocks. On the ground floor there are the ticket office, the bookshop and a spot for newly born children and their parents.



The huge collection of fossils, rocks and skeletons is displayed on the first floor. The map shows a particular organization for each room that nowadays is not totally respected. There is not a path that can guide visitors throughout the museum and highlight the must see, so in most of the cases the visitor feels quite disoriented and runs the risk of not even appreciating the experience.

[9] Vai, *Museo Geologico Giovanni Capellini - Guida breve per immagini, Alma Mater Studiorum- Università di Bologna*, p.13

As for the accessibility point of view, the museum states that a wheelchair is available for those who need it. Then, a mobile ramp and a stairlift allow disabled people to access the ground floor and go up to the first floor. The accessibility document of the museum underlines that each room allows people using a wheelchair to visit the museum, while it could be quite difficult for them to see the content inside the display cases. It should be noted that, considering how close the display cases and other furniture are, we find it hard to think that a person using a wheelchair could be able to admire all the musealia[10].

(c) Institutional Goal

The museum curators and the Dean Delegate for Cultural Heritage of University of Bologna talked about some goals that they would like to be implemented in the museum. For example, Michela Contessi explains the need to help the visitor's imagination, while Giuliana Benvenuti stresses the importance on green transition and behavioral change and trying to develop the museum's narrative based on contemporary topics[11].

Having considered these points of view, we chose six different possible institutional goals of the Museum, and then we selected only three of them. We thought that the visitor's imagination should be helped using innovative devices, so that the guides are not mandatory, and the exhibition's path can be understood even without them. Moreover, the museum should focus more on contemporary topics, such as the attention for the environment and the creation of a new bond between men and nature. In addition, Capellini Museum needs to increase the number of visitors, thanks to a possible renovation of the exhibition, further social media reach, digital innovation (i.e insertion of visual markers) and the visitor's participation. The three goals that we chose among the six were: the focus on the contemporary topic; the visitor participation; the stimulation of the visitor's imagination.

(d) Cognitive Goals

The same decisional process has been done for the cognitive-emotional goals, choosing at first six goals, and then picking only the three of them that were considered as the most pertinent. The museum needs to focus on stimulating dialogue between people, both talking and discussing about some items while visiting, or reporting their experience to others, so that the museum can be visited by an increased number of people. In order to create some immersive experiences with digital devices, there should be some places that guarantee silence and no further elements of distraction. Moreover, the museum needs to develop enchantment and a sense of wonder, focusing on the must-see of the museum and how they could be made more noticeable. Also, this aspect should be fundamental for digital experiences that can be built inside the museum: if the visitor does not feel curious or enchanted by it, there could be a high chance of not finishing the experience. In addition, seeing fossils, skeletons, listening to various stories related to them could improve the sense of memory and recall, thinking about ancient times and how the world was completely different then. Of course, this leads to the development also of the sense of imagination in the visitor. We can also point at two other goals through some stories that can be expressed by some items inside the museum: develop and accept diversity and develop a sense of belonging. This is achieved, for example, by thinking about the story that we chose to focus our project on: Capellini's meeting with the indigenous tribes during his travel in the United States.

[10] This piece of information has been taken from the accessibility document of Capellini Museum.

[11] This piece of information has been taken from the slides of the course.

(e) Star Assets (must-see of the museum, add images)

Full scale reproduction of the Diplodocus

Glyptodont

Mastodont

Skull of Rhinoceros

(f) Target Audience

Nowadays, the main audience of the museum are students and experts. Laboratories and specific guided tours are available for primary school children.

2. The audience

As for our target audience, we have chosen to deal with national and international tourists. We decided to focus on this type of audience because it allowed us to analyze people with different interests and backgrounds, that maybe already knew Capellini Museum but would be surprised to see its rebranding. The fourth stage of our design brief dealt mainly with deciding the type of the audience and the related motivations, barriers, capabilities and devices related to them and their experience.

A) MOTIVATIONS

- **Wonder.**
  Tourists are attracted by a museum if they potentially find it interesting, but, most importantly, they expect to be amused and surprised by what they see or experience in it. Capellini Museum has lots of objects that can help achieve that, starting from the big skeleton of the Diplodocus. The museum should highlight better the elements that capture the attention of the visitor by adding some interactive screens, or other interactive elements, that can help understand their story and context.
- **Time travel.**
  Tourists are amused by captivating experiences and time travel is one of these. This can be achieved just by stepping into the museum and seeing all the fossils, skeletons that can help us imagine how different life was millions of years ago.

B) BARRIERS

- **Poor Signage**
  One of the main barriers that we discovered in the museum is the lack of signage. The path that the visitor has to follow is not clear both on the ground floor, and, in particular, on the first floor. This could be a source of confusion in the visitor's mind because he/she cannot understand if the museum objects need to be seen in a particular order or not, and it could also reduce the time that the visitor is willing to spend inside the museum.
- **Restrictive opening hours**
  Nowadays, Capellini Museum is open only during the morning on weekdays, while it is open for the whole day during the weekend. This could discourage people from visiting the museum, considering that during the mornings both students and workers are always busy. Also, tourists could find these restrictive opening hours quite strange, because if they had planned to visit the museum, they have to organize it at a certain moment and not go there whenever they want, without running the risk of finding it closed. As a consequence, the museum needs to extend opening hours even during the afternoon, in order to allow everyone to visit it.

C) CAPABILITIES

- **Social media networks**
  National and international tourists supposedly know how to use social media. This could be a great advantage even for the museum, both because they could promote what they have seen on these platforms and attract new visitors to the museum.
- **Mobile apps**
  Mobile apps are used by almost everyone, for this reason we have considered it as a basic capability that national and international tourists can have to discover the museum from a different perspective.
- **Mixed reality**

Not everyone has had experiences with augmented reality, virtual reality or mixed reality but for sure they can be intriguing and also their functioning is easy to understand. Mixed reality merges the real world environment and a computer generated one. In this way the visitor can use augmented reality apps or virtual reality headsets.

D) DEVICES

- **Curiosity**
  Tourists decide what to see in a city according to their interests and their curiosity. Considering that curiosity plays a fundamental role in the tourists' experience, there's the need to surprise them in unexpected ways. The goal of the museum needs not only to attract experts or people that are already very interested in geology but also the general public. Curiosity can be achieved in lots of different ways: by seeing pictures of the museum shared on social media; by playing games inside the museum to find out frequently missed out objects, also by simply looking at the musealia and wondering what is it and what's its history.
- **Augmented reality set**
  Using an augmented reality set could increase the level of curiosity and the ability to recreate the original environment in which the animals, which skeletons and fossils are displayed in the museum, lived.
- **Personal relevance**
  The visitors are attracted by a personal connection that they share with the museum.

3. Concept

(a) Problem/s you are facing with your project, try to be specific (i.e. attracting an audience that usually is not interested to museums)

One of the main problems that we are facing is attracting an audience that is not interested in geology. At the moment, the museum is mainly visited by experts or people interested in the field and since our project is not is not strictly connected with geology, it could be perceived as a way to attract a wider and different audience to the museum.

The museum is the only one in Europe that still possesses its original furniture and labels that are considered highly important by the museum director and curators. Inserting a digital device in this environment could be perceived as strange or disorienting.

Furthermore, the device should be positioned in a specific room and not anywhere. Its positioning needs to be coherent with the museum's path and near the furniture in which the items from Capellini's journey are displayed. Also, the room in which the device should be placed needs to be large enough to allow it to be accessible from both sides even by people that are using a wheelchair.

The experience is facing some controversial topics, such as colonialism. As a consequence, there should be found a way to be inspired by the original story and analyze these topics in a politically correct way at the same time.

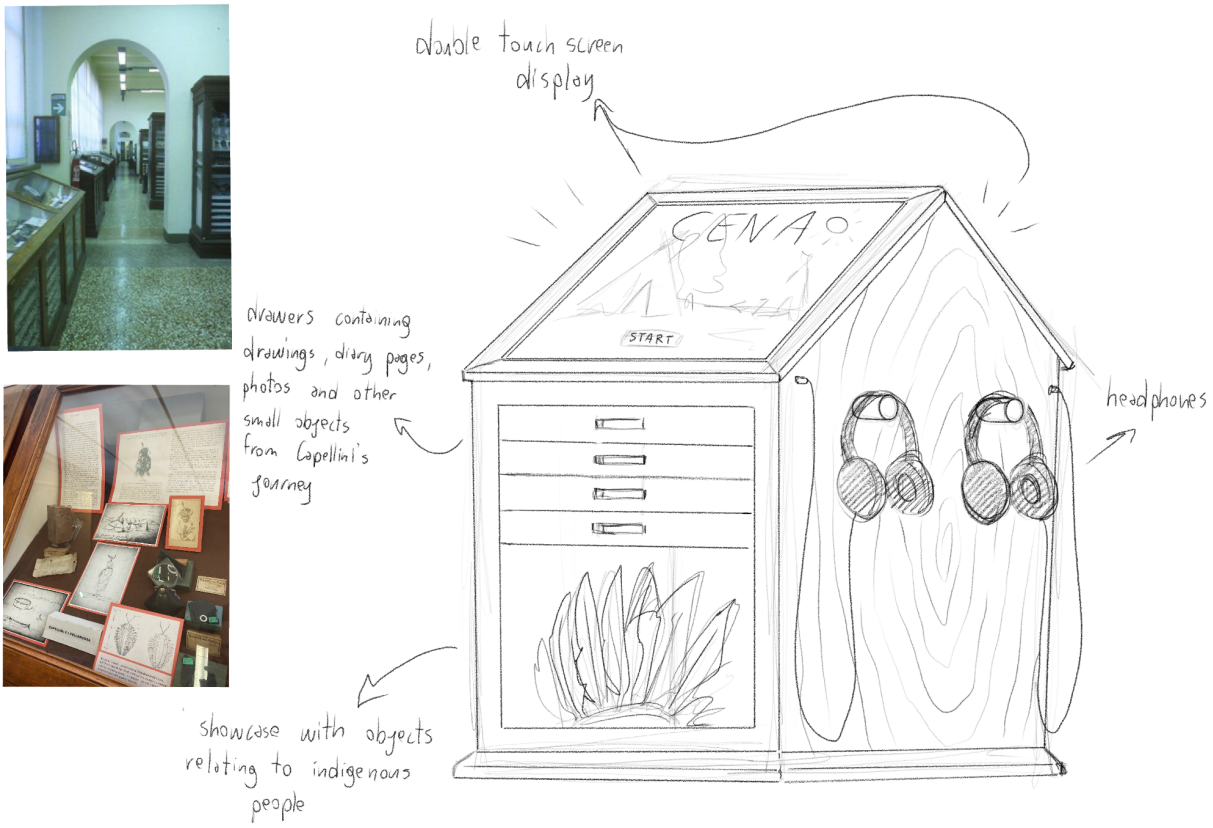
Another important problem is related to how the height of the device could become a problem if the users are children or disabled people that use a wheelchair to move around.

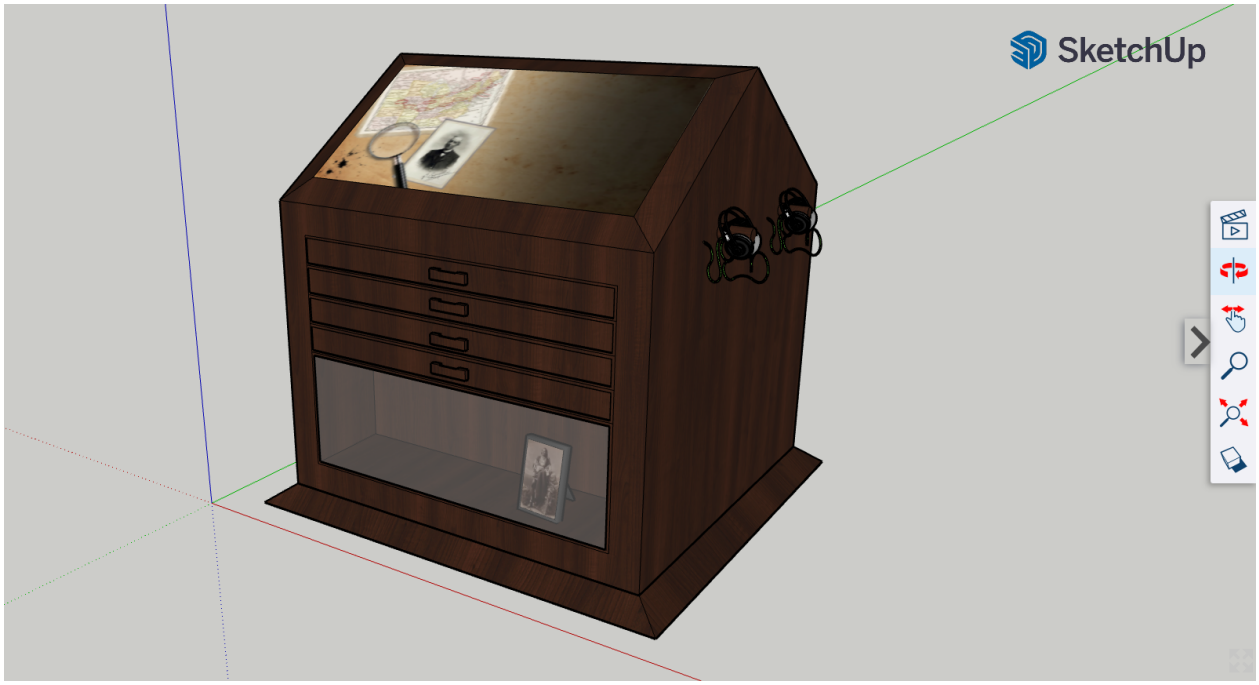
Nowadays, there's no internet connection inside the Capellini Museum. As a consequence, the digital device that we're planning to insert will not work because it needs a functioning connection to send automatic emails to visitors after the experience has ended.

The last part of our project focuses on filling a form to gather information both about the experience and the user. For this reason, we're facing the problem of asking for consensus to collect sensitive data that will be used only for experience purposes.
The last issue that should be highlighted is about the 3D objects that are added inside the final card. In our demo, we decided to personalize each card with a downloadable 3D object that represents the gift that the natives had given to Capellini. Some of those original objects are stored in Museo Civico Etnografico "Giovanni Podenzana" in La Spezia but the institution hasn't created 3D models of those objects yet. Since we couldn't refer to 3D models of the original objects, we decided to insert similar items taken from Sketchfab in our demo.

(b) how your project will face the problem/s

As stated before, our project is not strictly connected to geology but it is focused on Giovanni Capellini, a geologist and creator of the museum. The main point is to provide an experience that can study more in depth one of the minor topics of the museum. We chose to do that to enrich the museum's topics and attract a different group of people. In this way, tourists mainly interested in history or travel stories could be encouraged to visit the Capellini Museum.
The solution to the second problem could be camouflaging the device in a cabinet with a shape similar to the furniture used in Capellini Museum. In this way, there will be no high contrast between historical cabinets and a highly modern design.





The device should be positioned in one of the largest rooms, and in one of the cabinets positioned in the middle, so it can be easily accessed on both sides even by people in a wheelchair.
The main character of our experience, Giovanni Capellini, is not described as a colonialist as he did not behave like that even in his real experience. In this case, our goal was to highlight how Capellini's behavior was very different from colonialists, going there without prejudices and sharing even the indians point of view. We considered this as the basis to translate his figure into a modern narrative.
There should be the possibility to move the device up or down depending on the height of the user. As a consequence, everyone that is interested in the experience can do it without struggling to see what's going on.
Furthermore, a wi-fi connection could be installed inside the museum. This will allow both to use our device efficiently and to use mobile apps to further interact with the museum objects.
Moreover, consensus to use sensitive data should be asked at the end of the digital narration. In this way we could gather information about the users' experience both to improve it and to create the last step of the experience.
We should think of a collaboration between Capellini Museum and Museo Civico Etnografico "Giovanni Podenzana" in La Spezia, in particular regarding a photogrammetry session and 3D modeling of some of their objects.

(c) Museological approach

The device should be positioned inside in the room in which there are displayed the items related to Capellini's trip to North America. It should be placed in a strategic and coherent spot of the museum's path, in the middle of a big room, considering that the screen is double-faceted. In our project, the device needs to be installed inside a cabinet that resembles the historical ones. In this way there shouldn't be a high contrast between the modern device and the old cabinets.
The main topic of our project is Capellini's journey in North America, in particular the demo focuses on the moment in which he decided to visit a Native American tribe in Nebraska. We took inspiration from a cabinet in which there are some objects related to the trip, diary passages and a photo that Capellini took there. The items are put there without any explanation or

contextualization and so it could be interesting to focus more on an aspect related to Capellini's life in order to combine information regarding the figure of the creator of the museum with its content. In this way, topics different from the Museum's main one will be considered and a wider audience will be encouraged to visit it.

(d) Specific themes and topics you have selected as case study for your PW

The main topic of our project is Giovanni Capellini's trip to North America, in particular the meeting that he had with a Native American tribe on the 30th of September 1863. We took inspiration from what Capellini wrote in his diary[12] and modified it into an interactive narrative.

From this story we extrapolated some themes that constitute the core of our experience.

The most general theme is travel, in particular considering how different traveling was a century and a half ago and was done only for work purposes, rarely for pleasure.

The last two themes we are going to talk about are the institutional goals that have been suggested by the Dean Delegate for Cultural Heritage and the museum curators, these themes can be extracted from the narration of our application and are still relevant today.

We considered cultural exchange, in particular with a minority, as the second important topic. During the trip Capellini had the chance to meet the tribes of the Ponkas and the Omahas, he stayed with them a whole day and had the possibility to witness their daily life and know more about their traditions.

The third topic is a focus on the relationship between man and nature. It can be found throughout the narrative considering how the natives lived in a close contact with nature, while Capellini was only studying it, and so approaching it from an external point of view.

4. Requirements

Here you specify the requirements needed to reach the goals

(a) Must

The institutional goal that we considered as the most important is the focus on contemporary topics. We managed to do that by taking inspiration from Capellini's trip and developing a narrative that focuses on themes that are still relevant today, such as the relationship between man and nature, protection of minorities and dealing with colonialism. In order to fulfill the second goal, visitor imagination, the visitor must be able to do a time travel experience helped by the narrative and 3D scenarios built with Unreal Engine. The visitor participation must be achieved by an interactive narrative where the user can choose how to continue the experience. Both of the choices that are made inside the experience and in the final form help construct the "traveler card". In this way we suggest a comparison between Capellini's trip and the visitor's one and we produce a personalized output.

As for the cognitive-emotional goals, we must develop a narrative in which the native americans point of view is adopted in order to increase the sense of belonging and sympathize with them.

We've added some narrative devices that focus on objects that evoke enchantment and a sense of wonder such as sounds and videos.

The goal related to memory recall is achieved thanks to the presence of citations taken from Capellini's diary, one focuses on describing the traditional dances, the other tells the story of Black Bird.

(b) Should

[12] diario di capellini

In order to achieve more participation by the visitors, the experience should be available in more than one language. Moreover, the device and the room in which this should be easily accessible by people using a wheelchair and blind people. Then, the final personalized cards should be more structured and more accurate according to the previous choices that the user made during the experience.

As for developing the sense of belonging, we should add a database that stores all the answers to the open question “Which of your travel experiences can be compared to this?” and shows them in the final passage of our experience. In this way, the user can develop a sense of belonging and community to other users that have made similar choices in the experience.

The original objects that Capellini bought in America and that are now stored in Museo Civico Etnografico "Giovanni Podenzana" in La Spezia should be transformed in 3D models to enhance memory recall about the trip and native americans’ traditions.

(c) Could

The experience could focus more on some contemporary topics, such as climate change, in particular considering that this is a huge problem for the communities of native americans that are obliged to leave their territories because of desertification or the rising of sea levels.

In order to further develop visitor’s imagination, more videos and interactive objects could be added.

The experience could be also developed using VR to further attract the visitor’s participation. In this way, distractions and interruptions could be avoided, and the experience could be done by anyone, without depending on the height of the device.

Furthermore, the resolution of the 3D models/ 3D experience could be higher to make the experience seem more realistic and to increase enchantment in the visitor’s perspective.

The experience could be expanded by inserting all the steps that Capellini made during his travel to the US. The idea is that the user can choose which leg of the trip he/she wants to focus on.

(d) Won’t

The experience will not in any way deal with topics such as discrimination or the justification of colonialism, nor will it attempt to address them in a superficial manner. Furthermore, it will not induce users to abandon the experience before its completion. Instead, it will strive to make it engaging through the use of videos, sounds, images, and a compelling narrative pace. It will not be a sterile or self-contained experience, but rather emotionally and personally engaging, allowing the user to evoke and compare their own travel experiences with the one presented here.

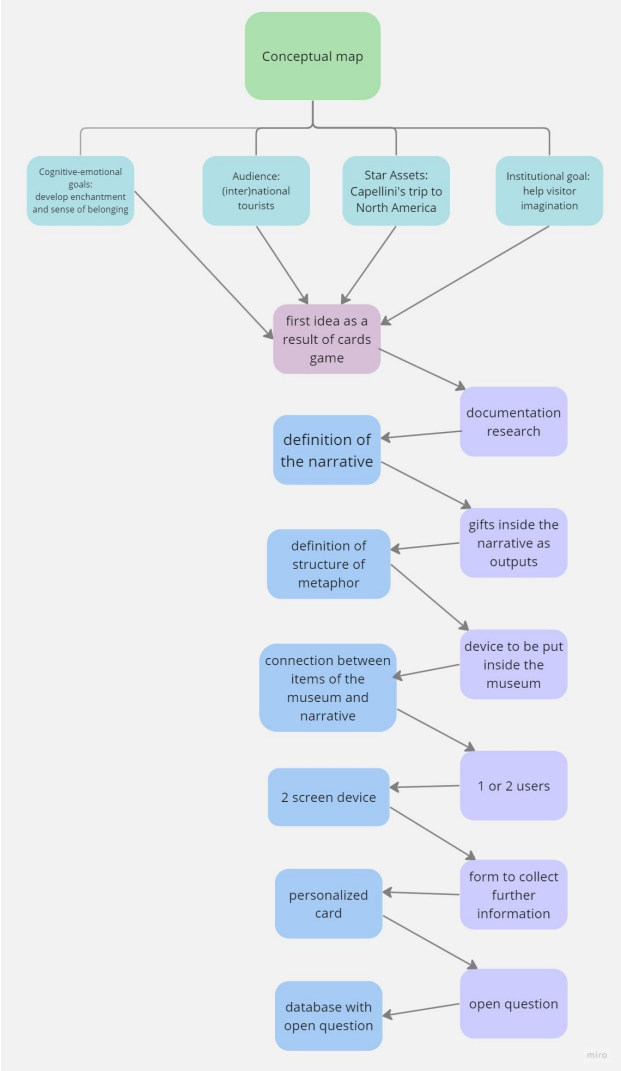
5. Ideation

(a) Experience (from the users perspective)

The user enters the museum and begins their visit. There may be an information panel at the entrance notifying visitors of a digital experience on the upper floor, in the section dedicated to Capellini's journey. Upon reaching the room with the devices for the CENA experience, the user will see a cabinet similar to those containing artifacts and other items in the museum, but instead of an angled display case, there will be a digital screen. This cabinet has a distinct shape, as it consists of two small showcases joined at the back, each with its own screen. In the case of two visitors, the experience can be enjoyed simultaneously by facing each other, with each person having their own screen in front of them. If only one user is involved, he will impersonate the geologist Giovanni Capellini, otherwise one will impersonate Ne-ki-ga-kuh, the chieftain of the Poncas tribe and the

other Giovanni Capellini. This station will feature a digital touch screen and hooks on the sides where headphones can be placed, enhancing the immersive and engaging nature of the experience. The user will initiate the virtual story simply by touching the screen, selecting the language and number of users, and following the instructions that appear as the narrative unfolds. Once the story concludes, the visitor will complete a brief questionnaire that helps create their personalized profile. This data will generate a customized visitor card (categorized as "explorer," "tourist," "local," etc.), which will be sent to their email as a summary of the experience. Within these final questions, there will be an open-ended prompt asking the visitor to share one of their travel experiences. This response will be saved and added to a public repository containing all the stories of the museum's "travelers." At the end of the experience, the user can navigate through the testimonies left by previous visitors. The experience will last about 10 minutes.

(b) Conceptual map



(d) The story (you can include an interactive narrative using Twine)

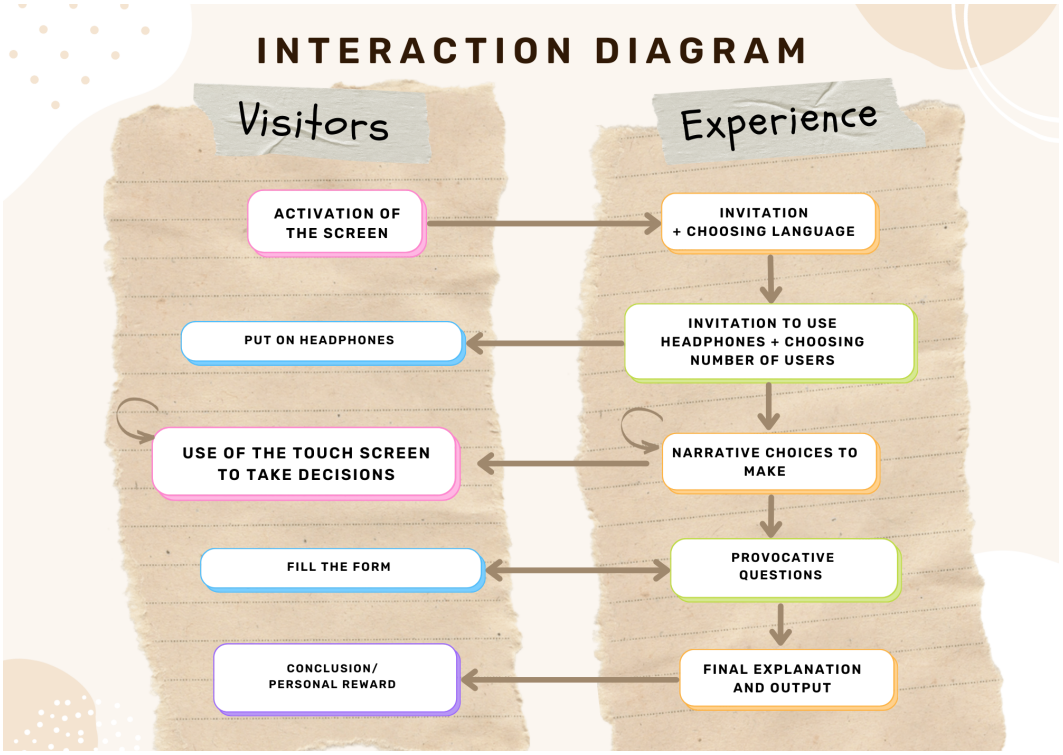
The narrative (developed on Twine) follows in the footsteps of Capellini's journey to North America in 1863, focusing specifically on his first encounter with a Native American tribe, the Ponca tribe. The visitor can experience the journey by playing the role of Capellini, if alone, or

choosing to portray either Capellini or the Ponca tribe chief, if there are two participants. The scene takes place at the Native American camp. Capellini meets "Big Drum" and observes a typical evening in the Native American camp up close. He reflects on moral issues (also discussed in his diary), such as the Catholic Western education imposed on the young children of the tribe, which quickly leads them to abandon their families and heritage. Towards the end, various objects come into play, including Capellini's notebook, his telescope, a calumet, a frog, and a pair of moccasins. Each object carries its own significance and represents a particular branch of the story, shaped by the user's choices. In the finale, the visitor is prompted to reflect on current ethical themes such as colonization and the disappearance of vulnerable yet profoundly rich populations with histories and humanity, who no longer have a place to call home due to the continual usurpation of their lands, as well as the increasing hardships caused by climate change.

Twine Interactive Narrative: https://giorgiacrosilla.github.io/cena/

(f) Description of the interaction between the application and the users (include Interaction Diagram)

The visitor sees the device in the museum gallery and decides whether to interact with it or not. They unlock the touch screen and initiate the interaction. The digital experience prompts the user to wear headphones to enhance immersion, asks them to choose the language of use, and select the number of participants involved in the experience. The narrative journey begins, and the user chooses which point on the map to focus on (in the demo, only Nebraska is available, but expansion to all stages of Capellini's journey in North America is hypothetically possible). The user then makes narrative choices using the touch screen. At the end of the story, the user is required to respond to questions by completing a form, which, along with the choices made in the narrative section, will contribute to building a specific personalized user profile. This profile will be returned to the user as the final output and summary of the experience.



(g) Foreseen workflow

For the development of the initial demo, we decided to start with documentation and source analysis, studying various texts such as *Ricordi di un viaggio scientifico nell'America Settentrionale nel 1863*, *Fossilia*, *I figli del vento*. With the acquired information, we were able to develop a narrative line that allows the user to relive Capellini's encounter with the Native Americans, reconstructing the key points from his diaries and following his sketches for the visual development of our experience. The demo is designed for one or two users. If there is only one user, they will automatically assume the role of Capellini. If there are two users, they can choose to each portray either Capellini or the chief of the Ponca tribe. Throughout the story, the user is prompted to reflect on certain key points that mirror Capellini's reflections in his diaries. One example is the observation of the behavior of young Native children who are forced to receive religious education at the settlers' base camp, gradually moving away from their original family and traditions. This element encourages reflection on the issue of colonization, the loss of one's roots, and the survival of indigenous populations who see their spaces and descendants being taken away. The narrative is also developed around several symbolic objects that accompany Capellini on his journey of discovery. The telescope, an object of exchange with the Native populations which was fascinated by its functionality. The sketchbook where Capellini sketches drawings of his journey. The frog that Capellini brings back from America as a study object. The moccasins and the calumet, gifts from the Native populations. At the end of the demo, we have created a form for the user that concludes the experience and allows us to gather additional information about them for the creation of a personalized profile. The user's profile reflects the decisions made during the digital experience and summarizes the type of traveler they are, providing a digital 3D object that encapsulates the lived experience in the virtual journey. The only open-ended question in the form asks the user to share a personal travel experience, which will be stored in the device's database, allowing users to read the testimonials of previous visitors who have completed the experience, like a continuously updated travel journal.

(h) Set-up: Foreseen hardware, software and Media (digital asset needed)

For the development of the demo, we utilized the following software tools:

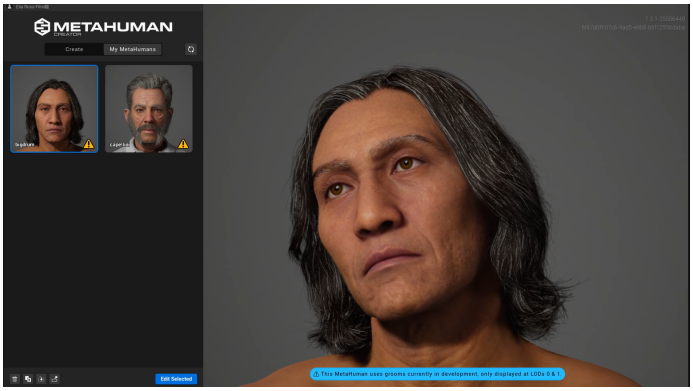
1) **Figma**[13], for creating the digital scenario derived from the use of cards. Figma is a collaborative design and prototyping tool that allows teams to create user interfaces, interactive prototypes, and design assets.
2) **Twine**[14], for crafting the demo of the experience with various possible choices. Twine is an open-source tool used for creating interactive, non-linear narratives and text-based games. It provides a simple and intuitive interface for authors to create branching stories by connecting passages of text with hyperlinks. Twine allows for the creation of complex decision-based narratives, where players can make choices that affect the outcome of the story. It supports the use of variables, conditional logic, and scripting, giving authors flexibility in crafting interactive experiences.

[13] Official website: https://www.figma.com/ (visited 13/06/2023)
[14] Official website: https://twinery.org/ (visited 13/06/2023)

3) **Unreal Engine**[15], for creating a precise and hyper-realistic setting of the indigenous village, where the user will be immersed in the narrative (exportable in various formats and modes). Unreal Engine is a powerful and widely-used game development engine created by Epic Games. It provides a comprehensive set of tools and features for creating high-quality and visually impressive games, virtual reality (VR) experiences, and simulations. Unreal Engine offers a robust visual scripting system called Blueprint, which allows developers to create gameplay logic and interactions without writing code. It also supports advanced scripting with C++ for more complex functionality and optimization. With its realistic graphics rendering capabilities, physics simulation, and extensive asset library, Unreal Engine is favored by both indie developers and major studios for creating immersive and visually stunning interactive experiences across various platforms, including PC, consoles, and mobile devices.

4) **MetaHuman Creator**[16], for generating highly realistic 3D characters of Capellini and Big Drum. MetaHuman Creator is a software tool developed by Epic Games that enables the creation of highly realistic and lifelike human characters for use in virtual environments, games, films, and other digital media. It leverages advanced algorithms and machine learning techniques to generate detailed 3D models of human faces and bodies. The tool streamlines the character creation process by providing intuitive controls and a wide range of pre-built options, allowing users to quickly generate unique and expressive virtual humans with realistic facial expressions and animations.

[15] Official website: https://www.unrealengine.com/en-US (visited 13/06/2023)
[16] Official website: https://metahuman.unrealengine.com/ (visited 13/06/2023)



5) Unreal Engine Libraries, such as **Quixel Megascan**[17] or **Niagara System**[18] assets, for enriching the landscape and objects within the Unreal Engine project. Quixel Megascan is a comprehensive library of high-quality 3D scanned assets for use in digital projects such as video games, films, architectural visualizations, and virtual reality experiences. It offers a vast collection of photorealistic textures, materials, and 3D models that are meticulously captured from real-world objects and environments. These assets cover a wide range of categories, including natural elements like rocks, vegetation, and terrain, as well as man-made objects like buildings, props, and surfaces. Quixel Megascan provides artists and designers with an extensive resource to enhance the visual quality and realism of their creations by incorporating detailed and physically accurate materials into their digital scenes. Niagara System is a powerful visual effects system developed by Epic Games as part of Unreal Engine. It allows artists and developers to create complex and dynamic particle effects, simulations, and visual behaviors for various types of projects, including video games, films, and interactive experiences. Niagara System provides a node-based interface that enables users to design and control the behavior of particles, fluids, and other visual elements in real-time. It offers a wide range of tools and features for creating stunning and realistic visual effects, including advanced particle simulation, dynamic particle behaviors, customizable shaders, and interactive workflows. We used Niagara to create the campfire.
6) **Sketchfab**[19], for researching and downloading realistic 3D objects to be incorporated into the Unreal Engine project. Sketchfab is an online platform and community that allows users to upload, share, and discover 3D models and content.

[17] Official website: https://quixel.com/megascans/ (visited 13/06/2023)
[18] Official documentation: https://docs.unrealengine.com/5.2/en-US/creating-visual-effects-in-niagara-for-unreal-engine/ (visited 13/06/2023)
[19] Official website: https://sketchfab.com/ (visited 13/06/2023)

7) **Procreate**[20], for creating graphics and visually enhancing images through digital drawing. Procreate is a popular digital art app designed exclusively for iPads. It offers a wide range of powerful tools and features that allow artists, illustrators, and designers to create stunning digital artwork with ease. With Procreate, users can sketch, paint, and draw using a variety of realistic brushes and customizable settings.
8) **ZapSplat**[21], for searching and downloading audio tracks to construct the immersive sound environment for the user. Zapsplat is an online platform that provides a vast library of high-quality sound effects and audio clips for various creative projects.
9) **Automatic Voice Reading**[22], for generating narrated audio tracks in English voices (also useful for accessibility purposes). Automatic voice reading refers to the technology that converts written text into spoken words using automated systems. It utilizes text-to-speech (TTS) synthesis to generate human-like voices that can be easily understood by listeners. This technology enables the automation of voice narration for various applications such as audiobooks, virtual assistants, accessibility features, and voiceovers for videos and presentations.
10) **SketchUp**[23], for creating the 3D object of the digital display case that we designed as a device to be placed in the museum for the enjoyment of our experience. SketchUp is a 3D modeling software that allows users to create and modify 3D models of various objects, buildings, and environments. It offers a user-friendly interface with intuitive tools for drawing, extruding, and manipulating shapes in three dimensions. SketchUp is widely used in architecture, interior design, construction, and related fields as a versatile tool for visualizing designs and generating detailed models.

For the future concrete implementation of the project, we propose using the same software as the demo, applied to a touch screen device. Unreal Engine is well-suited for implementing a choice-based gameplay logic, where the environment can be developed using blueprints and code strings with C++. Additionally, we suggest utilizing software such as **MeshLab** for processing the photogrammetric capture of the original objects brought back by Capellini and now preserved in the ethnographic museum in La Spezia.

(i) Further development and maintenance issues

For future project implementations, several interesting possibilities arise:

- Given the historical and scientific interest of Capellini's entire journey in North America, it would be interesting to propose the playability of all the **main stages highlighted on the map**. Each location would offer its own narrative path with a specific reflection on a particular aspect of the journey and encounters with different personalities and objects. This would provide users with greater choice, allow for an exponential expansion of the gameplay universe, and enable them to revisit many more pages of Capellini's diary, thus encouraging exploration of his history as an explorer.

[20] Official website: https://procreate.com/ (visited 13/06/2023)
[21] Official website: https://procreate.com/ (visited 13/06/2023)
[22] We specifically used this online tool: https://ttsmp3.com/ (visited 13/06/2023)
[23] Official website: https://www.sketchup.com/it (visited 13/06/2023)

- It would be important for the authenticity of our application to be able to load **digital scans of the original objects** used and received by Capellini during his journey into the 3D environment. Therefore, we would like to scan in high quality, using photogrammetry techniques, the objects used in our narrative, such as the telescope, notebook, moccasins, pipe, and frog. It would also be interesting to add new objects to the virtual environment, always belonging to those brought back by Capellini from his journey.

- In our demo, we show how we would like to collect user responses to the open-ended question in the final form, which asks them to share a travel experience that can be compared to Capellini's exploratory journey. The responses from each user are saved and stored in a **navigable visual database**. Specifically, we have considered storing users with their names associated with the stars in a night sky (the same sky observed by Native Americans through Capellini's telescope). Each star would have a nearby name. Pressing on one of the stars would open a panel containing that user's response text. In this way, at the end of the experience, the visitor can decide whether to dedicate some more time to reading the thoughts of people who came before them and explore this kind of "shared diary." We would like to further develop this idea and make it fully secure and functional.

- Given the great potential of Unreal Engine, where we have already created the implementation of our Native American village, it would be conceivable to create a **VR version** that can be used with VR devices. The application can be run on devices such as virtual reality headsets, such as Oculus Rift, HTC Vive, or mobile devices with VR support like Google Cardboard or Samsung Gear VR. Users wear the headset and use controllers to interact with the application in an immersive virtual environment. Considering our development with Unreal Engine and MetaHuman, it would be interesting to consider a future transposition of the narrative path to VR technology to enhance engagement.

- To fully leverage the extensive opportunities offered by VR, it would be interesting to make certain **objects interactive** in Unreal Engine through the application of Blueprints and C++ code. This would make the gaming experience more engaging and immersive. The ability to interact with objects could also be integrated into the touchscreen version of the game.

- Directly related to the previous point on interactive objects is the opportunity to develop "**open-world**" management of our 3D environment in Unreal Engine using collision techniques. In this way, the 3D characters of Big Drum and Capellini, modeled with MetaHuman Creators, can be inserted into the game dynamics and controlled by the user to move and interact with objects and space. With this dynamic, the environment becomes explorable, and new tasks or objects to collect could be hidden around the village. With this significant implementation, the application would focus more on the "exploratory" factor of the journey.

- An interesting possibility that we would like to explore is the concept of **replicability**. This project can be replicated and installed (with the same impact) at the Ethnographic Museum in La Spezia, where many of the objects featured in the game narrative are preserved. It would also be intriguing to observe the exchange of visitors between the two museums, quantitatively speaking, as they engage with this experience. In addition to this proposition "in-house," we would like to venture a similar idea for the Field Museum in Chicago, a natural history museum known for its embrace of digital technologies. Sharing the final database containing the

messages left by users with them would be fascinating, as it would open our travel journal to a more international perspective. Furthermore, it could potentially be developed further to create connections and knowledge-sharing between visitors of the two museums across the ocean.

Regarding maintenance issues, the following probable circumstances arise:

- Managing the device's **memory** is necessary to smoothly display and operate the application. A project of this kind would likely require large amounts of memory for data storage and continuous 3D usage.

- For the proper functioning of the final part of the experience, which is related to user form submission and reward reception, it is necessary to connect the device to a reliable **internet connection**. This way, user responses can be saved, and the visitor will receive their personalized card via email.

- An important consideration is the constant need for **power supply** to the device and its power consumption levels. It is worth considering the possibility of implementing power-saving settings, such as activating a standby mode after a few minutes of inactivity.

- For the ongoing **maintenance** of the application and the device, maintenance interventions by the creators/technicians will be necessary. They will need to assess the hardware and software functioning of the application.

6. Disruption

Threats and potential issues with the project and how we would face it:

- **Accessibility**
  - Threat: The screen is not accessible to all users. Wheelchair users would have difficulty seeing and interacting with it. Users with visual impairments would not be able to locate and use the device.
  - Response: To address these issues, it is possible to provide portable devices such as tablets or VR tools to give these individuals the opportunity to experience the exhibition. Additionally, all visual narration should be accompanied by a voiceover providing audio support for the visually impaired. For blind users, the option to make narrative choices can be provided by pressing either the right or left side of the screen, following specific voice commands. To help visually impaired individuals locate the device within the museum, in addition to suggesting guided assistance, it would be a good idea to install tactile paths throughout the museum, including one specifically designed to lead to the device.

- **Peace**
  - Threat: the user may not fully enjoy the proposed experience if interrupted by noise, distractions, or confusion resulting from external factors.
  - Response: the solution could be to place the device in a spacious, quiet, and suitable area within the museum to create a corner of immersion.

- **Maintenance**
  - Threat: the experience and the device, as currently ideated, could entail high maintenance costs.
  - Response: to prevent the unfortunate neglect of application maintenance, it is good practice to allocate a dedicated budget for maintenance from the outset of the project's development.

- **Configuration - Pace**
  - Threat: At the moment, the experience is designed for a maximum of two users. This could become problematic when a group of people visits the museum and cannot enjoy the application together, resulting in the need to split up during the experience.
  - Response: Some solutions could include considering the installation of multiple devices throughout the museum or providing a certain number of tablets (more affordable, simple, and lightweight devices) to the extra visitors, allowing them to experience the application simultaneously without having to separate the group. Another solution could be to organize scheduled time slots for experiencing the application. This way, visitors can sign up for specific time slots or reserve their preferred time in advance, ensuring that everyone gets a chance to participate without overcrowding or separating the group.

  By implementing a system of scheduled rotations, the museum can effectively manage the flow of visitors and optimize the utilization of the devices. This approach ensures a smoother and more enjoyable experience for all participants while maintaining a manageable number of users at any given time.

- **Narrative**
  - Threat: One challenge we have tried to address is the need to ensure visitor satisfaction and foster curiosity about the acquired information.
  - Response: To achieve this, we have implemented a personalized experience through a short final form, consisting of both closed and open-ended questions. This allows us to reinforce the user's knowledge (based on the choices made throughout the gameplay narrative) and provide them with a customized card as an output, describing the type of adventurer they are. The card includes a 3D object that the user has encountered in the story and a summary of their traveler's personality. After receiving feedback from users of our similar age, we have decided to incorporate additional elements into this reward card. Specifically, we include links to websites and supplementary documentation to allow visitors to delve deeper into the acquired knowledge. This decision arose from the feedback received, where users expressed satisfaction with the experience but expressed a desire to explore Capellini's journey further. By offering these additional resources, we aim to cater to the users' desire for more in-depth exploration and provide them with the means to expand their understanding beyond the confines of the application.

- **Stimulation**
  - Threat: Another crucial point to consider for the success of our project is the ability to stimulate and provoke users with reflections and questions on topics that connect to current and contemporary issues. In our case, these topics revolve around the aspects of colonialism in the territories of Native American tribes and the relationship between humans and nature as represented by the natives. These themes trigger reflections that extend to our present-day

world, allowing users to discover a journey that took place in the 1800s but still resonates today as a source of contemporary and counter-current thinking.
- Response: To meet this need, we have decided to incorporate choices within the narrative that demonstrate a propensity for exploration, respect, and care towards the Native American populations Capellini encounters. Specifically, these paths involve observing the behavior of children in the village and reflecting on Chief Ponca's thoughts about the future of his tribe. In the future, it could be beneficial to enhance these moments of reflection and introduce more direct and thought-provoking questions to capture the user's attention and encourage them to reflect on challenging topics. By integrating these elements into the narrative, we aim to engage users in meaningful discussions and encourage them to critically analyze the issues surrounding colonialism and the relationship between humans and nature. This approach fosters a deeper connection between the historical journey and contemporary concerns, ultimately enriching the user's experience and provoking thoughtful engagement.

- **Energy use**
  - Threat: the device may result in high electricity costs and significant power consumption.
  - Response: to address this issue, we propose implementing an energy-saving mode for the device. This mode would reduce the screen brightness after a period of inactivity and activate a low-power standby mode.

- **Replicability**
  - Threat: At the moment, the application (as well as the device itself) is specifically designed for installation at the Capellini Museum. However, this doesn't mean that the experience couldn't be replicated in other cultural venues.
  - Response: We have considered, for example, the possibility of bringing this experience to the La Spezia Museum, where the objects brought back by Capellini from his expedition to North America are still preserved. This would also allow the Capellini Museum to attract a greater number of visitors who have experienced the virtual journey in La Spezia. Also, the skeleton of the digital experience (metaphor-narration) could be applied also to other museums that refer to other travel journeys.

7. Teams roles and work

- Erica Andreose: Unreal Engine scenario, MetaHuman creators, graphical work with Procreate, sketch design for the cabinet.
- Giorgia Crosilla: implementation of the experience using Twine, 3D object with SketchUp, Figma digital asset for the card, ideation and development of users' output cards.

Together we created the structure of the story with choices, from choices we decided how to make the original metaphor adherent to the narrative, the output structures. We imagined the background images that could best fit the passages that we were building inside Twine narrative.

8. Scenario

https://docs.google.com/presentation/d/1z7druItnyvzCcmh1atEAFD8QH6DPwalM/edit?usp=drive_link&ouid=104309756660588013761&rtpof=true&sd=true

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