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## D5.1 Preliminary interfaces for interpretation and reflection

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# Project information

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5	OU	THE OPEN UNIVERSITY	United Kingdom
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## Executive summary

The aim of this document is to describe the initial specification of the citizen curation interfaces that will be developed in Work Package 5 during the SPICE project.

Based on the results of Work Package 2 in defining methods for citizen curation and the use cases described in Work Package 7, this document proposes a set of lo-fi prototypes for citizen curation interfaces. This proposal also takes into account the analysis of other previous systems and applications relevant to the identified citizen curation methods.

## Document History

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# 1. Citizen curation in SPICE

The SPICE project builds on the growing trend for museums, rather than providing an authoritative view, to present multiple voices related to their collection and exhibitions. In SPICE, an approach we term citizen curation is proposed as a way of supporting visitors to share their own interpretations of museum objects and reflect on the variety of interpretations contributed by others. To capture a wide range of voices, interfaces will be designed specifically to engage minority groups that tend to be under-represented in cultural activities. To achieve this goal, the interface will need to be intuitive, aesthetic and accessible for different audiences<sup>1</sup>.

Citizen curation methods in SPICE are organized around two types of activities: interpretation and reflection. In work package 2, deliverable D2.1 ("Initial methods for interpretation") identifies this initial list of interpretation methods:

- **Artifact analysis** is a method that utilizes any item, conceptual or material, as a primary data source to study the ideas, attitudes, beliefs and values of a person.  
Artifact analysis may support users in: answering questions that probe their own opinions; classifying artworks according to a set of tags; or developing their own interpretation of an artwork.
- **Collecting** is a method of selecting, gathering and keeping objects, that can serve curiosity about the past, or desire for understanding.  
Collecting may support users in: expressing emotions or aesthetics, when the user collects artifacts she likes; or logic, when the user selects based on a specific end-goal, like a treasure hunt or a story.
- **Storytelling and narrative methods** can involve sharing of personal or fictional narratives and can be applied to better understand and explain subjective realities.

Also in work package 2, deliverable D2.2 ("Initial methods for reflection") identifies this initial list of reflection methods:

- **Duoethnography** seeks to explore the impact of the life histories of individuals on their application of meaning to those experiences through multi-voice dialogue.  
In SPICE, duoethnography can be employed to allow two users with differing viewpoints to explore the cultural context of their individual experiences.
- **Narrative identity** conceptualizes how people develop their identity by narratively reviewing past events in the present, with respect to an imagined future.  
In SPICE, the theories on narrative identity can be used to reason about the personal, social motives and values of the users, and hereby determine similarities between groups and differences within groups, thus aiding social cohesion.

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<sup>1</sup> Bruni, Luis Emilio, Enrico Daga, Rossana Damiano, Lily Díaz, Tsvi Kuflik, Antonio Lieto, Aldo Gangemi, Paul Mulholland, Silvio Peroni, Sofia Pescarin, Alan J. Wecker: "Towards Advanced Interfaces for Citizen Curation". AVI<sup>2</sup>CH@AVI 2020

- **Cultural semiotics** can be viewed as the study of sign systems and meaning-making in cultural space.

In SPICE, cultural semiotics could be used to determine how deeply a text (an artifact, artwork, etc.) is tied to a certain culture based on how active the 'dialogue' is between the source-text and its surrounding culture.

From the point of view of the interfaces we are concerned with in work package 5, the emphasis will be on interpretation methods. Reflection methods can be seen as forms of use or tasks within interpretation activities. For example, narrative identity methods can be combined with storytelling techniques and artifact analysis for engaging the citizens in reflective processes.

Duoethnography can be used in the context of various interpretation tasks, for example, in order to inform the recommender system that attempts to provide alternative perspectives to a visitor, seeking to foster constructive dialogue.

In work package 2, visualization techniques are also proposed as a means to support interpretation, and reflection on groups of interpretations. We will not deal with such interfaces, firstly because they are already reviewed in deliverable D2.1, and secondly because in this area it is more difficult to find reusable techniques such as the ones we will collect in the second part of this document in Section 3.

In the next section, we describe relevant and existing tools for citizen curation. We will analyze the specific interfaces of those tools with the goal of finding inspiration in the design of the interfaces for citizen curation in SPICE.

## 2. Report on use of existing tools for citizen curation

### 2.1 Artifact analysis

#### 2.1.1 An Augmented Reality Museum Guide

This system was launched in 2008 and used as the Louvre - DNP Museum Lab (LDML)<sup>2</sup>. Due to the lack of smart devices at the time, they designed their own devices including Augmented Reality (AR). It includes a handheld device with a camera (similar to a tablet) that the visitors can use during their visit to a museum or gallery.

Museum Lab is composed of three main spaces (Presentation Room, Information Space, Theatre) and a Lobby. Information provided by multimedia tools surrounds the actual artworks on display, offering the visitor various approaches to these artworks. The AR is used in this project with two main functions being "artwork appreciation" and "guidance". "Artwork appreciation" means providing the visitor with some background knowledge in order to enable him or her to notice and enjoy the work's characteristics. "Guidance" means leading the visitor through the exhibition space in a sensible order.

From a technical viewpoint, the following requirements are important for making high-level design decisions in this project. For the artwork appreciation system function, AR was thought to be an effective interface providing 3D information to explain the points of artwork appreciation directly in front of the showcase. Important conditions are that the system must operate in a relatively dark environment and that the user should be free to point at the Artwork with the AR device from various angles. Museums also decided to use a character for their AR technology guidance system, in order to share a sense of "familiarity," "surprise," and "wonder" with the user. The character is considered to be an essential element, especially for children aged 12 and over.

The application on the handheld device is implemented using C# with a simple GUI. There is an "AR" mode or "audio guidance" mode which changes the interface from 3D reality to 2D routing. The system tracks the location of the visitor and plays recorded 3D animations at pre-defined stations. In the guidance animation, the system gives spatially related information to fulfill his task. In the system, the character is animated to look at the user at his or her most probable location, but the animation is not updated dynamically, according to the tracking information. In order to hide the limitations of the tracking, animations of floating balloons are used to indicate the position of the next point of interest. The "guidance" uses a 2D map and an audio description to route the visitor inside the museum.

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<sup>2</sup> Miyashita T, Meier P, Tachikawa T, Orlic S, Eble T, Scholz V, Gapel A, Gerl O, Arnaudov S, Lieberknecht S. An augmented reality museum guide. In 2008 7th IEEE/ACM International Symposium on Mixed and Augmented Reality 2008 Sep 15 (pp. 103-106). IEEE. DOI: 10.1109/ISMAR.2008.4637334



Figure 1. The balloon signs that are made by augmented reality

The camera setup is perceived as highly flexible, enabling visitors to see the exhibited artwork from various angles and to switch easily between an unfiltered view and a view with additional information by simply lifting the display. Because of the stable tracking, visitors can concentrate on the artwork and the augmentations without noticing the technical complexity of the system. Users have the opportunity to take a screenshot at the moment of their favorite scene. They are delighted when the screenshot is printed out and handed to them when they leave. One of the main problems observed with the presentation room system is the possibility of the text displayed during the animation becoming too small depending on the position of the camera and its distance to the work. Another source of confusion for the user is due to the lighting conditions in the presentation, at a low level of light, the peripheral environment is not visible (the image is black). Therefore, some users assume that what they see on the screen has been created entirely by computer graphics and is not the combination of real-life images with rendered content.



Figure 2. Use of the special device

With this tool, the user will be engaged to use the AR and check their surroundings. The users will be impacted by the AR to develop their interpretation of the artwork they are going to interact with. Also, the users' position will be tracked by the devices to know what they are interacting with and how they behave after seeing a specific object. These features are what characterize this tool as "Artifact analysis".

## I. Relevant aspects

Support: Special designed handheld devices

Expected user: Suitable for 12 and over

Requirements: Special handheld device

Is it hosted by the museum? Yes

Is it open source? No

### 2.1.2 ArsMeteo<sup>3</sup>

ArsMeteo is a Web portal for collecting and sharing digital (or digitalized) artworks, like videos, pictures, poems and music. The main aim of the project is to create a new space for a community of artists and art lovers, where a great variety of up-to-date contents about art and culture may converge, and where artists can find a dynamic, interactive and fertile background for artistic experimentation and cooperative artistic creation. Ars Emotica focuses on applying sentiment analysis to resources from online art collections, by exploiting, as an information source, tags intended as textual traces that visitors leave to comment on artworks on social platforms. The development of such semantic space enables new ways of accessing and exploring art collections.

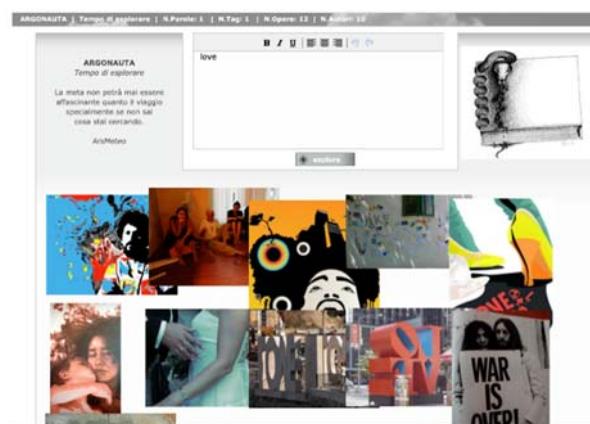


Figure 3. ArsMeteo website

The web platform combines innovative social tagging and tag-based browsing technology with functionalities for collecting, accessing and presenting works of art together with their meanings. It enables the collection of digital (or digitalized) artworks and performances, belonging to a variety of art forms including poems, videos, pictures and musical compositions. Meanings are given by the tagging activity of the community. All contents are accessible as "digital commons". Artists and visitors may express their own reception and meanings about the works of art by annotating them with words (tags): semantic references, mental associations, descriptive attributes, emotions, insights. Users can rate the relevance of tag-artifact relations, by clicking on the plus and minus symbols next to the tag. Such rating activity allows the system to associate a weight to a tag related to a given artifact, which will affect the ranking of search results.

The ArsMeteo contents are enriched with a variety of meanings by the tagging activity of all users of the community, both authors and visitors. In this setting, innovative artistic approaches to tagging and tag-based browsing have been thought of in order to create a dynamic and fertile background for artistic experimentation and cooperative artistic creation. The tagging activity of the community provides a basis for browsing the works of arts and finding new unexpected relations among artists and artworks. Users can choose to browse the contents according to a rather standard tag-based navigation or according to the experimental navigation metaphors respectively

Called: Art Time Machine, Argonaut and Serendipity. The searching methods are the following:

<sup>3</sup> <http://www.arsmeteo.org/>

Tag cloud-driven navigation: users browse contents by accessing a search page, where a tag cloud visualizes the most used tags of the folksonomy

The Art Time Machine: the whole ArsMeteo± archive, which consists not only of tagged artworks but also of forum posts and events, can be accessed by year

Serendipity: users can find resources without performing an explicit and systematic search.

Argonaut: the idea is to visualize by ArsMeteo± artworks the evocative power of sentences and text. The user starts by writing a sentence in the proper text area.



Figure 4. ArsMeteo searching methods

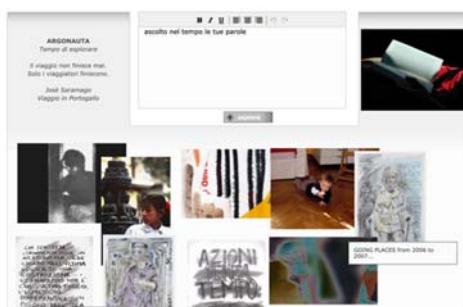


Figure 5. Research artwork using "Argonauta" mode



Figure 6. ArsMeteo TagCloud

ArsMeteo is relevant for Spice because it uses tagging and sentiment analysis for searching and connects artworks, artists and visitors which makes it a part of the Artifact analysis group.

## I. Relevant aspects

Support: Website

Expected user: artist, art lover,

Requirements: no

Is it hosted by the museum? No

Is it open source? Yes

### 2.1.3 Automatic Museum Audio Guide<sup>4</sup>

An automatic “museum audio guide” is presented as a new type of audio guide for museums. The device consists of a headset equipped with a camera that captures exhibit pictures and the Eyes of Things computer vision device (EoT). The EoT board is capable of recognizing artworks using features from accelerated segment test (FAST) keypoints and a random forest classifier, and can be used for an entire day without the need to recharge the batteries. Besides, an application logic has been implemented, which allows for a special highly-efficient behavior upon recognition of the paintings.

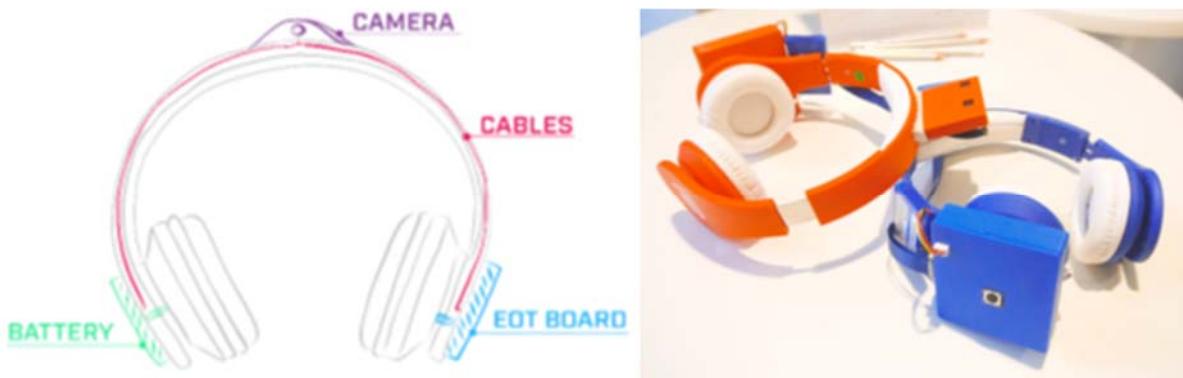


Figure 7. Specifically designed headset

The hands-free museum guide is based on the classical audio guide use case, and therefore it is restricted to audio interpretation only. Several steps were identified in this scenario:

1. Visitor enters the exhibition and receives EoT enhanced headset;
2. Visitor explores the exhibition;
3. Visitor is notified about available audio interpretation from the recognized exhibits;
4. Visitor listens to audio interpretation and continues exploring the exhibition.

On the other hand, in the multimedia museum guide, the user can use a smartphone or a tablet to retrieve visual information about the recognized exhibits.

1. The visitor enters the exhibition and receives the enhanced headset which connects to an application on the visitor's smartphone. The “visitor application” can be downloaded on smartphones/tablets or visitors may receive a mobile touch device from the museum which is pre-deployed with the application and preconnected to the device.
2. The visitor explores the exhibition. The visitor puts on the headset and starts the museum visit. During the visit, the device permanently tracks the view of the visitor. Image recognition algorithms automatically detect exhibits for which content is available.
3. The system detects available exhibits. After an image recognition match (combined with a specific threshold time), the headset device notifies the mobile application via message queue telemetry (MQTT) that a registered exhibit has been detected.
4. The visitor receives rich content and/or performs interaction. The visitor is notified via an audio signal on the headphones and in the mobile application, and then is provided with rich content, for example, the biography of the artist, the “making of” of the

<sup>4</sup> Vallez N, Krauss S, Espinosa-Aranda JL, Pagani A, Seirafi K, Deniz O. Automatic Museum Audio Guide. Sensors. 2020 Jan;20(3):779. <https://doi.org/10.3390/s20030779>

image, other related artworks, etc. The user is allowed to interactively zoom and pinch through high-resolution images or consume videos. This makes the system a fully developed multimedia museum guiding system.

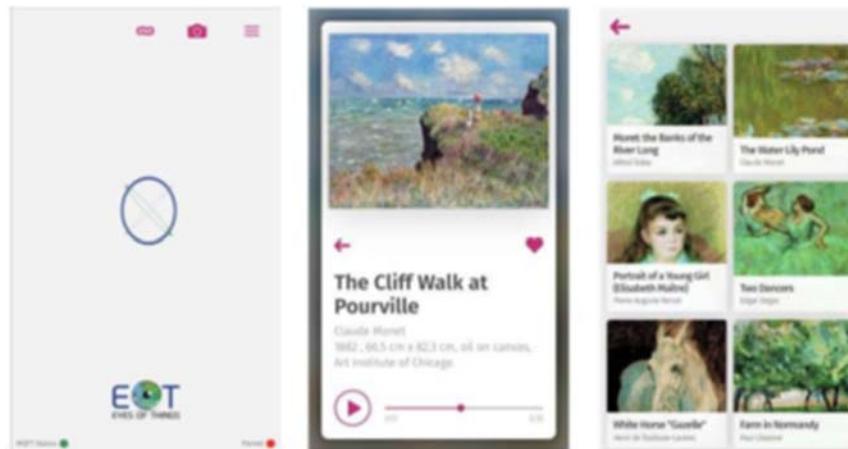


Figure 8. Example of the information that can be provided by the system

The software developed for the museum audio guide consists of several applications:

- EoT-based headset application;
- Museum Guide CMS;
- Museum Guide mobile application;
- CMS frontend for museum operators.

The software running on the EoT-based headset consists of four modules: Image acquisition, painting recognition, network communication, and application control.

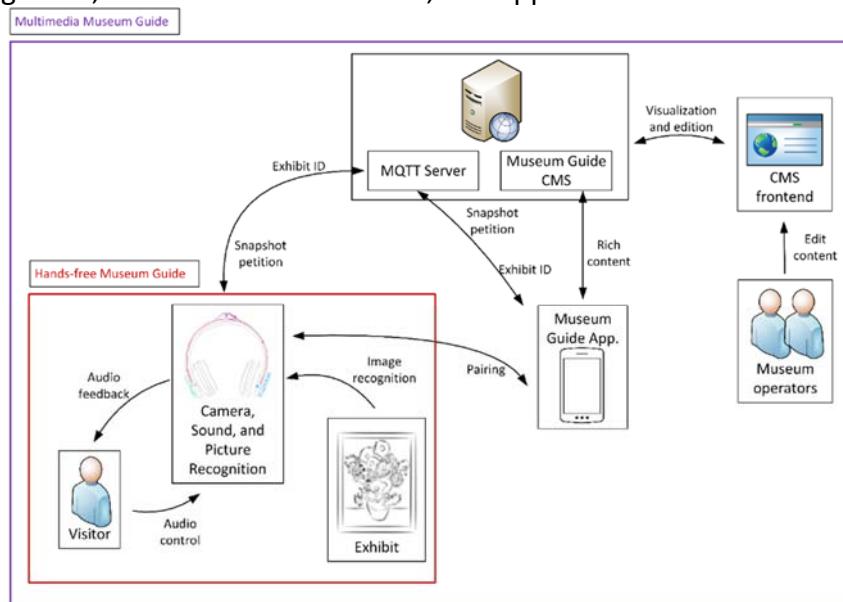


Figure 9. Scheme of the Automatic Museum Audio Guide system

This tool tries to simplify the aid that a visitor of a museum might need. Using IoT along with a specially designed headset helps the designer to keep track of the visitor's activities. It is possible to guide the visitor to check a set of artworks and gather the information about which parts they paid more attention to or had their eyes on. By providing short voice location-based instructions this tool can help the visitors to develop their own opinions and

interpretations about their visit. These capabilities mean this tool belongs in the Artifact analysis group.

### I. Relevant aspects

Support: Smart Devices

Expected user: not specified.

Requirements: Special headphones

Is it hosted by the museum? Yes

Is it open source? No

## 2.1.4 CC Microblogging Service

The Micro-Blogging module was developed within the H2020 project CrossCult, and designed for providing social network services to the CrossCult Apps. Through this module, the users of the Apps were able to exchange messages related to their experiences during their visit to cultural institutions. The microblogging platform allowed the users to create groups, join and leave groups, follow other users in order to see their messages, send messages to other users, to groups or the public domain. Instant notifications for incoming messages are delivered to the mobile devices of the CrossCult users and an administration interface lets administrators examine the activities and perform relevant maintenance tasks.

Access to the microblogging service functionalities is provided through the mobile museum application user interface; there, menus, buttons and other appropriate controls are hosted to allow the users to post information to the microblogging service, access posts submitted by other users and manage their social relationships. While the microblogging service does include a web-based user interface, this is not exposed to users.



Figure 10. CC Microblogging interface.

The Micro-Blogging module is based on [GNU Social](#), a complete social network implementation similar to Twitter. In this sense, the internal logic of GNU Social is unknown as well as its database structure and organization (the implementation is considered to be a black box), while the relevant tests have been conducted by the GNU Social development team.

GNU Social offers a complete API (notably, in two forms: a custom, AtomPub based API, and a Twitter-compatible API with extensions to support additional features of GNU Social, such as groups). Therefore, testing for the Micro-Blogging module needs to ensure that the available APIs cover all the functionality required by the CrossCult Frontend apps and that they function correctly.

The Micro-Blogging module was also required to produce events that will be directed to end-user applications, to notify the respective users of developments they need to know about, such as the arrival of new messages, friends joining the network, etc. The necessity to produce such events was determined by the cooperation pattern between end-user applications and the GNU Social Backend module.

This system could serve as a reference of a social module that addresses at the same time artifact analysis and storytelling methods, although artifact analysis would be the core function to take into account. Since it would allow multiple users to interact with each other around different artifacts, expressing their emotions around them, sharing their thoughts and opinions about them. The interface is simple and straightforward but allows the users to show a set of emotions and thoughts and use it as a way of reflection and discussion around culture.

## I. Relevant aspects

Support: web-app

Expected user: adult visitors to cultural institutions.

Requirements: protected by the CrossCult SSO a CrossCult account is needed to be able to use it.

Is it hosted by the museum? No

Is it open source? No

### 2.1.5 CrowdHeritage<sup>5</sup>

Crowdheritage is an open platform developed with the contribution of the EC under the Connecting Europe Facility (CEF) program. The scope of the platform is to use the power of the crowd in order to improve the metadata quality of digital cultural heritage content stored in Europeana, the European portal for cultural heritage, and in the databases of cultural heritage institutions across Europe. The lack of granular and rich descriptive metadata highly affects the searchability and usability of the digital content stored in museums, libraries and archives and on Europeana, thus often frustrating the user experience on these institutions' portals. In this context, crowdsourcing can offer an opportunity for improving the metadata quality of digital cultural content in a scalable way, while at the same time engaging different user communities and raising awareness about cultural heritage assets. The platform offers the possibility to cultural heritage institutions and aggregators to design and launch ad-hoc crowdsourcing campaigns for metadata quality improvement with gamification elements and verifiable results. Through these campaigns, users will be able to add annotations or validate existing ones in a user-friendly and engaging way.

CrowdHeritage is an open-source platform that integrates and supports the Europeana APIs and several other available APIs from cultural institutions across the world, like the Rijksmuseum and the Digital Public Library of America). The Crowdheritage platform has been developed by the National Technical University of Athens in collaboration with the European Fashion Heritage Association, the MICHAEL Culture Association, the Ministry of Culture of France and the Europeana Foundation.



Figure 11. A campaign in the CrowdHeritage website

The website consisted out of several “campaigns” with various topics. Each campaign has a specific goal to reach before a deadline. User can find the campaign they are interested to contribute to using the search options provided by the website before the campaign meet its deadline. The contribution can be done to the campaign by helping to put relevant “Tags” on various artwork or art-related objects. An Item with a set of tags will be shown to the user and the user will be asked to express his/her feeling toward the relevance of each tag to the object by liking or disliking them. This process is gamified so the most liked tag will be the winner and the user liking it or introducing it will receive points for it.

<sup>5</sup> <https://crowdheritage.eu/en>

Shawl brooch



cm

TAGS
FULLSCREEN 

Add or validate the object type of the item displayed on the left. You can either upvote or downvote an already listed object type, or you can add one by looking it up in our fashion thesaurus (just start typing the first letters in the box below). The more specific the object type the better (try to add or upvote not more than one type per image).

Brooch	 11 0 
Pin (jewelry)	 3 0 
Metal thread	 2 0 
Ephemera	 2 0 
Jewelry	 1 0 
Pearl	 1 1 

RIGHTS STATEMENT  
TRC Leiden

CONTENT PROVIDER  
Textile Research Centre Leiden

See it in [Europeana](#)

Figure 12. Tagging process in CrowdHeritage

The main goal of this website is to build bigger metadata around artworks. For doing that a platform with gamification features is made. Users can participate in campaigns to build metadata for a specific topic and earn points by tagging objects as accurately as possible. The campaigns always have a deadline to finish so the users will be eager to gain the points faster. User also can just check the campaigns and gain information about the topic of them by visiting the big set of artworks available by the website. The tagging process is one of the aspects that can put a system like CrowdHeritage in the Artifact analysis group.

## I. Relevant aspects

Support: Website

Expected user: not specified

Requirements: internet access.

Is it hosted by the museum? No

Is it open source? Yes

## 2.1.6 Emotion Mapper<sup>6</sup>

This experience uses the Emotion Mapper software as part of a web app (created by NextGame) that gives visitors an emotional encounter. Visitors look at selected exhibits and answer questions about their emotional experiences. The answers are compiled into visualizations that show how visitors react emotionally. Emotion Mapper provides a way for visitors to reflect on their emotions when they visit a museum. It also gives the museum insight into what they feel when they stand in front of an exhibit, and what they are interested in emotionally. With the Admin interface, the museum creates questions for exhibits they select. The interface is connected to a data server, which stores all data generated by visitors. Most of the studies about museums concentrate on the cultural, historical or critical analyses of the museum as an institution: its role in society; its politics; its administration; its function as a place for learning, leisure. Emotion Mapper tries to gain information about physiological, social, psychological, aesthetic of the visitors<sup>7</sup>.

The institution needs reliable wi-fi or at least stable 3G or 4G service wherever the selected exhibits are located. In order to use the tool fully, the museums must have a server to store the data that is gathered, along with hosting the default web app if they choose to use it. Storage requirements will depend on the uptake. The Admin component will be Windows-compatible; the User component will be available for most smartphones. Emotion Mapper comes with an Open Source License, museums will be able to download and change their own version of the tool to whatever degree they wish.

Emotion Mapper is built for museums to customize which exhibits they want to ask about and which emotions they want to relate to each one. These can be changed at any time. Emotion Mapper could also be used to ask different types of questions, including factual ones.

The app shows visitors a list of different emotions, each linked to one object selected by curators at the Museum. When the visitor selected an emotion – for instance, “Love” – the app would guide them to the corresponding object. After finding that specific object, the visitor can listen to an audio recording about the object, emotionally charged interpretation of the painting. Afterward, the visitors are asked to give their own insight about the object, describing their emotions.

Emotional data is highly personal; visitors are not only asked for their consent at the start of the experience but will also be asked at the end whether or not they would ‘donate’ their data to be used in research. Visitors who do not consent will have their data deleted.

Some factors are interesting to investigate in this work. These factors are pre-visit expectations towards the exhibition; socio-demographic characteristics; personal relatedness to art; the visitor’s mood prior to the museum visit; the post-visit assessment of exhibition aspects; and potential social group dynamics. Questionnaires are provided for the visitors to describe their answers about these factors in some of the museums. Using the data from previous visitors, museums can update the emotions related to the objects. This will help future visitors to find artworks based on how they feel or try to sense other people’s feelings over a special object.

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<sup>6</sup> <https://gifting.digital/emotion-mapper/>

<sup>7</sup> Kirchberg, Volker, and Martin Tröndle. "The museum experience: Mapping the experience of fine art." Curator: The Museum Journal 58, no. 2 (2015): 169-193.

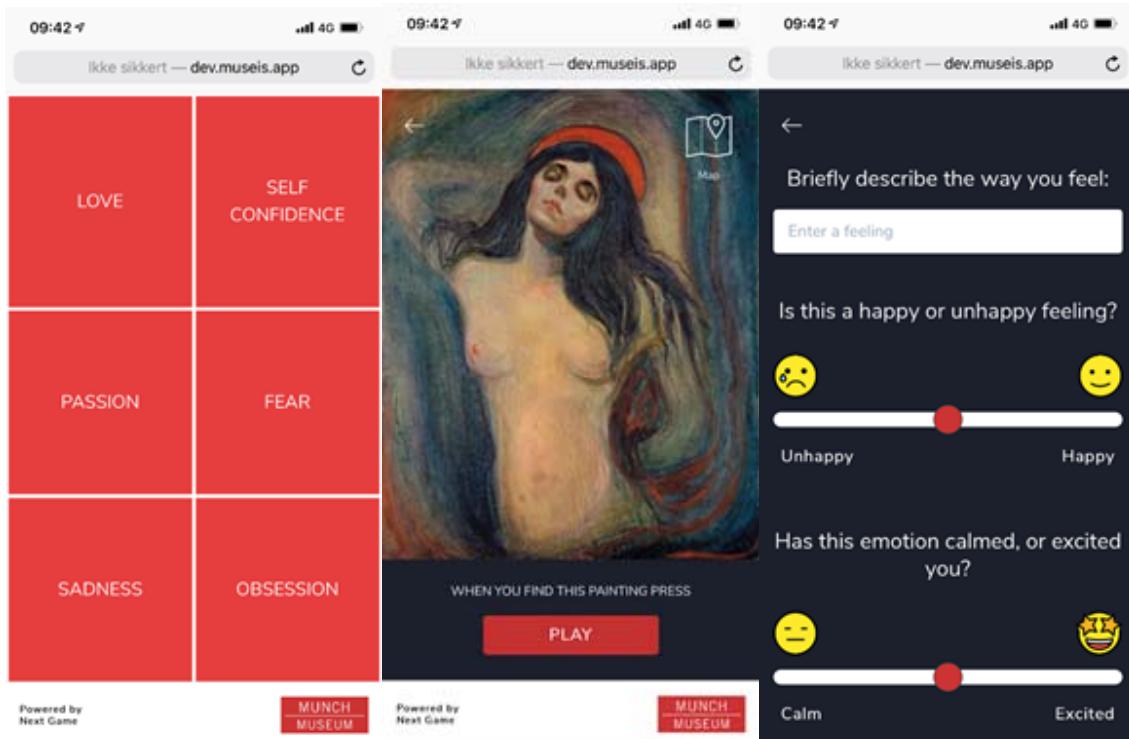


Figure 13. Emotion Mapper interface

After observing an artwork, this application will ask a set of questions from the visitor about the emotions they experienced. By concentrating on answering these questions, the visitors will feel closer to what they observed and how much it affected them. They can express their opinion about the artwork and the museum will gather information about the physiological, social and psychological features of their visitors after visiting an artwork. In brief, the Emotion Mapper application belongs to the Artifact analysis group.

### I. Relevant aspects

Support: Windows for the host. Android/IOS for the users.

Expected user: not specified.

Requirements: reliable internet connection and storage for the host, a smartphone for users.

Is it hosted by the museum? Yes.

Is it open source? Yes.

### 2.1.7 Gesture-Based IAG

The aim of this work is to create a system that enables blind and visually impaired (BVI) people to explore tactile materials in a more autonomous way. The main goal of the system is to allow users an undisturbed exploration, without unwanted explanations, and precise control over when and about what to get information. The user should be able to explore the relief with one or both hands without triggering unwanted audio. This means, that only very distinct gestures should trigger audio comments, gestures that normally do not occur during exploration and that can be reliably detected<sup>8</sup>.

The gesture-controlled Interactive Audio Guide (IAG) consists of a depth camera as the only sensor, connected to a computer and mounted above a tactile relief. In contrast to conventional color cameras that give an RGB color value for each pixel, a depth camera (or RGB-D camera) also returns a depth value, i.e., how far an object at this pixel is away from the camera. First, the system is initialized with only the relief present and the hands kept away. The system stores the acquired depth image, the so-called background image. Whatever is now put on top of the relief creates depth measurements that are nearer to the camera, and can therefore be easily detected. This process is called foreground segmentation. As any objects may be added, the foreground is carefully searched for hands, and whether these hands form certain input gestures. Finally, depending on the gestures, real-time audio feedback is given to the user.



Figure 14. how one sample for the Gesture-Based IAG is made

The user now will be able to use his hand(s) to make some predefined gestures each of which will run a different command including:

- Giving audio description about the object
- Giving audio description about a specific part of the object
- Play help instructions about the commands

With this approach, the BVI community can now have a better insight into the museum objects as evaluations of this system show the high satisfaction of the users. The system is designed to be installed in a sort of kiosk at the museum and the users can easily be guided through to have their time instead of being forced to follow normal tour guides that usually cannot give as much information as needed to a BVI person. The evaluations also show that most of the users found the hand gestures easy to use and mastered them quickly, although some needed extra guidance to familiarise themselves with the system.

<sup>8</sup> Reichinger A, Fuhrmann A, Maierhofer S, Purgathofer W. Gesture-based interactive audio guide on tactile reliefs. InProceedings of the 18th International ACM SIGACCESS Conference on Computers and Accessibility 2016 Oct 23 (pp. 91-100). <https://doi.org/10.1145/2982142.2982176>

As mentioned, this work aims to create a system that enables the BVI community to explore tactile materials more autonomously. The system wants to provide the users with an exploration without any extra information. Also, the user has precise control over the information they are going to receive. In this way, the BVI people can develop their ideas and opinions around an artwork without unwanted interfere or with as much aid as they need. Having these features this system can be categorized within the Artifact analysis group.

## I. Relevant aspects

Support: Specially designed system

Expected user: BVI community

Requirements: Special system

Is it hosted by the museum? Yes

Is it open source? No

## 2.1.8 Listen: a user-adaptive audio-augmented museum guide

The LISTEN<sup>9</sup> project is an attempt to make use of the inherent “everyday” integration of aural and visual perception, developing an audio-augmented environment for the visitors of art exhibitions. The challenge of the LISTEN project is to provide a personalized immersive augmented environment, an aim that goes beyond the guiding purpose. The visitors of the museum implicitly interact with the system because the audio presentation is adapted to the users’ contexts (e.g., interests, preferences, motion, etc.), providing an intelligent audio-based environment. The LISTEN system enhances everyday environments with interactive soundscapes. The users of the system are provided with interactive access to personalized and position-dependent acoustic information spaces while they naturally explore their everyday environments.

The user moves in the physical space wearing motion-tracked wireless headphones, which enable the rendering of three-dimensional sound. This auditory rendering process takes into account the user’s current position and head orientation in order to integrate the virtual scene with the real one. Speech, music and sound effects are dynamically arranged to form an individualized and location-aware soundscape offering information related to visual objects as well as creating context-specific atmospheres.

In contrast to traditional audio guides, the application manages an intelligent memory in order to reduce repetitive loops in the audio presentation. The system registers the repetition of actions and reacts immediately by offering other sound entities and new audio sources. The personalization process detects and carefully applies redundancies in the presentation of audio information.

LISTEN system exhibits an adaptive behavior that it selects for that purpose, recommends, presents, and adapts audio information considering the visitor’s goals, preferences, knowledge, and interests. Traditionally, the acquisition of information about the user is driven by monitoring the user’s activities and explicit interactions with the user interface. One of the main objectives of the LISTEN project was to avoid any portable device or remote control for the visitor except for the headphones and the movement in physical space. For the personalization process, this means that only implicit feedback is available in any LISTEN application and the visitor’s body is the only interface for interaction. In this regard, the LISTEN system differs significantly from the other approaches.

The system can cover matters like:

- **description** of the visual object, e.g., the name of the artwork, its creation date, the type of artistic media,
- **relations** to physical space, e.g., the relation to other exhibits in the environment, anchorage in object zones or focus,
- **content** of the visual object, e.g., phases of work, image genre, or technical aspects regarding the production of the artwork.

This system does not have any interface and only works by tracking the location and the direction of the head of the visitor looking at a different object, hence not much data can be provided regarding the GUI.

Even though this system does not include any graphical interface, it can still manage to guide the visitors of a museum or artwork with a specific goal successfully. The visitors listen to short and purposeful audios that are recorded previously and are played on-demand or based

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<sup>9</sup> Zimmermann A, Lorenz A. LISTEN: a user-adaptive audio-augmented museum guide. User Modeling and User-Adapted Interaction. 2008 Nov 1;18(5):389-416. <https://doi.org/10.1007/s11257-008-9049-x>

on the visitors' location. These short audio recordings are designed in a way that they will not distract the visitor from their own thoughts and also will help the visitors to develop their own ideas around what they are observing. Lacking a GUI does not prevent this system falling inside the Artifact analysis group.

### I. Relevant aspects

Support: Special designed headset

Expected user: Not specified

Requirements: Special headset

Is it hosted by the museum? Yes

Is it open source? No

### 2.1.9 NGAkids Art Zone app<sup>10</sup> (National Gallery of Art)

The NGAkids Art Zone app is an app developed by the National Gallery of Art of Washington D.C. which provides an immersive experience as children visit a virtual art museum and explore a variety of works spanning more than 300 years of art history. The high-resolution graphics, attention to detail and exposure to a variety of subjects, painting styles, and techniques are meant to convey an understanding of the artistic process and reinforce the familiarity of children with the fundamental elements of art, also making use of animation and audio features.

The NGAkids Art Zone app contains eight interactive activities inspired by works in the collection of the National Gallery of Art, plus a sketchbook for freehand drawing and a personal exhibition space where users can save and display art created with the program. Each activity offers various levels of complexity to make it suitable for all age groups, although it is optimized for ages 9 to 11. The child-friendly interface, easy-to-use tools, and the overarching emphasis on discovery, careful looking, and artistic self-expression make the NGAkids app educational and fun.

NGAkids activities are designed for children to use—unassisted—in a recreational, non-academic context through a child-friendly interface, easy-to-use tools, and the overarching emphasis on discovery, careful looking and artistic self-expression. They are not meant to be art lessons but to preserve a sense of quiet exploration that encourages artistic expression and creativity. The fact that children are encouraged to figure out how things work and to mentor each other adds another dimension to the experience, addressed to achieve personal connections to art and enhance capability of users to express their own stories and views.

The app contains 10 sections to explore: Portrait, Landscape, Seascape, Still Life, Action Painting, Exploring Color, Color Field, Collage, Sketchbook and My Art Gallery. And works of art by a wide range of artists—including Edward Hicks, Fitz Henry Lane, Berthe Morisot, Claude Monet, Vincent van Gogh, Mark Rothko, Josef Albers, and Robert Rauschenberg, along with several anonymous American naive painters—serve as inspirational models.

Since this application fosters artistic self-expression and creativity of children coming from some recognizable pieces of art but keeping the exploration as one of the main purposes of the activity, it could be seen both as a tool of artifact analysis and narrative methods. On one hand, it allows children to add another layer of self-expression over the pieces and a way of analyzing and complementing the work of art. On another hand it allows the children to participate and include new perspectives and dimensions to what is presented.

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<sup>10</sup> <https://www.nga.gov/education/kids.html>



Figure 15. various views of NGAkidsArt Zone app

## I. Relevant aspects

**Support:** iPad through Apple Store - If case of the lack of an iPad, the program files can be downloaded onto a computer (for either PC or Mac)

**Expected user:** optimized for ages 9 through 11, but suitable for even adults.

**Requirements:** an iPad for users.

**Is it hosted by the museum?** Yes.

**Is it open source?** No

### 2.1.10 One Minute<sup>11</sup>

One Minute uses image recognition to identify artworks and offer visitors short, bite-size reflections about them. Visitors use the app to scan an artwork. The app displays a story about the artwork, divided in chunks so visitors direct their attention to the artwork. Museums may guide the visitors by indicating which artworks are scannable.

The heart of the system is the story editor. The editor helps the museums or galleries make stories that direct visitors to reflect on details within artworks. Tests show that the app is a companion rather than a distraction: The app provides a format for personal reflections that encourages visitors to direct their attention to specific details in the artwork.

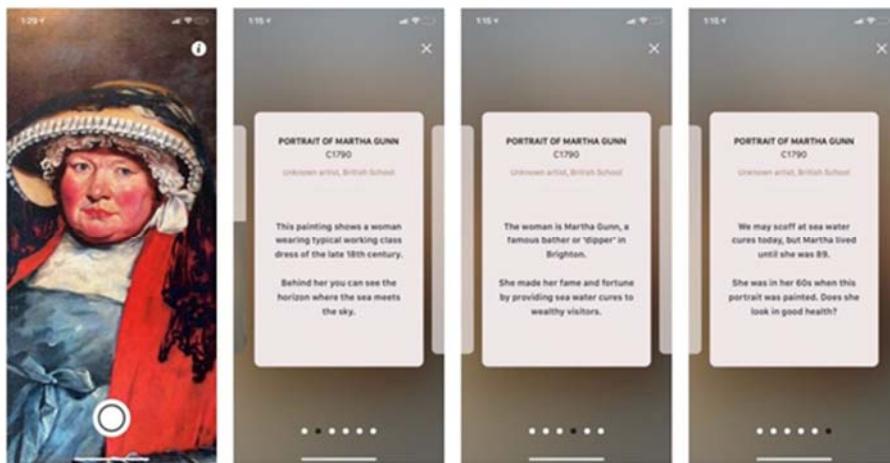


Figure 16. example of short information provided by the One Minute app

One Minute Experience has a couple of features that make it distinctive. First, rather than relying on the user to scan a QR code or other graphic or text link, visitors using One Minute Experience simply photograph the exhibit to reveal the story. This removes the need for additional labels and clunky signage and gives the user a more direct connection with the object. Second, the app presents the story about the exhibit in the form of bite-size sequential cards. The production of this content is backed by a story editor which helps writers frame their narrative around a series of prompts.

By providing a structured process that guides the writer through creating a simple narrative, One Minute Experience offers a tool that could assist the production of much more accessible content for museum guides.

As the story editor is designed to work well on a mobile phone, it is even possible for the writers to tell their stories while standing in front of the exhibit. This may not be ideal for many writers, but it provides one key advantage: it is much easier to understand the audience when you know they will be standing in exactly the same spot as you when reading the story, and will be able to see the same details that you can observe.

One of the simplest applications in terms of use in this list is One Minute. All that the users will need to do is to have their smart device with them while visiting a museum. A series of very short stories about the object that they are visiting will appear on their devices that will help them build better insight into that specific object. These stories are purposefully made to be short so as not to distract the visitor but to provide them with hints so they can develop their own interpretation of what they are observing. By what this application does, it belongs to the Artifact analysis group.

<sup>11</sup> <https://gifting.digital/one-minute-experience/>

## I. Relevant aspects

Support: Web-based app for the editor, Android\IOS for user

Expected user: No age limit specified.

Requirements: Internet connection, Smart device with a camera

Is it hosted by the museum? Yes

Is it open source? Yes

### 2.1.11 Reflective associations tool (Pilot 2 of CrossCult)

Another example that has been identified is the CrossCult interface extracted from the Pilot 2 that was developed during the project for a set of small venues with the aim of engaging people of multiple nationalities, in the discovery of connections between their respective bodies of cultural heritage. In this sense, an interface was created that allowed humanities experts to define reflective topics, and choose the most relevant associations to be presented in the app. The experts' tool facilitates collaborative development of the contents of the experiences through its interface, based on the feedback received during the project in a Living Lab. The experts' tool offers association discovery mechanisms that import potentially useful sequences of semantic triples from the CCKB, identify the most relevant ones to the selected topics, develops MCQs quizzes that involve the selected entities (characters, events, heritage items, locations or artworks), and adds new semantic triples to the CCKB, by processing the app's users' comments, or by owing to their knowledge about the venues.

The experts' tool's main screen (which can be seen below) shows the reflective topics' tabs in the upper part, which can be modified, rearranged, or removed by the experts. A reflective topic has a title, keywords that can be entered as text or normalized vocabularies imported from EuroVoc<sup>12</sup>.

To create a new experience, first, experts would select the venues involved from a preregistered list of venues (in the CrossCult platform). Next, they would be able to define target users' types according to their level of knowledge, demographics, personality traits, and/or visiting/cognitive styles, where these could be collected from their users' profiles in the CrossCult apps.

This tool interface and construction method can be also used for curating purposes, starting with the collection topics and external knowledge bases such as Wikipedia, to be adopted by the general public and moderated by museum experts and in this sense could be used as a reference related to the development of new artifact analysis and collecting methods in which general users find ways of reflecting and creating connections with others.

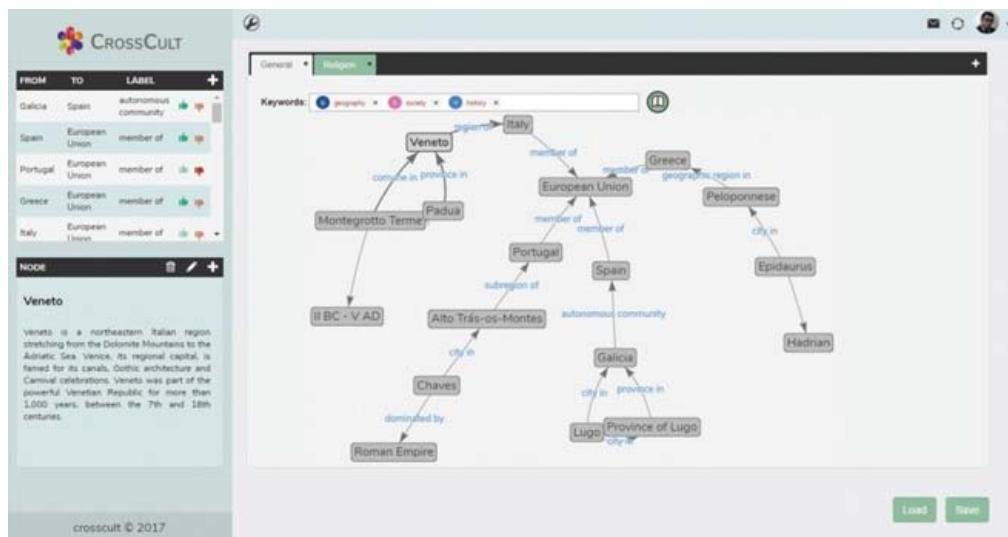


Figure 17. The interface of the Pilot 2 of Crosscult.

<sup>12</sup> <http://eurovoc.europa.eu/>

This interface could be a good reference around reflection and collaborative development of the contents of the experiences through its interface

### I.Relevant aspects

Support: Windows/Mac for the host.

Expected user: not specified.

Requirements: Access to the app is protected by the CrossCult SSO so a CrossCult account is needed to be able to use it.

Is it hosted by the museum? Yes.

Is it open source? No.

### 2.1.12 The Met Unframed<sup>13</sup>

The Met Unframed is an app, launched by the Met Museum in 2021. It offers an immersive virtual art and gaming experience with enhancements powered by Verizon 5G Ultra-Wideband and featuring more than a dozen one-of-a-kind digitally rendered galleries and nearly 50 works of art from across The Met's vast collection.

Visitors are able to explore digital galleries and play games that unlock augmented reality (AR) versions of the art on view that can then be displayed virtually at home. The Met Unframed is accessible from any 4G or 5G smart device and is available for free for a limited five-week run.

Within the experience, four of the AR works of art are enhanced with activations accessible to users on Verizon 5G Ultra-Wideband. These users can watch the objects come alive in AR thanks to high-speed responsiveness and ultra-low lag.



Figure 18. Screenshot of the MetUnframed

Although, unfortunately, the experience is now closed and it is not possible to explore it, we consider it a relevant recent example of artifact analysis through AR.

#### I. Relevant aspects

Support: App

Expected user: no

Requirements: no

Is it hosted by the museum? No

Is it open source? No

<sup>13</sup> <https://www.themetunframed.com/>

### 2.1.13 VRtefacts<sup>14</sup>

VRtefacts puts visitors into a Virtual Reality experience where they explore and touch 3D models of museum objects and share stories about them. VRtefacts is a VR storytelling experience. Visitors can touch an object that has been 3D scanned and overlaid in VR onto a physical 3D print. In the end, visitors are invited to share a personal 'story' that comes to mind. VRtefacts is a workflow that lists hardware and skills necessary for producing the experience. Museums can customize the experience by scaling up or leaving out elements, for instance, the storytelling element. Visitors can touch objects that they couldn't touch otherwise. When visitors touch and tell their personal stories, they experience an increased sense of connection to and understanding of the object.

VRtefacts is designed to heighten a visitor's sense of connection and engagement with items from the collection, ending with visitors donating a personal story around that object. VRtefacts uses 3D scans of some of the museum's objects along with 3D prints of those scans. The visitor can actually feel, manipulate, and view the objects up close – in VR and the real world. All 3D prints are made to a scale that enables most users to hold them easily and intuitively.

From the visitor's point of view, they are putting a VR camera on their face and start exploring a virtual space, which is previously designed by the museum (The more realistic and detailed this space, the more engaged and interested the visitors will be). 3D printed objects can be handed over to visitors to observe and explore. In the VR environment, these 3D printed objects will appear as real museum object with all the details and colors.

After the visitor has taken their time exploring and reflecting on the object, they are invited to respond to it with a 'story' (a memory, association, or other reaction), which is recorded in both the actual and virtual space. The result is a composite video that shows the visitor telling their own story about an object that appears in great detail in the VR environment.

Unless the visitor changes their mind, that video is donated to the museum to use as they wish (which is made clear to the participant before accepting the donation) – for promotional or educational purposes, for their own understanding of their visitor base, as the basis of a new exhibition of its own, etc.



Figure 19. User experience with VRtefacts

<sup>14</sup> <https://gifting.digital/vrtefacts/>

## I. Technical requirements

Although a Virtual Reality experience using 3D scans and 3D prints may sound expensive or far-fetched for many smaller or precariously funded cultural heritage institutions, VRtefacts actually uses low-end versions of these technologies which are cheaper along with free software, therefore appeals to a huge pool of less-than-expert users, who have created a wealth of free resources anyone can use. Because VRtefacts can use more advanced technologies, including those not yet on the market, it will be robust for the foreseeable future.

VRtefacts already addresses the main risks to users regarding Virtual Reality: namely, the potential for mild nausea, the risk of injury while moving through a physical space that cannot be seen, and the learning curve for many museum visitors of navigation and control.

This system probably is the one that needs the most requirements out of the other introduced ones. Objects need to be scanned in 3D and then printed precisely using a 3D printed. These models can be used later by the users of the system while having a VR experience of visiting a museum. Being inside a virtual reality and having the access to touch the exact same model of an object (which with the help from VR will appear as the real object to the users) creates a new experience for visitors that they never had access to before. This system makes it possible for people to touch an object that before they could only see from distance in a glass box. By adding a new sense to a visit the user will have a better idea about what they are dealing with and can make their interpretation of that object from a new point of view. This system belongs to the Artifact analysis group because of the new opportunities it is offering to the users.

## II. Relevant aspects

Support: Virtual reality device

Expected user: No age limit specified.

Requirements: 3D scanner, 3D printer, VR devices.

Is it hosted by the museum? Yes

Is it open source? No

## 2.2 Collecting

### 2.2.1 Animal Crossing Art Generator

Animal Crossing life simulation video game developed and published by Nintendo. The J. Paul Getty Museum's collection, more than 70,000 artworks, can easily be imported into Animal Crossing, thanks to an open-source online tool and the Getty Museum's open-access collection. Simply search for the piece of art you would like in your game within the museum's collection. This online tool was based on the Animal Crossing Pattern Tool<sup>15</sup>. The user cannot decide on a painting, the museum has created a selection of its favorite artworks. It can also be used to import art from another museum's collection, by simply obtaining an IIIF from a participating museum (e.g. MET, CAM), and inputting that into the Getty's Animal Crossing Art Generator. The paintings that appear in Animal Crossing are low resolution, and they are only available in a square-crop format.



Figure 20. Art Generator view in Animal Crossing game

#### Step 1: Select an artwork

The player has to select an artwork from the gallery.

##### Step 1: Select an artwork

Either search the Getty Museum's open-access collection or select from our gallery of favorites. Want to use artwork from another museum? [Import using IIIF](#).

Q

**Our Favorites**

Figure 21. Select an Artwork

#### Step 2: Select the crop for your artwork

After the selection, the player has to crop the artwork selected

<sup>15</sup> <https://acpatterns.com/>

**Step 2: Select the crop for your artwork**

Figure 22. Select and crop the artwork

**Step 3: Import the artwork into Animal Crossing.**

After cropping the artwork, the player imports it into Animal Crossing

**Step 3: Import your artwork into Animal Crossing**

Getty experiments.getty.edu/ac-art-generator

Download artwork and QR code 

Download and save your QR code. Add your artwork to your *Animal Crossing: New Horizons* game via NookLink.

1. Download the [Nintendo Switch App](#) and set up NookLink to connect your smartphone to your *Animal Crossing* game on your Nintendo Switch.  
2. Scan your QR code using the Nintendo Switch App.  
3. In *Animal Crossing*, use your NookPhone to download designs into your custom designs app.  
[More detailed step-by-step instructions here.](#)

Figure 23. Import the artwork to Animal crossing

**Step 4: Share with game users**

Share the custom design and use it to display on canvases or on walls, shirts, and even floors.

In 2020 there were several Animal Crossing projects developed by the museum, one of the reasons for this success is the desire to involve younger audiences through the game.<sup>16</sup>

It is relevant for SPICE because it allows the user to recreate a museum setting, the player could be a museum curator/artist, it is possible to select and exhibit artworks from different museum collections (thanks to Open Data) and play with other players. These features fall under the scope of the Collecting group.

<sup>16</sup> <https://www.usgamer.net/articles/animal-crossing-new-horizons-how-to-unlock-the-museum>

## I. Relevant aspects

Support: App

Expected user: children

Requirements: Nintendo Switch Online (available for iOS and Android)

Is it hosted by the museum? No

Is it open source? No

## 2.2.2 Artland<sup>17</sup>

Artland is a web-based application to showcase and sell artworks. There is also an IOS version available for mobile phones. The app consists of several pages that are eventually connected. There is a possibility to choose from some major cities to see the available exhibitions on a map. Each of these exhibitions can use different tools to show their artworks including a 3D view, the exhibition view, viewing room etc.

### Art Guide

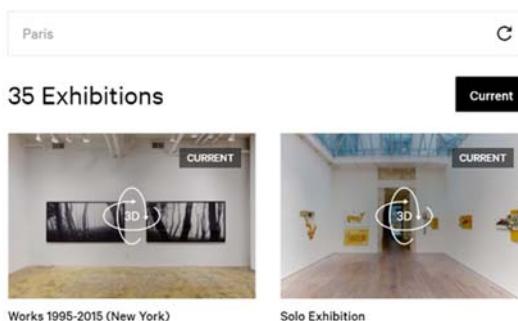


Figure 24. A map view of available exhibitions in Artland

The 3D view and the exhibition view are two different views for the same objective. The 3D view gives the user the power to go around the exhibition room using controls like Google street view. The exhibition view gives a higher view over the complete area of the exhibition (also in 3D) that can be rotated, zoomed and viewed from different perspectives like a dollhouse. All the artworks are marked by a circle in these views which provide users more information about that specific object by clicking. This information might include the price, the owner, the artists, date and location of the art, etc.

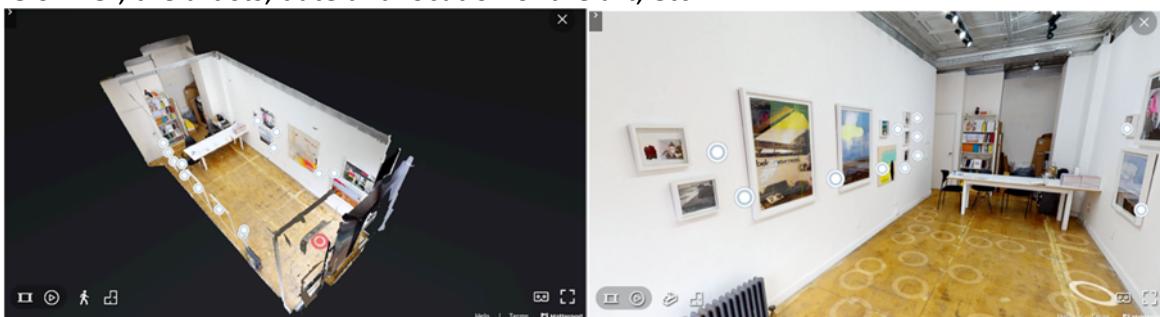


Figure 25. Various ways to navigate inside exhibitions in the Artland app

There are also viewing rooms that are designed to showcase only one specific artwork. Using the viewing room the user can see the artworks being presented on a wall of an exhibition, gallery or museum. Again, by clicking on the artwork more detail will be shown about the object. Also, the option to buy that object is activated here. The users will have the opportunity to follow their favorite artists or make a private collection out of their saved objects for themselves.

Artland is free for individual users, who can create a profile, browse art from around the world, save favorite works, and contact individual owners or galleries to arrange to purchase a piece that is for sale. Galleries, on the other hand, are required to pay a monthly subscription

<sup>17</sup> <https://www.artland.com/>

(about €200) to post their wares and 3-D scans of their exhibitions. Artland has trained technicians in major cities around the world who will schedule appointments with galleries to scan the show with special 3D cameras.



Figure 26. A private view with art specifications for trading in Artland

The app also offers several supplementary tools, including digital archiving for galleries. The 3D function is a marketing tool when galleries open an exhibition, also it can be used for archiving too, allowing shows to live online even after they have been taken down. And not every exhibition sells out, so this tool makes it possible for people to visit after the fact and purchase later on.

In Artland the main purpose is to make a collection of artworks. This is aided by the application provide the users with various graphical interfaces. They can use the app to make their collection and interact with other people by reading their comments. Moreover, users can visit other collections and build their ideas about them. The website is built around collecting and sharing which makes this fall inside the Collecting group.

## I. Relevant aspects

Support: Web-based, IOS app

Expected user: not specified

Requirements: Internet access

Is it hosted by the museum? No

Is it open source? No

## 2.2.3 Artsonia Kid Art Museum<sup>18</sup>

Artsonia is a digital art museum for kids that's available on the web, iOS and Android apps. Teachers at institutions can create a page on Artsonia and use it to share what their students have created via galleries. Galleries can include a description of the project, materials used, and national standards addressed. Projects include drawings, paintings, ceramics, handicrafts, writings, yarn art, 3D papercrafts, and more. Teachers can ask students to complete artist statements, including specific prompts they set up. Students use the companion app to photograph, edit, and upload their work, and add the title and artist statement. Parents can easily upload their kids' artwork as well, through the app or on the website. There are options to crop, adjust, or edit the photo, as well as to blur areas of the image, such as personal information. Students can earn awards, be added to the hall of fame, and become the artist of the week. Parents see their children's work before it comes home, and are able to share it with other people using social media. Students, teachers, and families can view the creations and leave comments for the artists.

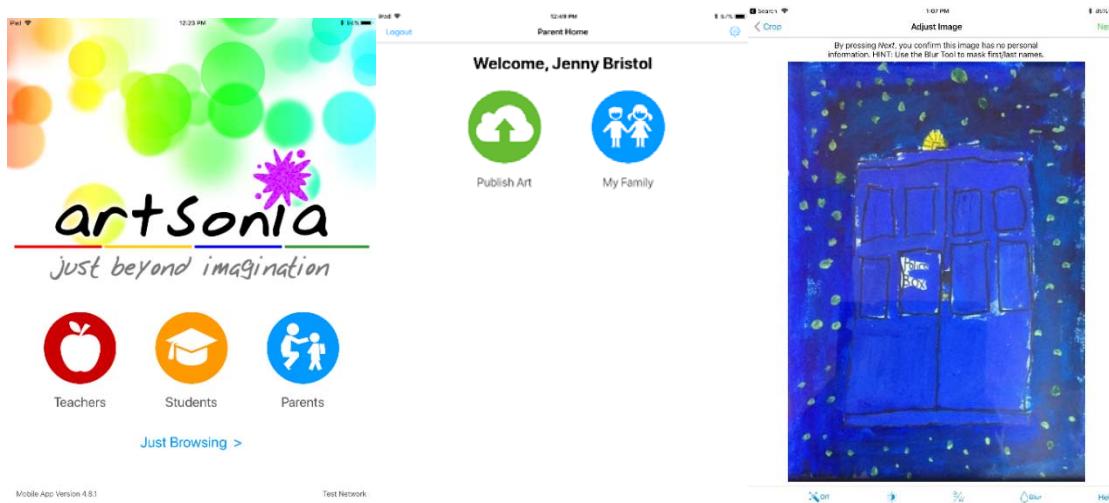


Figure 27. Artsonia main interface to publish art

From within the teacher section of Artsonia, teachers can download high-res images of their students' work for use on a class website or in a slideshow. The artist statement option offers cross-curricular connections, inviting students to include a short or long statement explaining their art and expand on the experience or their artistic process. This can be short and simple for young students, but older students can take good advantage of this as an ELA exercise. A gift shop is included in the application in which parents can buy items personalized with their children's artworks. A portion of this money goes to the institutions and they can use it to purchase supplies such as educational tools for the students.

<sup>18</sup> <https://www.artsonia.com/>

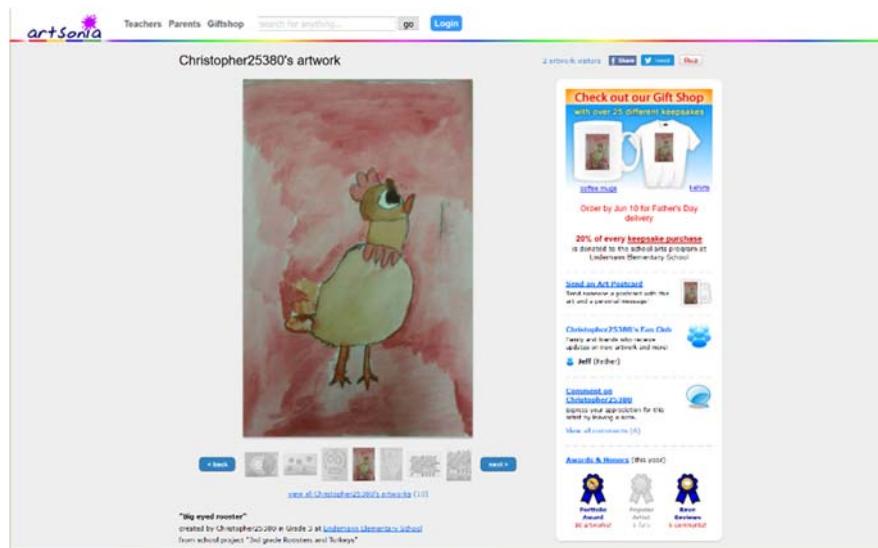


Figure 28. Artsonia webpage to buy the kids arts

Exhibiting work is a focus of the National Core Art Standards, and Artsonia provides an option that is not possible in the majority of art rooms: an exhibition of work to a wide audience. Students may be more motivated to finish a piece, knowing it will be added to an online portfolio, and teachers can pose questions for students in their artist statements and assess student understanding. Teachers can also send progress reports home to parents digitally or via a printable certificate.

Artsonia helps get parents involved in their kids' art lessons and encourages them to upload the art their children make at home as well. Parents can create fan clubs for their kids, as well as moderate comments, so students can see how their artwork positively affects others. Childrens are encouraged to share and display their artwork and are supported by positive comments and awards. This validates students of all ages by calling them artists and showcasing their creations, helping them establish an online digital portfolio of their artwork. This application is designed with an educational setting in mind. Teachers or parents can give an assignment to children and they can make or collect artworks based on that. These collections can be viewed and shared by the teachers. Also, other users can check out each other's artworks and be inspired by them, save the favorites, and even ask their parents to make a real representation of their artworks (for example print it on a shirt or a mug). These making, sharing, selecting favorites and other activities put this application in the Collecting group.

## I. Relevant aspects

Support: Web app, Android, IOS

Expected user: kids up to 12 years.

Requirements: smart device.

Is it hosted by the museum? No

Is it open source? No, free app

## 2.2.4 ArtUK curations<sup>19</sup>

ArtUK is an online environment for public art collection in the UK. It is also based on a charity, and the website represents a collaboration between over 3,300 British institutions. The main feature of the website is making personal collections, however, there are several other features implemented too. To start using this website the user needs to register. To find an artwork a search area is presented which allows the user to find their desired art by searching based on name, author or other parameters like location on a map.

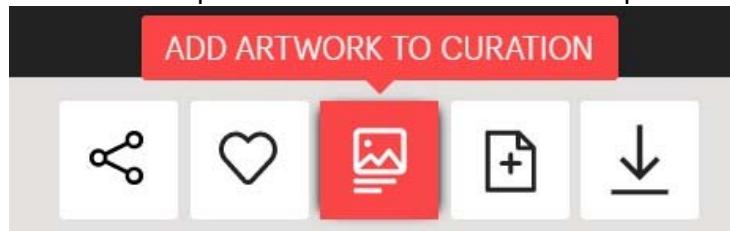


Figure 29. Tools for managing a collection in ArtUK.

After selecting the intended art, the user can enter comments or a long note describing that specific artwork and save it as a file. These files can be shared using any third-party social media network or simply added to the user's favorite arts by clicking on the "heart" button. All the files can be edited or deleted by the owner.

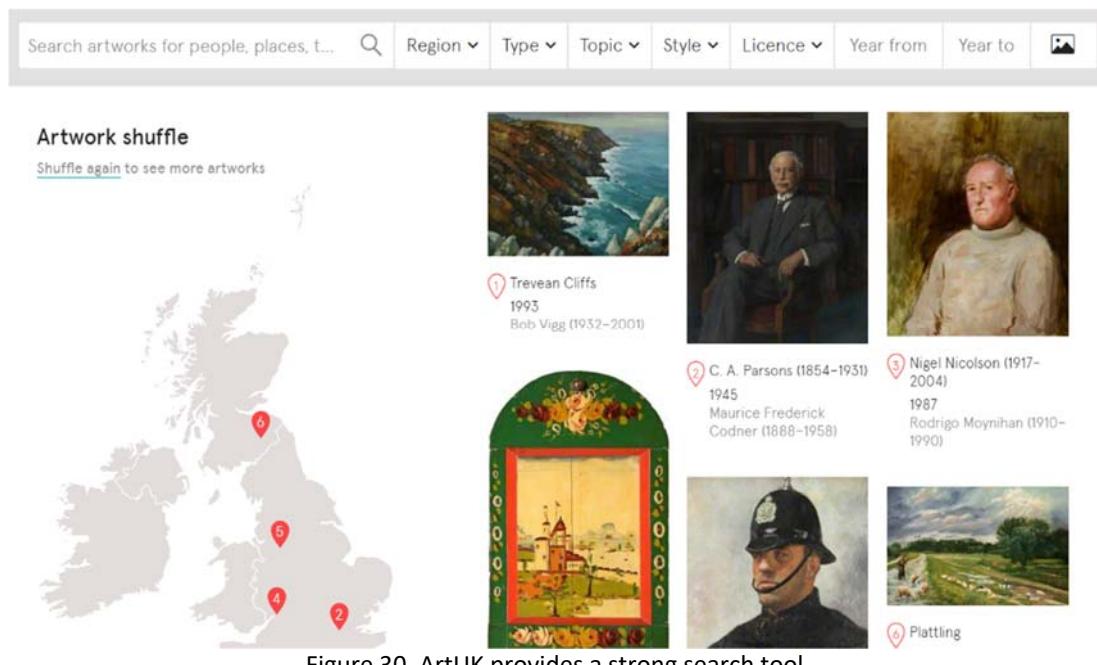


Figure 30. ArtUK provides a strong search tool.

One of the other features that the ArtUK website presents is education. User can choose a topic or even an artist and view information about that artist in form of text, picture or even videos. The website aims to educate communities, schools and home stays by helping them "learn" about art terms and topics. More tools are available on the website like shopping, discovering, visiting, participating in events, etc.

Gathering various artworks from around the UK is the major goal set for this website. Each user collects their own selection from a variety of options. To do so they will have a set of

<sup>19</sup> <https://artuk.org/>

interfaces to interact with, including location-based search on maps or a search engine with lots of sorting fields. These selections can be shared, become favorites, downloaded, and described by leaving comments and notes on them. These activities define ArtUK as a member of the Collection group.

### I. Relevant aspects

Support: Website

Expected user: not specified

Requirements: Internet access

Is it hosted by the museum? No

Is it open source? No

## 2.2.5 Enigma MNCN<sup>20</sup>

This tool is a mobile treasure hunt game developed for kids of 8 to 12 years old. The game is designed with educating kids in mind. For example the designers used the scientific names of the objects that are intended to be found in the treasure hunt. The main control of the tool is the camera of the mobile device and it will not use QR codes (as most of other games) but the real object itself.

Kids will be assigned to find an object that they will have to aim their device camera at after accomplishing it. Since kids at this age might not be familiar with using this type of technology the tool provides them with some help. The help can be asked at any time for how to use the application or about what object they are searching for (it might be hard for them since the game is using scientific names).

The hunt can include only one object or several, which after completing each part of it the kids will have to play a mini game related to it. Since the game uses the objects of the museum, the location of the kids will be known hence, it is possible to include other objects in their surroundings in these mini games. There are four types of mini games in this application: Packaging, Skeletons, Magic Fields and AR Hunt.

Packaging is a puzzle game where the kid has to put all the pieces appearing to the right of the box, inside of the box. The kids will be put in a context of helping the museum to pack some object which are usually similar to what they recently viewed in their hunting game. Doing this they will learn about those objects in a closer view.

Skeletons, as Packaging, also require visual-spatial skills to be solved. A partial skeleton will be provided on the left of the screen with some missing bones on the right. The goal is to place the bones at the right positions. To provide and contextualize the task, the game has taken the kid in front of that same skeleton in the museum, so that she can look at the original to get inspiration.



Figure 31. Packaging and Skeleton mini games in Enigma MNCN

A magic field is a 3D scene that is loaded after a search task that has led the player in front of the illustration panel, making that illustration come alive. The goal in the mini-game is to move around the 3D scene, through the gyroscope of the mobile device, and find a particular prehistoric animal, which usually corresponds to a skeleton that has been seen before in the game.

AR hunts use augmented reality technology to insert an image of a prehistoric animal into one of the illustration panels of the museum, where an extinct insect is moving around the

<sup>20</sup> Camps-Ortueta, Irene, Pedro A. González-Calero, María Angeles Quiroga, and Pedro P. Gómez-Martín. "Measuring Preferences in Game Mechanics: Towards Personalized Chocolate-Covered Broccoli." In *Joint International Conference on Entertainment Computing and Serious Games*, pp. 15-27. Springer, Cham, 2019.

illustration as seen through the camera of the device. The goal is to capture the moving animal by tapping it.



Figure 32. AR hunt and Magic fields.

For the educational version of the game two more elements were added: the field notebook and the quizzes. Having the educational aspect in a treasure hunt game in a museum give the kids a good overview of what they are looking at. This makes a visit to a museum more fun and interesting for the kids with this age. These features are amongst the ones belonging to the Collection group.

### I. Relevant aspects

Support: Android/IOS

Expected user: 8 to 12 years old

Requirements: Internet access

Is it hosted by the museum? No

Is it open source? No

## 2.2.6 Gift<sup>21</sup>

With Gift, you use your smartphone or tablet to create a digital gift. It's like a playlist or a mixtape, except with objects from a museum<sup>22</sup>.

Users explore the museum with a person they love or who is special in mind. An audio narrator guides the users in choosing up to three objects from the collection. They must take a photo of each object, record an audio message about why they chose it and enter a written clue to explain how to find the object in the museum.

Making a Gift typically takes between 2 and 20 minutes. Different people use the app in different ways. Some people used all their three gifts, some just used one. There is an opportunity to take your time and search all over the museum and find a personal gift or use it as a new experiment. Some people take their time and change their gift in a sort of treasure hunt game that makes it a more fun experience. The app uses informal speech with minimal instructions and the need to look at the device to minimize the distraction so users can focus on their experience.

The goal of the app is to use digital platforms to create a playful, social and personal experience that deepens visitors' engagement with museums' collections. Besides, doing so can be a friendly invitation to the museums to share familiar experiences with your loved ones or friends' group. This will engage other people in the visitor's circle to see their point of view and interpretation that supports citizen curation.

The app was developed in three main phases. The prototype was a native android app tested in July 2017, the second prototype was a similar app designed for android and IOS. Both of the first versions suffer from the same problem, users were forced to register in the app and send their gifts via the application itself. This means the receiver of the gift also had to install the app to receive it. Registering on a new unknown application is a process that average people tend to avoid. The final version (developed in 2019) fixed this issue by changing the platform from smartphones to a web application. This allows visitors to create a gift from their phone's own browser and send this using their preferred social media accounts.

Recent observations on the application revealed two key points. First, the location of the QR code that starts the process is very important. It can be handed out to the visitors at their arrival and ticket check and might be scattered at various places inside the museum. Studies of this app show that the second method is more successful since the staff are busy on other tasks and visitors are still orienting themselves around the place itself. Second, the children and teenage group engagement in the app. This age group showed more interest in using the application while being accompanied by their families while being on a school trip limited their reactions. Recent tests show that younger children on a school trip usually are not allowed to have their own smart device and the devices provided by their school have social media applications blocked and that prevents children from their gifts. By contrast, visitors aged 16-17 used their gifts more frequently.

The app consists of two main functionalities, when you want to create a gift and when you receive one. Users will also have access to the main menu at any time while using the app.

### Create:

<sup>21</sup> <https://gifting.digital/gift-experience/>

<sup>22</sup> Adams, M., Spence, J., Clark, S., Row-Farr, J., Benford, S., & Tandavanitj, N. (2020). From Sharing To Gifting: A web app for deepening engagement. <https://doi.org/10.14236/ewic/EVA2020.7>

Pressing the proper button will start the process of creating a gift. The narrator reads instructions about what the user needs to do that happens in various steps (these instructions can be replayed, skipped or even read by using the tools provided in the app).

1. Deciding on who the receiver of the gift will be, after that the user should type the receiver's name in the app and go to the next step.
2. Users will need to search around the museum with the receiver in mind to find a gift. After finding a gift, the user can open the device camera (using the app) and take a photo of it.
3. The user will need to record an audio message for the receiver describing why they chose this special object or any other recording that will be played when the receiver finds his/her gift.
4. That app will ask the user to provide a clue about where the object might be so the receiver can use it to find the gift or ask the museum staff about it for help. This step can be skipped by the user.
5. Users can decide to add more objects (up to 3) and repeat from the second step or finish the process and send the gift.

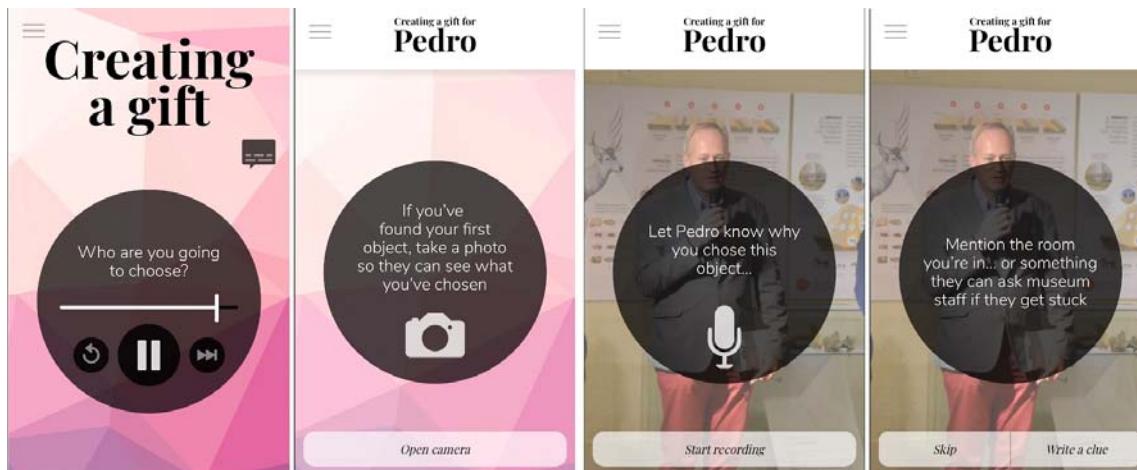


Figure 33. Creating a gift using the Gift app

#### **Receiver:**

An invitation to Gift reaches you as an URL that leads you to the Gift system. Depending on how many objects are in the gift the receiver will follow the app instructions to find those objects doing some simple step.

1. After opening a gift the app will show the picture that the sender of the gift included. The user can decide to start a search for the object right away, read a clue that the sender might have included or ask the staff for help.
2. As the object is found the user will inform the app by pressing the proper button that will lead to the app playing the recording audio about that specific object.
3. A user might need to redo the same steps up to 3 times depending on the number of objects inside the gift.



Figure 34. Receiving a gift in the Gift app

To use this app two people need to be involved, one should act as the creator of the gift and the other as the receiver. Of course, the same gift created can be sent to several others. A gift starts with selecting a collection of artworks followed by a series of treasure hunting. The creator will collect a set of artworks with a specific goal in mind that will help the receiver go through the desired experience and feel a mutual memory. In the end, this series will end up as the receiver finds the so-called treasure and build an idea around the artwork with the interpretation of the creator (sender) in mind. This treasure hunt experience places the Gift into the Collecting group.

### I. Relevant aspects

Support: Web-based app.

Expected user: Adults, Teenagers.

Requirements: A portable device (tablet or mobile) with an internet connection and camera.

Is it hosted by the museum? No.

Is it open source? Yes.

## 2.2.7 Google Art & Culture

Google Arts & Culture is an online platform through which the public can view high-resolution images and videos of artworks and cultural artifacts from partner cultural organizations throughout the world. The digital platform utilizes high-resolution image technology that enables the public to virtually tour partner organization collections and galleries and explores the artworks' physical and contextual information. The platform includes advanced search capabilities and educational tools.

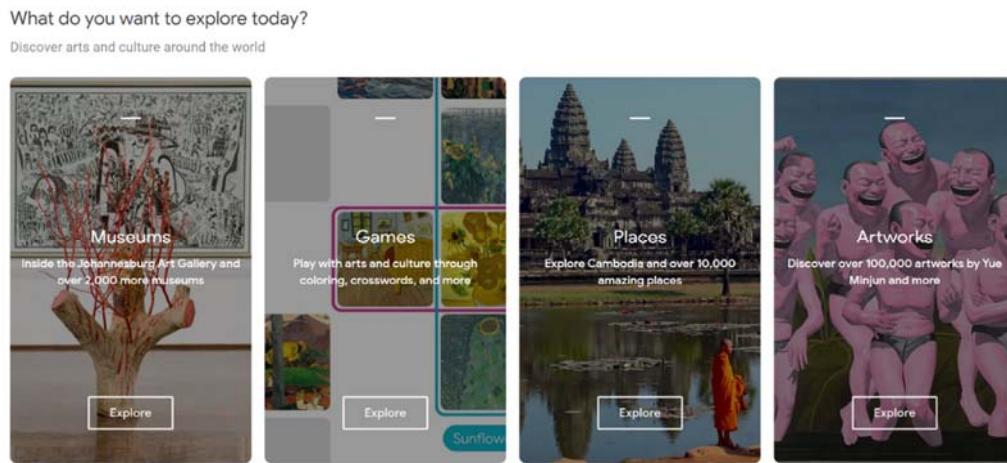


Figure 35. Various categories in Google Arts & Culture

Through the Virtual Gallery Tour users can virtually 'walk through' the galleries of each partner cultural organization, using the same controls similar to Google Street View or by clicking on the gallery's floorplan. From the Gallery view, users can zoom in on a particular artwork to view the picture in greater detail. The Microscope view provide users a dynamic image of an artwork and scholarly and contextual information to enhance their understanding of the work. When examining an artwork, users can also access information on the item's physical characteristics (e.g. size, material(s), artist). Additional options are Viewing Notes, History of the Artwork, and Artist Information, which users can easily access from the microscope view interface. Each cultural organization is allowed to include as much material as they wanted to contribute, so the level of information varied.

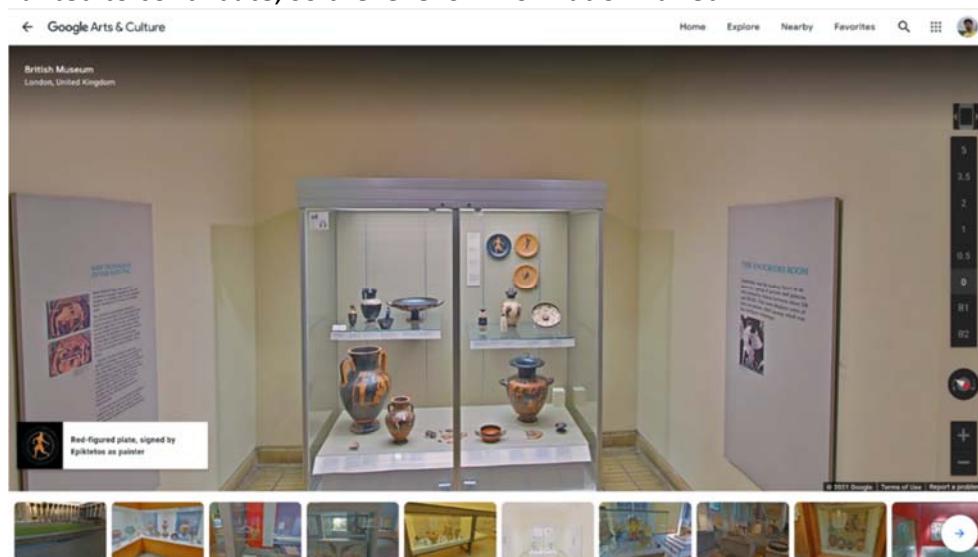


Figure 36. Visiting museums using Google Art

Users can compile any number of images from the partner organizations and save specific views of artworks to create a personalized virtual exhibition. Using Google's hyperlink abbreviator (Google), users could share their artwork collection with others through social media and conventional online communication mechanisms. This feature was so successful upon the platform's launch that Google had to dedicate additional servers to support it. The second-generation platform integrated Google's social media platform Google+, so that site users could upload video and audio content to personalize their gallery and share their own collections through social media.

In the second launch of the platform, Google updated the platform's search capabilities so that users could more easily and intuitively find artworks. Users could find art by filtering their search using several categories, including artist, museum, type of work, date, and country. The search results were displayed in a slideshow format. This new function enables site users to more easily search across numerous collections. Several partner cultural organizations opted to include guided tours or welcome videos of their galleries. This provides users the option to virtually walk through a museum and listen to an audio guide for certain artworks, or to follow a video tour that guided them through a gallery.

Play with art using your phone

Explore with Augmented and Virtual Reality



Figure 37. The ARs offered by Google Art

Google Arts & Culture includes several educational tools and resources for teachers and students, such as educational videos, art history timelines, art toolkits, and comparative teaching resources. Two features, called "Look Like an Expert" and "DIY", provide activities similar to those often found in art galleries. For example, one quiz asks site visitors to match a painting to a particular style; another asks visitors to find a symbol within a specified painting that represents a provided story.

Google Arts & Culture allows people to find their fine art likeness by taking a selfie. The app matches the user's face to old art museum portraits from Google's database. The feature was initially created by Cyril Diagne.

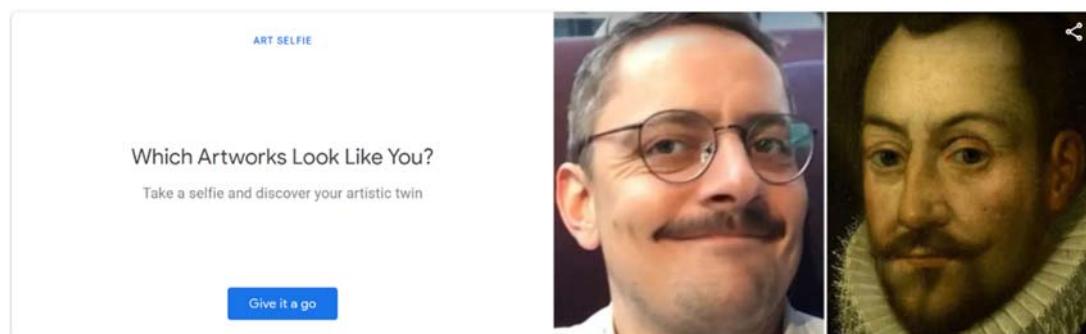


Figure 38. Google Art tool to find look alikes in art

Google Arts & Culture is an online platform with a vast set of features. The users of this platform can make their collection, build a story around an object and publish it, start a treasure hunt and much more. Of particular interests to this study is the capabilities in the making and sharing of the collection. There is a big set of artworks available on this platform; users can search them using the Google search engine and find many different types of art based on what they searched for. The user can collect them, put their own comments on them based on their own idea and what they understand by looking at them, build a new set out of them and share it with many other people. This platform does not exclusively belong to the Collecting group but it is one of its many capabilities.

### I. Relevant aspects

Support: Web-based, Android and IOS app

Expected user: not specified

Requirements: Internet access

Is it hosted by the museum? No

Is it open source? No

## 2.2.8 Labyrinth 3D<sup>23</sup>

In the last decades, the advent of the World Wide Web has led public institutions and private entities (the latter is also known as creative and cultural industries), to publish their media archives online, dramatically increasing the range of cultural content that are available to the general public. Parallel to this, the digital convergence has brought content producers and consumers to share and generate content, working alongside the traditional paths of cultural markets and education<sup>24,25</sup>.

Personalization and integration with social networks have innovated the relationship of the archives with the audience, but the basic access paradigm, which relies on formally specified queries, has not changed yet. The access to digital media archives is largely based on keywords and/or tags, through which the users can filter contents to find what they need.

On the technological side, the shift towards semantic encoding has opened the way to the creation of interfaces that allow the users to build personal paths in heritage collections by exploiting the relations over the artworks, according to the paradigm of exploratory search. The Labyrinth project leverages the notion of “cultural and narrative archetypes”, situated at the intersection of narrative motifs, iconological themes and classical mythology, to support the construction of personal paths through digital archives.

The 3-D environment consists of a virtual labyrinth that contains digital representations of the items in the archive, linked by pathways that represent the similarities between them. Targeted at the general audience, the project aims at encouraging users to explore the media repository, as a way of promoting personal cultural enrichment and cultural heritage dissemination. The design of Labyrinth 3D relies on two main features: the use of well-known visual codes for the representation of the maze and the insertion of elements of gamification into the user experience.

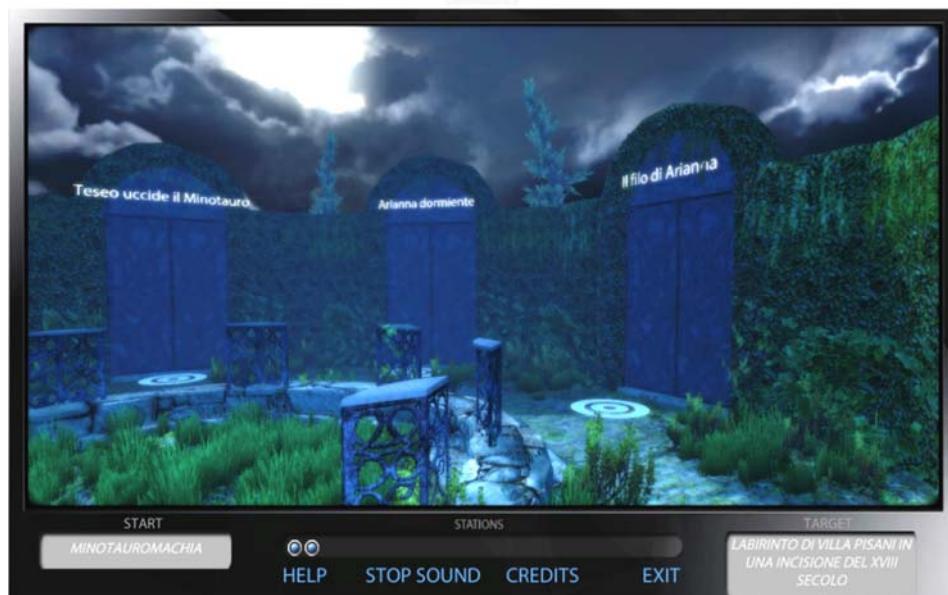


Figure 39. Labyrinth 3D world view

<sup>23</sup> <http://di.unito.it/labyrinth/>

<sup>24</sup> Damiano, R., & Lombardo, V. (2016). Labyrinth 3D. Cultural archetypes for exploring media archives. *Digital Creativity*, 27(3), 234-255. Damiano, R., Lombardo, V., Lieto, A., & Borra, D. (2016).

<sup>25</sup> Exploring cultural heritage repositories with creative intelligence. The Labyrinth 3D system. *Entertainment Computing*, 16, 41-52.

In Labyrinth 3D, the floor is partly tiled, partly covered with grass, evoking a deserted location that is seldom visited, so that the user gets the feeling of undertaking a solitary journey in an abandoned area. The environment includes two types of elements, namely nodes and pathways connecting the nodes. Pathways differ in length and form: some are shorter and let the user catch a glimpse of the destination; some are longer and bend so that their end is not visible before the user gets near the end. Small differences in the visual appearance of the nodes and pathways embellish the environment, serving at the same time the function of allowing the user to remember the elements visited so far, useful in case of backtracking, or in case the user finds themselves in a location that they have already visited before – a not unusual situation in mazes that are purposely allowed for by the design of the environment. In the bottom area of the interface, a bar represents the advancement of the user through the maze, expressed as the list of the nodes (called stations) visited so far, intending to provide an element of orientation to the user. The session ends when the user reaches the target location (start and end locations are randomly assigned at the beginning of each session).

Labyrinth 3D is designed for the users to make their collection in a 3D world. The environment of the application is designed in a way that will make the users feel in a solitary private area of their own. In this type of environment, the users can make a collection free of influence from others and by their own mind. They will start in a maze, visiting several artworks in the maze and will end their experience by finding the end of the maze. It is possible to start a new maze with new artworks in it and find new artworks for the collection. The idea of labyrinths and collecting arts in them makes this application most suitable for the Collecting group.

## I. Relevant aspects

Support: Web-based

Expected user: No age limit specified.

Requirements: Multi-platform app

Is it hosted by the museum? No

Is it open source? No

## 2.2.9 Minecraft<sup>26</sup>

Minecraft is a sandbox video game developed by Mojang. In *Minecraft*, players explore a blocky, procedurally generated 3D world with infinite terrain, and may discover and extract raw materials, craft tools and items, and build structures or earthworks. Depending on the game mode, players can fight computer-controlled "mobs", as well as cooperate with or compete against other players in the same world. Players can modify the game to create new gameplay mechanics, items, and assets. There are several projects developed for and by museums to gamify learning experiences (e.g. Great Fire 1666 from Museum of London)<sup>27</sup>. Suitable for anyone from the age of seven, users collaborate throughout the creative 3D adventure game.



Figure 40. Museum in the Minecraft game

Minecraft uses blocks of different colors and textures with which players can make whatever takes their fancy. In most cases, players construct buildings, walls and other structures to protect their character and enhance their environment. When played by experienced users, entire worlds can be constructed, with streets and buildings that have architectural merit. The three-dimensional visualization of the game means that Minecraft's many devotees feel like they are inside the game, enjoying it as a virtual world.

Minecraft is very popular for museum purposes<sup>28</sup>. We will describe the project carried out by Museu de les aigües<sup>29</sup> launched in December 2020, players are challenged to build a refuge for biodiversity. The game aims to simply convey the message that we need to do something and players learn how to help with small actions.

Players must protect all creatures, big or small, by creating an action plan to raise and protect the native flora and fauna of the Museum, getting native species to reproduce and providing shelter and food.

<sup>26</sup> <https://education.minecraft.net/worlds/create-your-own-museum>

<sup>27</sup> <https://www.museumoflondon.org.uk/discover/great-fire-1666>

<sup>28</sup> <https://education.minecraft.net/lessons/museum-heist>

<sup>29</sup> <https://atlasofthefuture.org/project/minecraft-water-museum/>

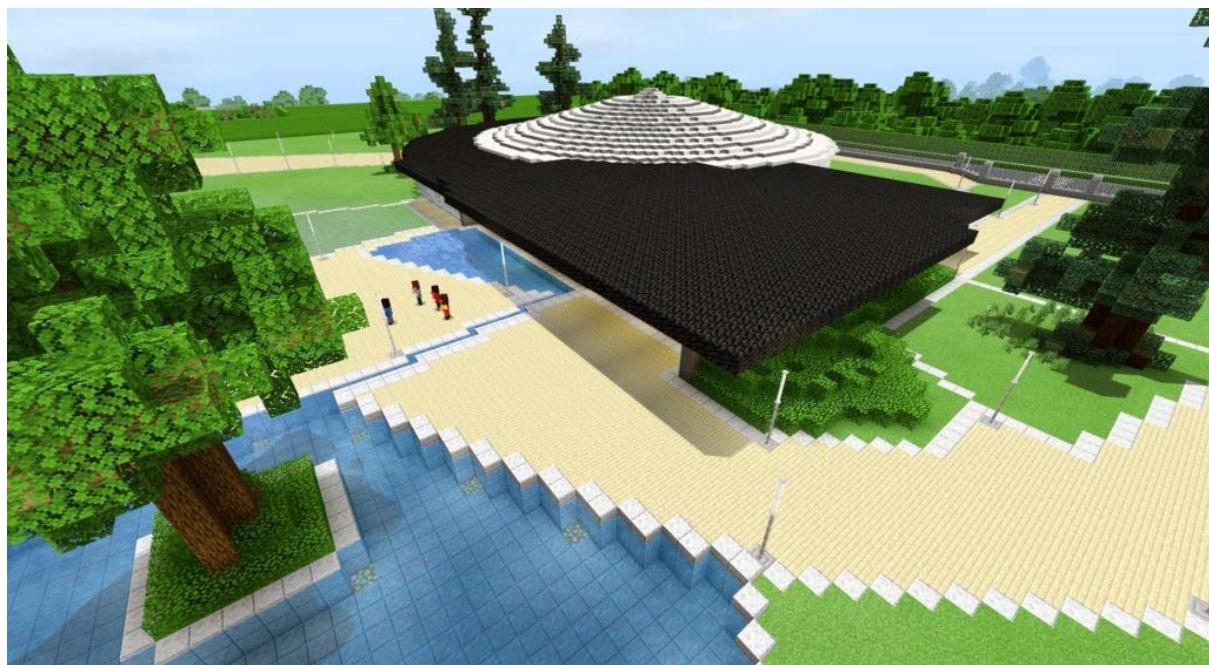


Figure 41. Water museum in Minecraft

It is relevant for SPICE because it allows the recreation of a museum setting; it is the most popular video game for younger users and there are several educational projects carried out by museum involving schools (e.g., Raffaello in Minecraft of Galleria Nazionale delle Marche).

### I. Relevant aspects

Support: App

Expected user: all user from 7 age

Requirements: MS Minecraft, Office 365 educational

Is it hosted by the museum? No

Is it open source? No

## 2.2.10 Mozilla Hubs<sup>30</sup>

Mozilla Hubs is an open-source project by Mozilla that allows anybody to create and design virtual rooms and populate these rooms with digital content. We describe a particular use of Mozilla Hubs in the Ars Electronica 2020 online festival where more than 60 Mozilla Hubs with a multitude of content were created by Ars Electronica and its partner gardens worldwide. The system has two main aspects as Host and visitor. Here the aim is to check the visitors' experience using Mozilla hubs. The user opens the website showing the world map with all the available rooms on it. It is possible to select any of them to check how many people are currently inside the room, a short description of what this specific room is about, the preferred device to use the room etc. Also, it is possible to see a list of the available rooms on the website to go directly to them. The user can select the room by simply clicking on the join button.

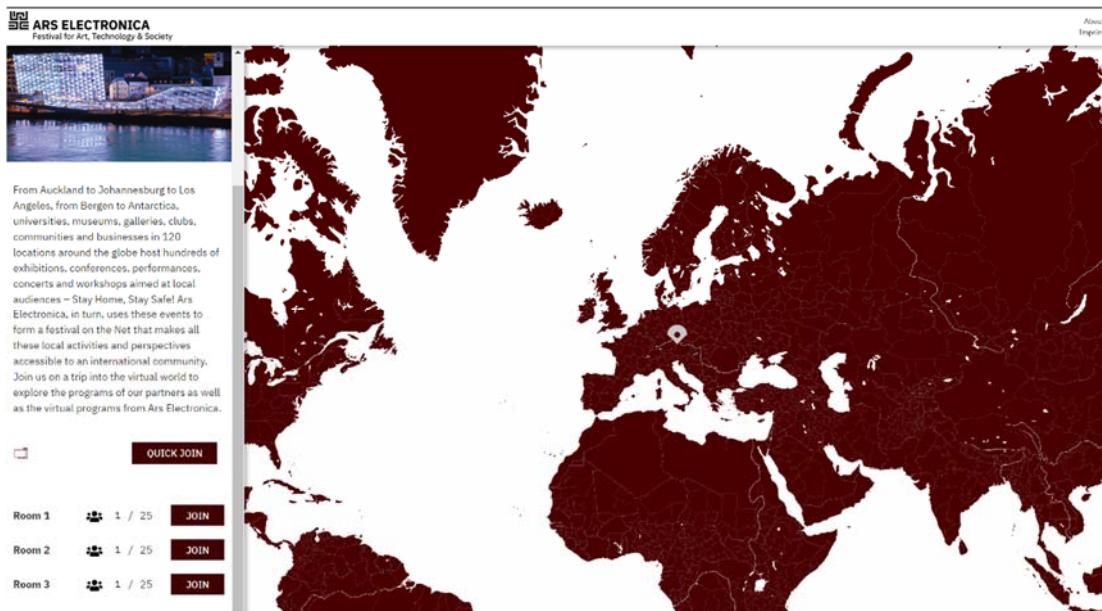


Figure 42. The map interface in Mozilla Hubs

Upon entering the room, a small picture with a hint will appear on the window, introducing how the controls will work. After the pages load the user is asked a series of questions and permissions. There is the option to use Virtual Reality (VR) or a normal monitor. After that, the user needs to choose an avatar. The user then will have to give the Mic permission to the website since it is the main way to interact with other users inside the room.

<sup>30</sup> <https://hubs.mozilla.com/>

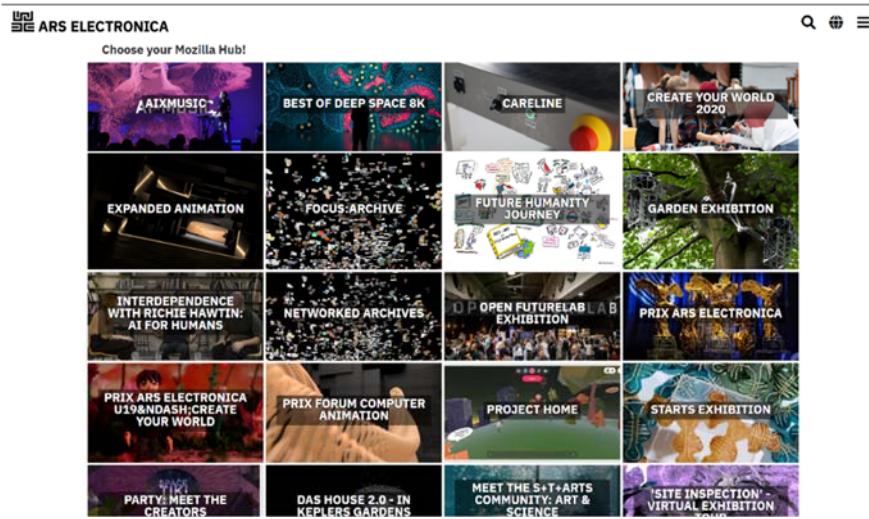


Figure 43. A Collection of available rooms in Mozilla Hubs

Inside the room, the visitors can use their mouse and keyboard to walk around the area and explore it (it is designed similar to a first-person shooter game). The rooms are designed in 3D with various objects inside them. They can be used as an exhibition room with artwork on the wall, as a conference room with a person presenting a topic or even a gallery showcasing their work. Inside each room, there is always a small booth as the setting and connection point that users can go to check the options available. Around the screen, the user has access to the menu button, favorite button, help button and some data about how many people are currently using the room. This is a great way to share art and ideas in an online way especially during the lockdown to make the people see different points of view and talk to each other inside the room over specific topics.

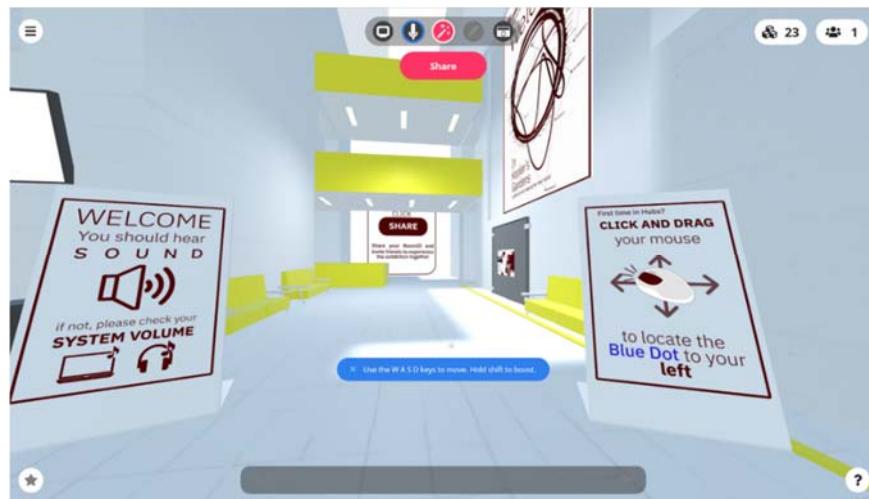


Figure 44. Navigation interface inside a room of Mozilla Hubs

This website provides an environment for finding and collecting artworks. Having a location-based map search and several sets of pre-made collections make it easier for the users to build their own collection. These collections can be shared with other people through a 3D visualized room that can be designed by the user. The rooms can be shared with others and they can visit these rooms using the first-person view of avatars, can communicate with other avatars, sharing their note, ideas and opinions about them. Artworks inside rooms can be selected and chosen as favorites by visitors and later be used in their rooms too. Having the

option to make a collection from other arts and sharing them with others in virtual galleries makes this application a part of the Collecting group.

### I. Relevant aspects

Support: Web-based

Expected user: not specified

Requirements: Internet access

Is it hosted by the museum? No

Is it open source? No

## 2.2.11 Occupy White Walls<sup>31</sup>

In Occupy White Walls, people can create a museum and curate its contents. Construct a space, fill it with art that is personal to them then open its doors to other people to explore. OWW is powered by an art discovery AI called DAISY and has a fun, creative, and adult player community. It includes artificial intelligence, more than 2300 architectural assets to build places, over 10,000 artworks, 18th and 19th centuries arts.

Artists are a big part of OWW, any artist can join this game and share their art with the world. Playing the game is free and there is no advertisement or in-game purchases however, to upload an artwork it is needed to pay a one-time purchase of around 9€, and it can be sent outside the game environment. Since there is no censorship in the game, artists are allowed to upload any kind of abstract art they have in mind and that is why this game is rated as +18. The AI of the game (DAISY) constantly tracks players' behavior and interests to connect people with similar tastes in new communities or show new arts that the players might enjoy based on their history. Players don't have to do anything for DAISY to work – they will just look at art that interests them, and avoid the ones they do not enjoy. They will soon start seeing lots of art selected just for them.

In short, OWW enables a world of artists to connect with audiences which they could not have reached before, allowing artists to sell their artworks both in-game and in real life.

### I. Key Features

- Build a gallery (or a museum) in a creative sandbox environment with over 2300 unique assets.
- DAISY, an art curation AI helps you discover art by the history of your search and interests, build a community around people with the same taste in art. This is exactly how this game contributes to citizen curation.
- OWW for artists – People can upload their art into the game and discover new audiences using DAISY
- Collaborative building – There is a possibility to play co-op with friends (or strangers) building artworks.

The game is available on steam and a cloud gaming platform. The locally installed gaming is for free but payment is required for playing the game on a cloud system. After installing the game on a Windows\Mac device (15GB of free space needed) a first-time registration is needed to start playing. Each player has a unique avatar that can modify to his\her taste. Using the avatar Players can roam inside a virtual Museum (art gallery) that they will find various types of art inside.

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<sup>31</sup> <https://www.oww.io/>

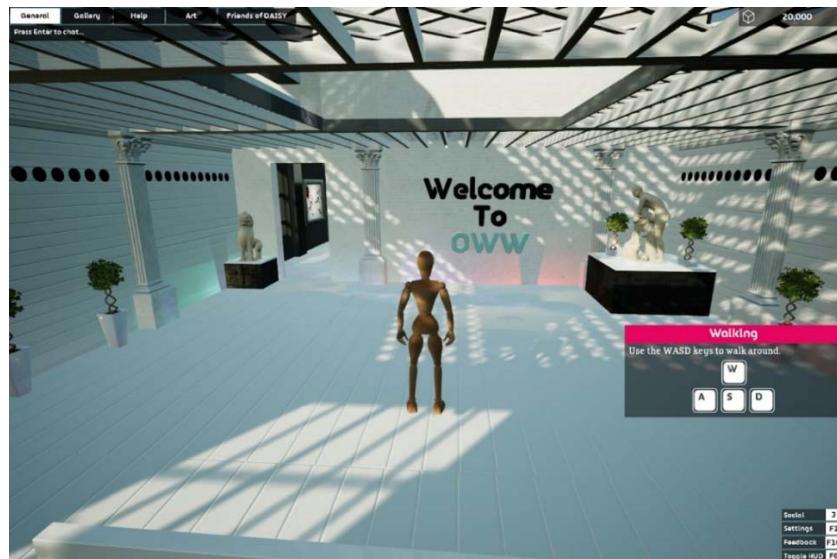


Figure 45. Navigation and avatars in OWW

If anything looks interesting for the player they can have a closer look (by pressing an especial button) that will give them a direct view of the artwork plus more details about the artists, the art itself, and other peoples comments on that specific art. Birmingham Museums<sup>32</sup> participates in OWW.

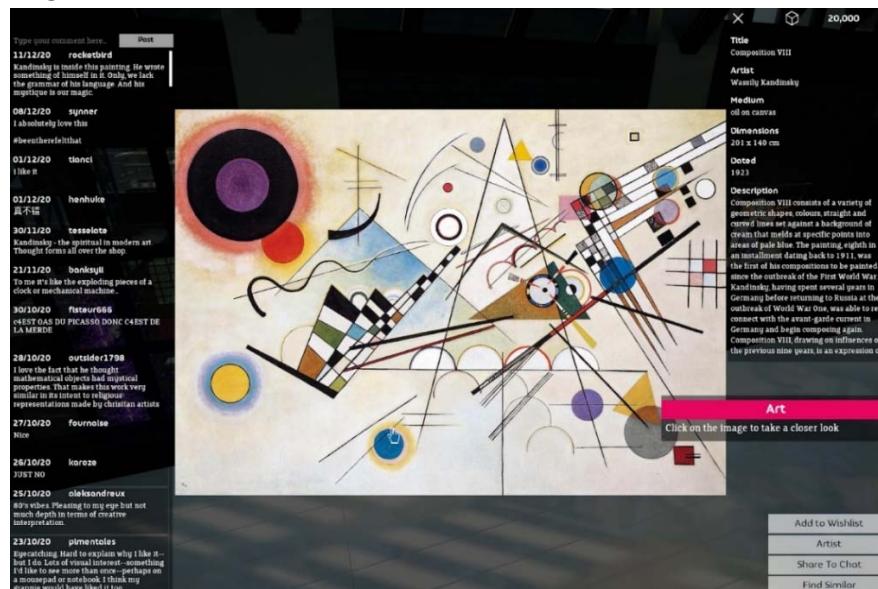


Figure 46. Art view and its comments in OWW

As mentioned before, OWW is a game based on visiting artworks and gathering your collection. Players navigate inside a 3D environment using avatars and check artworks on hanged on walls. Players can see the information of those artworks using the game controls, have a chat with other people there and build their idea about the artwork on their own or by having help from others. It is also possible for the players to add their artworks in the game and make their gallery from scratch or by adding other people's arts to the walls. The

<sup>32</sup><https://www.birminghammuseums.org.uk/blog/posts/going-global-in-lockdown-birmingham-museums-becomes-first-official-museum-to-partner-with-occupy-white-walls>

opportunities to add art, make a collection, share it with others gain a spot for this game in the Collecting group.

## II. Relevant aspects

Support: Windows and Mac (on steam), Cloud gaming.

Expected user: Adults, the game is rated as +18.

Requirements: Computer system plus an internet connection.

Is it hosted by the museum? No.

Is it open source? No.

## 2.2.12 Rijksstudio<sup>33</sup>

Launched in 2013, Rijksstudio is an online presentation of 125,000 works of the Rijksmuseum collection. Rijksstudio invites members of the public to create their own masterpieces by downloading images of artworks or details of artworks in the collection and creatively using them. The ultra-high-resolution images of works (2500 x 2500 pixels, 300 dpi), both famous and less well-known, can be freely downloaded, zoomed in on, shared, added to personal ‘studios’, or manipulated copyright-free. Users are encouraged to download the images and to do something—anything they like—with them. Users can interact with them, “like” them, share them with others and use them in any way they wish. Users can have prints made of entire works of art or details from them.

After the login users can:

- explore the collection by searching for themes
- zoom in
- save
- add a description
- create own collection
- add new images
- manipulate images and create a new artwork
- share

Users are encouraged to download the images and to do something creative and share

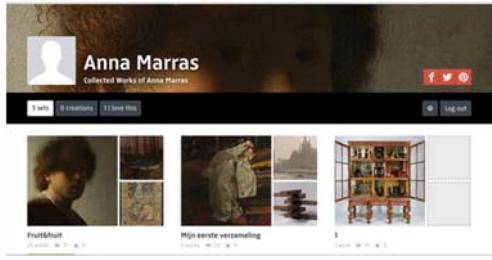


Figure 47. Personal Dashboard in Rijksstudio



Figure 48. Saving option in Rijksstudio

<sup>33</sup> <https://www.rijksmuseum.nl/en/rijksstudio/instructions>



Figure 49. How to create a new artwork in Rijksstudio

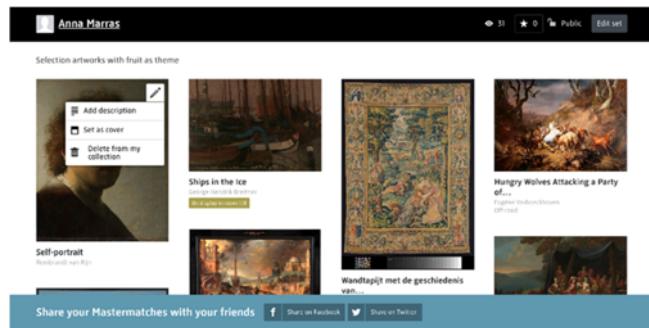


Figure 50. Rijksstudio interfaces

Rijksstudio Award is the biennial art- and design prize from the Rijksmuseum. With this competition, the Rijksmuseum invites everyone to create their own masterpiece inspired by the Rijksmuseum's collection.

It is relevant for SPICE because it is a long and stable application that engages the visitor, not only for available high-resolution images in Open Data but because it invites the visitor to create their collection as a curator and to become an artist using famous masterpieces. The use of the application is simple and user-friendly.

## I. Relevant aspects

Support: Website and App

Expected user: targeted at all ages and profiles

Requirements: no

Is it hosted by the museum? Yes

Is it open source? Yes

Other categories: Citizen Art.

## 2.2.13 Smithsonian Learning Lab<sup>34</sup>

Smithsonian Learning Lab is a website designed for education purposes. It is built on four main aspects, Discover, Create, Share and Learn. Each of which can be used by the user after free registration.

### I. Discover

Using this tab the user can start discovering pre-made collections of ideas on various topics. These collections are presented based on topics or resource types. Amongst these topics “art” can be selected to follow up on related ideas.

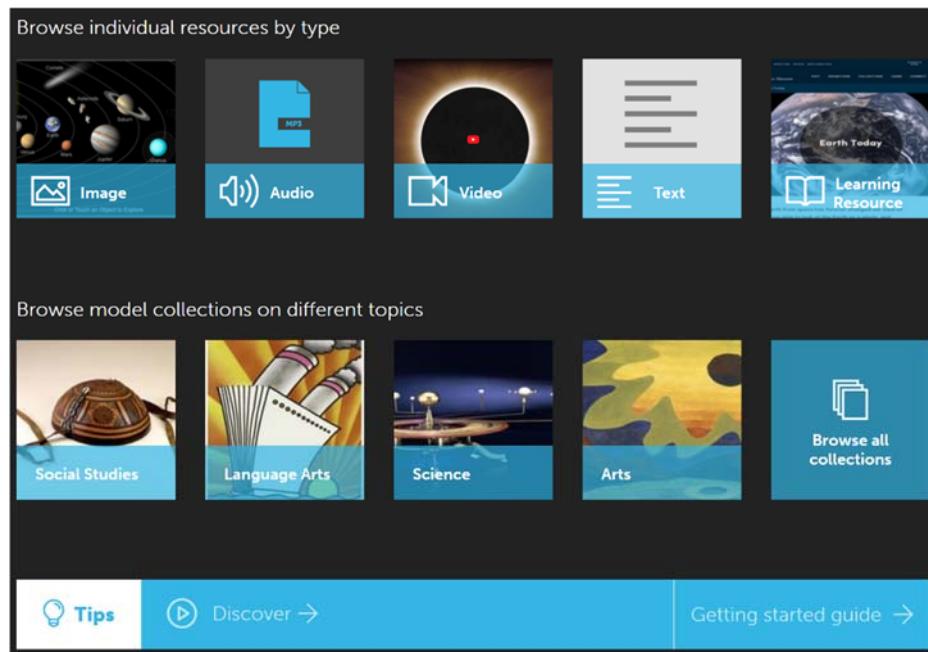


Figure 51. Discovering tab in Smithsonian lab

### II. Create

Users are free to create their own private or public collections. They are encouraged to search in the pre-made collections (**Discover**), choose their favorites and copy them or even upload their own ideas to create a new collection. Users can write notes, comments and full descriptions of what they have uploaded as their collection for further use. The tools available allow the users to make a collection as “student friendly” which later can be used by students to learn about them.

### III. Share

Sharing can be done with different tools and purposes in the Smithsonian lab. Users can share their **Created** collection using third-party social media apps or publish it inside the app so other users can **Discover** them. They can ask for an embedded code so they can use it in their own blogs or web pages. Or these collections can be assigned to other people (mostly students for education) with some tasks on the collections for them to Discover more about the assignment.

<sup>34</sup> <https://learninglab.si.edu/>

All these options are related to one important structure in the Smithsonian lab which is the collection. After discovering or creating a collection lots of options will be available for the user on the page. These collection pages can be very educative with lots of information or simply have some questions inside them for the user to try and search and learn more about them.

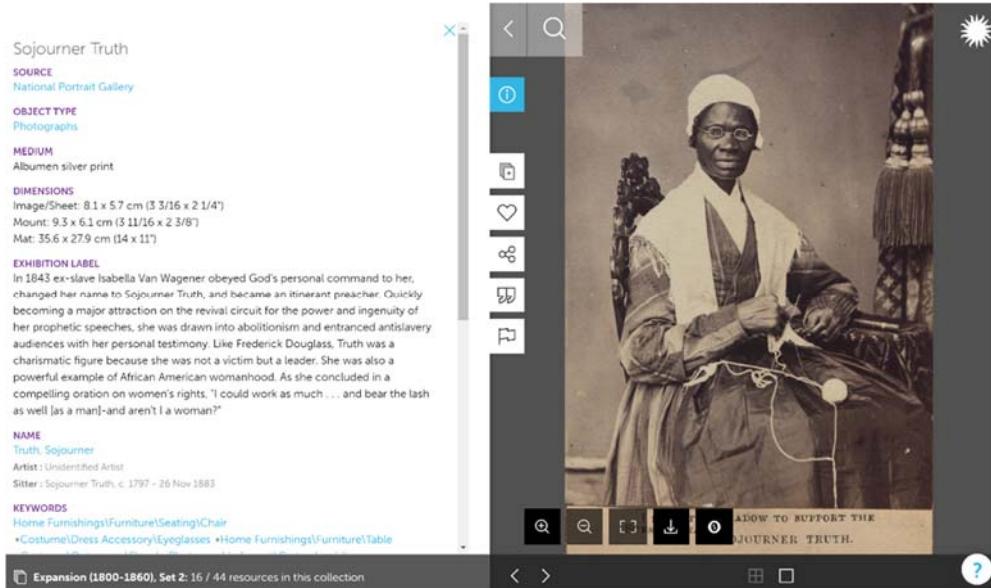


Figure 52. Example of a collection in Smithsonian lab

Similar to many other systems in this list, Smithsonian Learning Lab provides an environment for its user to build their collection of artworks. The users have the opportunity to search artwork by using the website's "discover" tab and simply visit them or put comments on them. Moreover, users have the tools to select what they want from these discovered artworks and create their collection out of them. Having their own collection, they can add notes of what they have in mind to their collection and then share the complete package on the website so other people can discover it and be inspired by it. Being able to gather and create a personal group of artworks, building your perspectives about it and sharing it with others is what puts this website in the Collecting group.

#### IV. Relevant aspects

Support: Website

Expected user: not specified

Requirements: Internet access

Is it hosted by the museum? No

Is it open source? No

Other categories: Artifact Analysis

## 2.2.14 Treasure Hunt Game Generator<sup>35</sup>

Visiting a museum might become a rather boring experience for the children, hence it is important to make it appealing and fun for them. Children are not the only important participants in the process, parents should be considered too as they have to company their children and enjoy their visit at the same time. Here is when gamification become useful as a tool to meet the needs.

Traditionally, some museums had printed version of games that they could hand in to the interested visitors so they can follow the steps and have a more interesting visit. This had issues in the execution, staff need to be presented for that and materials (like pen or booklets) need to be provided for the visitors. It is well-known that computer games can engage children in a fun and attractive way to appreciate the learning process. Using this concept in a museum visit can alter the experience for children and the parents specially if the parents themselves are not familiar with the museum objects. Treasure hunt is one of the most popular educational games for children visiting the museum, which are used to secure the children's active interest, make learning fun, and enhance the museum experience.

This tool is presenting a system that was designed to generate treasure hunt games for children visiting the Hecht Museum<sup>36</sup>. The staff of the museum did not have any specific education in making games or computer knowledge background. The tool had to be built in a way that the museum staff could work with it easily and without GUI difficulties.

Treasure hunt game is based on finding object and correct positions, hence knowing the player location is important for the system; this system does that getting help from QR-codes which are widely spreading and are a well-known feature by the smart phone users. The game creation system contains three simple components: starting/ending point definition and management, goals definition and management, and finally game definition and management. These steps are available in the interface designed to be used by the museum. This study is more interested in the visitors' interface of the system.



Figure 53. Interface designed to be used by the museum to build a treasure hunt game.

<sup>35</sup> Kuflik, T., O. Rokeah, S. Salman, N. Proctor, and R. Cherry. "The Treasure Hunt Game Generator—a system and its application at the Hecht Museum." *MW2014: Museums and the Web 2014* (2014).

<sup>36</sup> [http://mushecht.haifa.ac.il/Default\\_eng.aspx](http://mushecht.haifa.ac.il/Default_eng.aspx)

A visitor who is interested to play a game must first scan a QR-Code at the entrance to the museum. Once the QR-Code is scanned, a list of all available games and their icons are presented. Once the visitor has selected a game, a screen with the game's general instructions appears. The visitor can then start to play the game. It begins with the presentation of a clue for the first exhibit. As described in the game instructions, the visitor must go to the correct position and scan the QR-Code there. If the visitor did indeed locate the correct place, a multiple-choice question is then presented. If the visitor went to the wrong position, they are notified of this through a graphic feedback display. A graphic feedback display also appears to notify the visitor whether they gave the correct or incorrect answer to the multiple-choice question. Once a correct answer has been given, a new clue to help the visitor find the next position is presented.



Figure 54. visitors' steps in a treasure hunt game

### I. Relevant aspects

Support: IOS/Android

Expected user: suitable for children

Requirements: smart phone

Is it hosted by the museum? Yes

Is it open source? No

## 2.3 Storytelling and narrative methods

### 2.3.1 A Hollow Body<sup>37</sup> (Museum of London)

A *Hollow Body* is an interactive mobile app with an evocative music score and narration that guides two people on an atmospheric audio tour through the City of London's streets and narrow alleys. Described as a “cinematic walk for two people”, the experience includes a specially composed evocative soundtrack combined with narration guides the user and a companion through city streets and narrow alleys that they may not know. It is not a historic walk or guide, instead, the users are encouraged to imagine walking through a film, where they are the main characters. The users at times “guide” the application by choosing which way to go, and at other times follow the narration. The narration encourages users to observe the city, its inhabitants and buildings and to peel back its complex layers and stories.

The experience was created in partnership with collaborative art collective, Circumstance, and commissioned by the Museum of London as part of their Sherlock Holmes season. The application was designed to be experienced in pairs – much like Sherlock Holmes and Dr. Watson move through the city in Sir Arthur Conan Doyle’s stories, and the journey begins on Paternoster Square in London, under the archway that leads to St Paul’s cathedral. It takes approximately 45minutes. The experience involves crossing over roads, exploring streets and following a set of audio guidelines on the user’s own. During the experience, the two companions will sometimes go on separate routes. The experience is therefore not recommended for unsupervised children under 14 years of age. While the group endeavors to make their experiences accessible, this route is in the public realm and includes steps and narrow alleyways, and as such it is not fully accessible to wheelchair users. They do, however, offer the possibility of contacting them for accessible, alternative routes.



Figure 55. Hollow body main app

Emilie Rolland, Creative Partnerships Manager at the Museum of London characterized *A Hollow Body* as part of the museum’s recognition that digital technologies are changing the way in which people engage with art and the increasing focus on deepened interaction and

<sup>37</sup> <http://www.ahollowbody.com/>

participation. She has called the application “part soundtrack; part walking tour”, created in collaboration with the art collective Circumstance, known for creating intimate experiences in urban environments so as to create a unique experience. According to Rolland, the application was built around themes arising from Sir Arthur Conan Doyle’s great detective stories, and by taking inspiration from Sherlock Holmes, is aimed at giving people the chance to connect with the city around them in a different way. The museum sees *A Hollow Body*’s dependence on the users’ mobile phones as a way of increasing the intimacy of the piece because mobile phones are very personal devices, which allow the pair of users to get the “starring role of their very own experience throughout the city.”<sup>38</sup>

Exeunt Magazine has labeled *A Hollow Body* “more experience than story”, because the elements of narrative that do exist within the app “are elliptical and fragmentary” in ways that allow users to “transcend the grand impersonal buildings, these temples of high finance and the cold impersonal plastic bricks we carry in our hands.” In their review, the magazine highlights the fact that the experience varies enormously depending on the user’s relationship with the other person and with the city itself. They also highlight the app’s special ability to raise diverse emotions in diverse audience members, “you might find it frightening or romantic. It might make you excited, sad or angry. It’s a city full of stories, full of connections and full of secrets. In not asking us to solve a puzzle, Circumstance gives us the space to explore those connections that are personal to us.” The application achieves this by providing a frame that “slows things down”.<sup>39</sup>

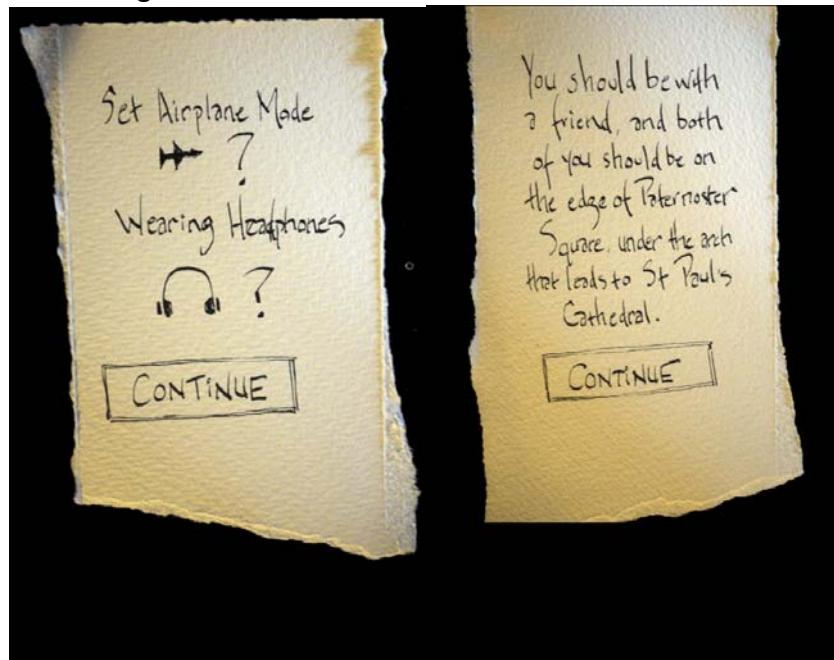


Figure 56. Hints are given inside the app

Divided into three chapters (See, Listen, Touch), *A Hollow Body* also allows users to get lost, such that the ‘chapter index’ button can be used to start or re-start any of the chapters. Each chapter begins with a map telling the user where they need to be. It is recommended that users connect to a WiFi network to download the app before traveling to the starting location. Each user needs to have their own device and headphones.

<sup>38</sup><https://artdaily.cc/news/74497/Think-you-know-the-streets-of-London--The-Museum-of-London-s-new-app-might-just-make-you-think-again---#.YFhyPmRKg-Q>

<sup>39</sup><http://exeuntmagazine.com/reviews/a-hollow-body/>

In the *A Hollow Body* experience, narrative methods and storytelling are employed as curatorial methods. Specifically, users are invited to imagine themselves as part of a fictional narrative, and invited to interact, and personalize it, by choosing where to guide the narrative. Narration is the main building block of the application, and its underlying idea is that through alternative narrations, alternative understandings and experiences of the city can be achieved.

### I. Relevant aspects

Support: the app is available for iOS & Android devices.

Expected user: pairs of adults, able-bodied (requires walking through London for 45 minutes), not recommended for unsupervised children (requires crossing roads).

Requirements: reliable internet connection and storage for downloading the app (iPhone/iPad/iPod running iOS6 or greater or Android running 3.0 or greater), a smartphone and headphones for each user. Data connection is not necessary during the experience.

Is it hosted by the museum? Not clear (but commissioned by Museum of London).

Is it open source? No, but it is free.

### 2.3.2 Artsteps

Artsteps is a web-based environment that allows its members to create virtual art galleries in lifelike 3D spaces. It is a virtual gallery that operates online exhibiting hundreds of exhibitions permanently and simultaneously and is curated externally by individuals using the site.

Released by Dataverse Ltd, a software development company, it is an application meant for artists, art organizations and art enthusiasts to model actual or virtual exhibitions by designing realistic 3-dimensional room complexes. Virtual exhibitions may include 2-dimensional artifacts (e.g. paintings, photos and posters), 3-dimensional artifacts (e.g. sculptures or small installations) and streaming videos.

Through a simple, interactive tool that allows easy modeling of virtual exhibitions, Artsteps makes artwork available to anyone, there is no selection process and no monitoring. It can be accessed over the internet, using a common browser, without any additional software requirements. So virtual exhibitions can be explored on the Artsteps website or can be embedded on any web page, site or blog. They can also be rated, discussed and shared through a multitude of options, including posting on popular social sites.

An example of the use of this gallery space is as a platform for art enthusiasts to curate an exhibition of work that would be close to impossible to collate in the physical world.

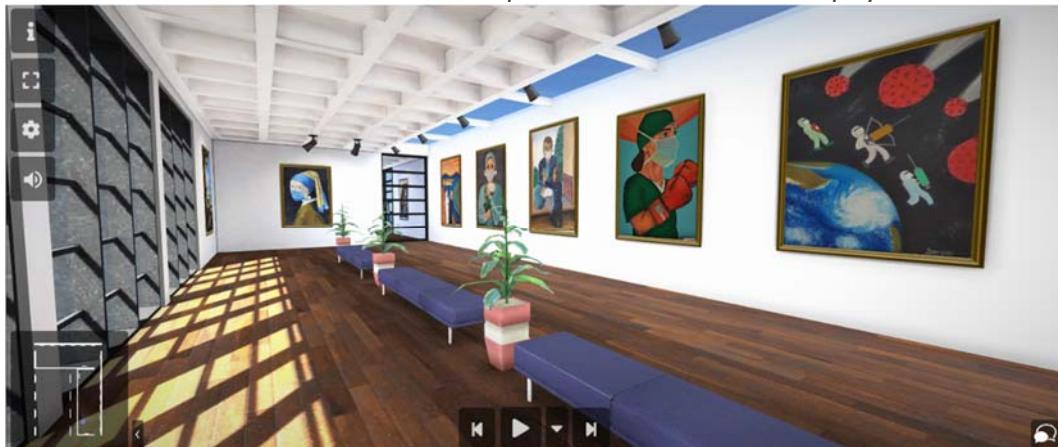


Figure 57. A gallery designed in Artsteps

In order to arrange an exhibition of work at Artsteps, the user starts from scratch. Firstly, the user starts by defining the virtual environment, the space in which the pieces of work are going to be present: Placing the walls and doors on a grid, defining and becoming the architect of your environment, filling the space with color and textures, even with some that the user has previously created by his own.

Then the user can fill the space with the Digital Content: occupying the walls of the virtual space with images or videos (from the PC of the user or the internet) - adding titles, description or copyrights, and making them interactive - including 3D assets from a collection provided by Google's Poly API or importing the user's own 3D objects or adding music or speakage to any type of content and make your virtual space even more interactive.

There is even the possibility of placing Guide points across the VR space, giving them a title and a description and even place in them multimedia contents.

The final objective of the tool is that every user can finally choose the flow between the guide points and the uploaded content in order to stage his/her own narrative, and being able to share this story with other users who visit the online gallery. In order to do so, the users can share their VR spaces on social media or embed them on their websites, allowing them to

communicate with others and follow their latest creations in order to discover new experiences and sharing ideas.

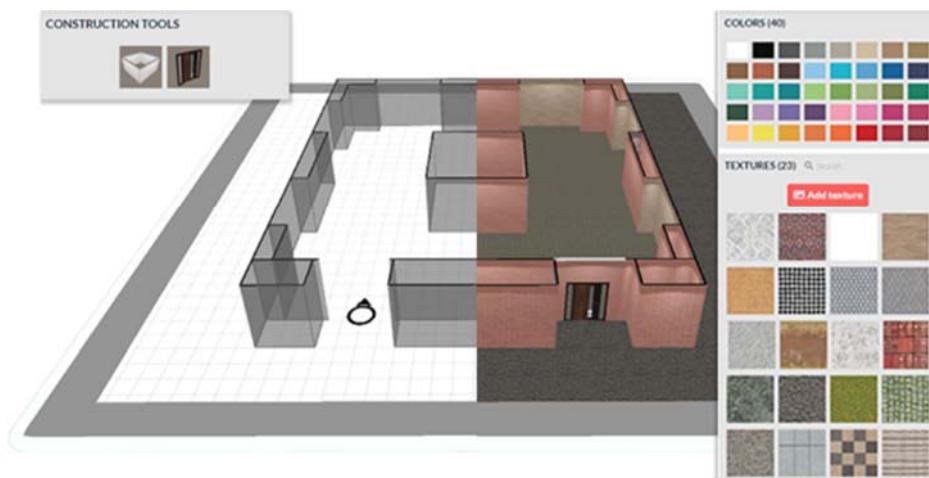


Figure 58. Room design in Artsteps

In this sense, Artsteps aims at providing new ways of collecting and sharing cultural artifacts, doing so in new digital environments. Due to its characteristics, which try to imitate how an exposition in real life and physical premises would work, the system does not seem a perfect example for the analysis of cultural artifacts. Since the opinions, interpretations and beliefs from a user which observes is not expressed and in principle, it serves more as a way of collecting and gathering digital cultural assets.

However, taking into account that it offers the capability to multiple users to carry out their own exhibitions and with the combination of other platforms, it could serve as inspiration for new storytelling and narrative methods that allow users to share their own vision on culture.

#### I. Relevant aspects

Support: web and app available for iOS & Android devices.

Expected user: artists, art organizations and art enthusiasts.

Requirements: no special requirements.

Is it hosted by the museum? No

Is it open source? No

### 2.3.3 Dramatour<sup>40</sup> (CIRMA, University of Turin)

Developed and tested in 2008, Dramatour is a character-based virtual guide for mobile devices. The methodology below Dramatour features two basic tenets: the information delivered by the virtual guide is written in the dramatized form to attain the emotional engagement of the user; the presentation is segmented in units that are assembled in real-time given the visitor's position along the visit path in audio-visual form. An open-to-the-public installation has been applied to the Savoy apartments of Palazzo Chiabrese, in Torino.



Figure 59. Dramatour device and screen.

In Dramatour, the visitor is free to walk around in the location, since the delivery of the contents adaptively follows the visitor's itinerary by relying on the WiFi signal and selects the relevant information units from the historical and artistic perspectives. Based on the metaphor of the guided visit, the animated character, called Carletto (an anthropomorphic spider from an aristocratic family who stores his knowledge of the premises in his web), engages in a social relationship with the visitor, following a social protocol that involves initial greeting and self-introduction, the proper guided tour and a final farewell; along with the visit, the character spills some anecdotic information about himself, intending to create a personal relationship with the visitor. The interface represents the screen of a webcam (according to the metaphor, Carletto observes the visitor while hidden in the ceiling to escape the janitors), so controls (apart from start and end buttons) are absent, except the controls of the device.

The user study revealed that the users liked to interact with Carletto, and appreciated the personalized delivery of the contents; however, the app lacked a social dimension, which is relevant for group visits, as noticed during the ethnographic observations conducted onsite<sup>41</sup>. Dramatour is specially relevant to SPICE due to the narrative component represented through the use of an animated character for engagement.

#### I. Relevant aspects

Support: legacy PDA OS

Expected user: targeted at all ages and profiles

Requirements: PDA (not marketed anymore)

Is it hosted by the museum? Yes

Is it open source? No

<sup>40</sup> [http://www.cirma.unito.it/portfolio\\_page/dramatour/](http://www.cirma.unito.it/portfolio_page/dramatour/)

<sup>41</sup> Damiano, R., Gena, C., Lombardo, V., Nunnari, F., & Pizzo, A. (2008). A stroll with Carletto: adaptation in drama-based tours with virtual characters. *User Modeling and User-Adapted Interaction*, 18(5), 417-453.

### 2.3.4 Emotive Multiuser VR gaming experience<sup>42</sup>

Multi-user experience providing a space for exploration, interaction, and learning within virtually reconstructed portions of the Neolithic site of Çatalhöyük. This explores virtual IBR (Image-based renderings) renderings of replica houses and the excavation area currently on-site at Çatalhöyük today. The experience aims to emotionally engage users through hands-on activities in the virtual space and a task-driven narrative. It fosters reflection on the lifeways of those who once lived at Çatalhöyük, then invites users to connect these concepts to their own lives, and more broadly to the lives of people today. The overall experience is designed for a non-specialist audience, targeting ages 18 to 35, and takes place entirely in the virtual space, with users using HTC Vive headsets. The aim of ÇVR (Çatalhöyük Virtual Reality) is to encourage users to:

- Interact with another player and with the virtual environment, Enact affect via emotional thought, an ethic of care, and historical consciousness,
- Learn about Çatalhöyük as an archaeological site. The experience prompts users to interact with one another and with the virtual environment through scripted tasks.

In the ÇVR experience, both artifact analysis and storytelling are employed as curatorial methods. Specifically, players are asked a series of questions around ideas and concepts related to the artifacts they are presented with. As such, artifact analysis is employed when the guiding voice asks the players to engage with and explore specific artifacts (e.g., burial bones) with the goal of facilitating reflection around specific concepts (e.g., death, mourning). This experience also employs storytelling as a curatorial method because it is based on the idea that the two players should discuss and share their experiences by using narrative methods. The players are invited and encouraged to come up with and share with each other to explain their subjective perceptions and connections to the artifacts.

#### I. Relevant aspects

Support: not maintained now / Hardware: a special hardware device is used

Expected user: 18-25 years old

Requirements: Samsung VR Headset

Is it hosted by the museum? No

Is it open source? No

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<sup>42</sup>[https://emotiveproject.eu/wp-content/uploads/2019/12/EMOTIVE\\_D9.4\\_Summative\\_Evaluation\\_Final\\_Release\\_Platform\\_and\\_Experiences-v1.0.pdf](https://emotiveproject.eu/wp-content/uploads/2019/12/EMOTIVE_D9.4_Summative_Evaluation_Final_Release_Platform_and_Experiences-v1.0.pdf)

### 2.3.5 Emotive Provocative ChatBot<sup>43 44</sup>

A Chatbot application developed to enable visitors to change conceptions, to be critically reflective. The app is a provocative bot, a “bot of conviction”, aimed at triggering conversations on complex topics (e.g., death, wealth distribution, gender equality, privacy) and, ultimately, soliciting specific actions from the user it converses with. A guide has been made available online.

Emotive Provocative ChatBot, in the bot of conviction experience, employs the storytelling and narrative methods curatorial method, as users are invited to develop and polish their own personal narratives and to reflect around concepts through establishing a dialogue with a chatbot.

#### I. Relevant aspects

Support: Not currently maintained or accessible

Expected user: Kids and young adults

Requirements:

Is it hosted by the museum? No

Is it open source? No

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<sup>43</sup> Roussou, Maria, et al. "Transformation through Provocation?." Proceedings of the 2019 CHI Conference on Human Factors in Computing Systems. 2019

<sup>44</sup> [http://athena.emotiveproject.eu/chatbot/EMOTIVE\\_UpdatedHow-to-Guide.pdf](http://athena.emotiveproject.eu/chatbot/EMOTIVE_UpdatedHow-to-Guide.pdf)

### 2.3.6 G-CMS

The G-CMS is a CMS for geolocated content also created for CrossCult. It was initially created to serve as an authoring tool for a Pilot driven in Crosscult (Urban discovery mobile app with discovery and sharing gamification elements) but the data it manages can easily be reused thanks to a REST API.

The CMS is a single-page app featuring a map and an authoring panel. Access to the app is protected by the CrossCult SSO so one needs a CrossCult account to be able to use it.

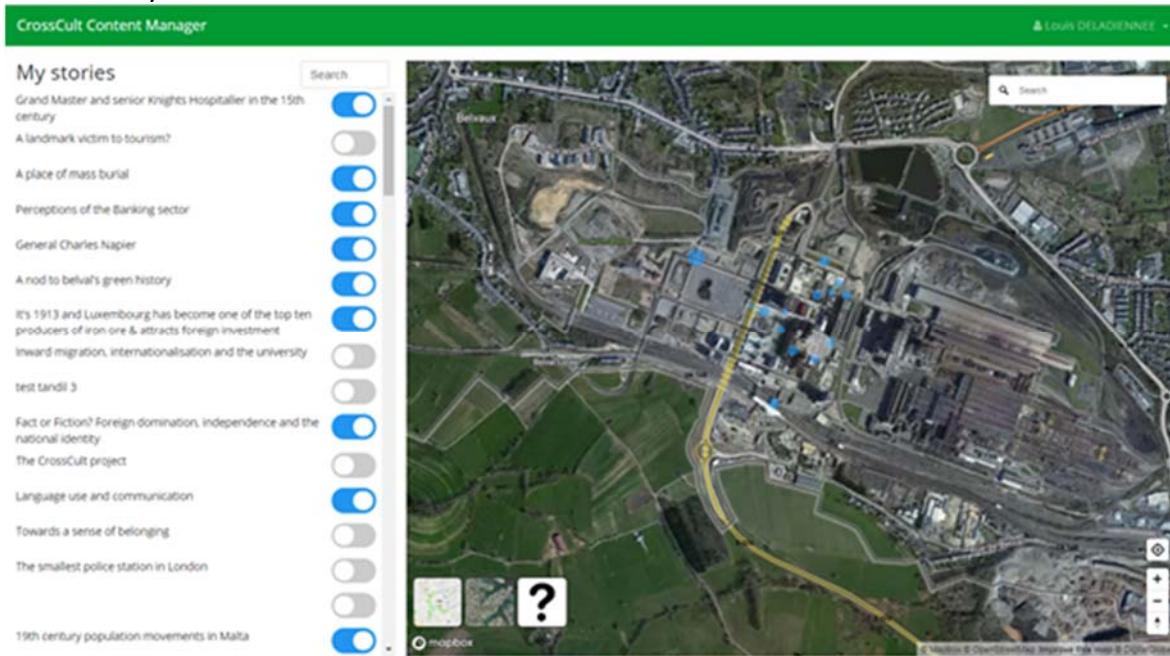


Figure 60. The GCMS main interface features a map and a stories panel.

Thanks to the map, it's easy to find places where to attach stories. A search box is also there to help find places by their address. Finally, the style of the map can be changed to facilitate geospatial recognition for the author.

Creating a new Point of interest is as simple as double-clicking on a location on the map. By clicking add, the user is redirected to the authoring view where the actual content of the POI can be edited. The first thing to do is to fill in the clue details. The clue is expected to be a navigational aid for the users that help them identify the place/building to which the story is attached. The radius of activation of the POI can also be parameterized.

The POI authoring view allows to configure the POI itself and to attach a story to it.

Then, the next step is to enter the story details. Once everything is filled, the story can be saved and the point is added to the list of stories but is deactivated (i.e. is not accessible from the app yet). To make it visible in the app, the author has to activate the story by switching the toggle.

The figure consists of two side-by-side screenshots of a web-based application interface for creating stories.   
Left Screenshot (Story Screen):  
- Title: Story  
- Subtitle: Attach a story to this POI.  
- Field: Story Title (empty)  
- Field: Story media (with a placeholder 'Drop a file here')  
- Field: Media copyright (empty)  
- Buttons: Back, Next (the 'Next' button is highlighted in blue)  
Right Screenshot (Story Screen):  
- Title: Story  
- Subtitle: Attach a story to this POI.  
- Field: Story Tags (empty)  
- Field: Tag search (empty) with an 'Add' button  
- Field: Story Content (placeholder 'What does this location triggers?')  
- Field: Question (placeholder 'Want to ask something to the user?')  
- Buttons: Back

Figure 61. The story creation screens.

Similar to the story editor this system eases the inclusion of content or stories to certain assets or places with high cultural interest, in this case making use of a map interface and helped by geolocation. In this sense, the system can be observed as an example of how to allow users (in this case professionals but the perspective could be easily changed) to elaborate new narratives and stories over existing cultural assets that could be used as a reference to design new storytelling and narrative methods in this project.

## I. Relevant aspects

Support: Windows/Mac for the host.

Expected user: not specified.

Requirements: Access to the app is protected by the CrossCult SSO so a CrossCult account is needed to be able to use it.

Is it hosted by the museum? No

Is it open source? No

### 2.3.7 meSch<sup>45</sup> – Material Encounters with Digital Cultural Heritage

The Material Encounters with Digital Cultural Heritage (meSch) project has the goal of designing, developing and deploying tools for the creation of tangible interactive interfaces that connect the physical experience of heritage with relevant digital cross-media information in novel ways. meSch enables heritage professionals to create physical artifacts enriched by digital content without the need for specialized technical knowledge. The approach adopted is grounded on principles of co-design, the broad participation of designers, developers and stakeholders into the process, and on a Do-It-Yourself philosophy to making and experimentation. The ambition of the project is to enable the creation of an open community of cultural heritage institutions driving and sharing a new generation of physical/digital museum interactives.

The meSch project envisages a cultural space filled with smart objects, each with their own (adaptive) stories embedded therein, that become revealed if and when conditions are right, e.g. When visitors have reached the right time in the storyline, or when a group of them is acting in a certain way, or when another smart object is close by.



Figure 48. Scheme of the meSch system.

meSch works closely with the Internet of Things technologies (IoT), so that a visitor can access multimedia content by interacting naturally with the environment or just by manipulating physical objects, like items of the collections or their replicas. Even without technical expertise, curators can create personalized stories (i.e. personalized by language, age, knowledge of the topic, the theme of interests), that make visits the exhibitions interesting and engaging as they express the visitors' interests. User experiences are logged in an anonymous form. The cultural heritage professional can obtain information on how the exhibition has been used and how much has been appreciated; this information can be then used to tune and improve the effectiveness of the created exhibition<sup>46</sup>.

meSch is composed of an online Cloud platform, reachable at the address [www.mesch.io](http://www.mesch.io), and a set of devices to be installed in the exhibition space. Devices and the online platform

<sup>45</sup> <https://www.mesch-project.eu/>

<sup>46</sup> Petrelli, D., Not, E., Damala, A., van Dijk, D., & Lechner, M. (2014, November). meSch–Material Encounters with Digital Cultural Heritage. In Euro-Mediterranean Conference (pp. 536-545). Springer, Cham.

communicate through standard protocols of the Internet of Things technologies (MQTT, HTTP): this enables also third parties to integrate custom-developed devices. The following devices are currently available:

- meSch ioBox, a multisensor kit that integrates up to 5 NFC readers, 5 buttons, and a proximity sensor.
- meSch ioHub, which coordinates the devices and interact with the online platform. Any Windows 10 PC or mini PC can be used. The suggested option is INTEL NUC, which already powers several exhibitions.



Figure 49. meSch as an IOT

Devices can be freely combined in numbers to support the desired interaction. Furthermore, meSch offers an authoring tool, accessible through the [www.mesch.io](http://www.mesch.io) cloud platform, which allows one to create and autonomously manage interactive experiences.

The cloud-based online service is based on the metaphor of “recipes” that can be used by curators to connect technological devices with the content of their choice. The idea is that like a food recipe made of diverse ingredients, interactive experiences can be created from ingredients such as the technological devices, the content, and the users. By having access to guidelines to connect these ingredients, curators and heritage professionals can use and create new experiences that are editable and flexible to specific use cases.

The meSch project also deems evaluation of the impact of the meSch approach as a task of critical importance. The project, therefore, had a dedicated [Evaluation Work-Package \(WP7\)](#) that explores the short and long-term impact, potential and viability of meSch and its products for all implicated stakeholders: museums, Cultural Heritage professionals, museum visitors, designers, tech developers and engineers. The project invites researchers, museum visitors or museum staff with an interest in meSch evaluation activities to contact them to participate in evaluation processes.

One example of the way the meSch kit was used was the co-creation, in collaboration with curators, of an interactive multi-narrative soundscape for the remains of trenches and a fortified camp from World War I. The soundscape is activated by the presence and the use of a bespoke device. The design intertwines technology and historical content in context to augment the visitors’ experience of the place in an evocative, personal way. In it, the experience with tangible interaction was changed by the form of the object (eg., a book or a belt) the user interacted with, as there were embedded stories in place, played as an automatic response to the visitor’s movement. Four different stories were available and visitors could listen to many stories in the same place by changing the position of a bookmark on the book or by placing another card in the belt. The field trial showed that experimenting with different forms is crucial for visitor experience, as they have an impact on visitors’

expectations beyond what they experience directly. It also showed the value in simultaneously designing interaction and content to achieve an effect that goes beyond the contribution of the single components.

The meSch project provides a general framework with which to develop diverse experiences that may employ any or all of the presented curatorial methods. The framework's varied "recipes" for interactive experiences allow for multiple curatorial methods to be used in the design, depending upon curatorial and institutional desires. The storytelling and narrative methods activities are especially adaptable for any number of designs. For example, in the mentioned applications about World War I, the interactive experiences not only use some artifact analysis methods by asking users to interact in different ways with the same artifacts, but they also have a strong sense of narrative as a driving force for interpretation and reflection (even though the users were not asked to share their personal narratives).

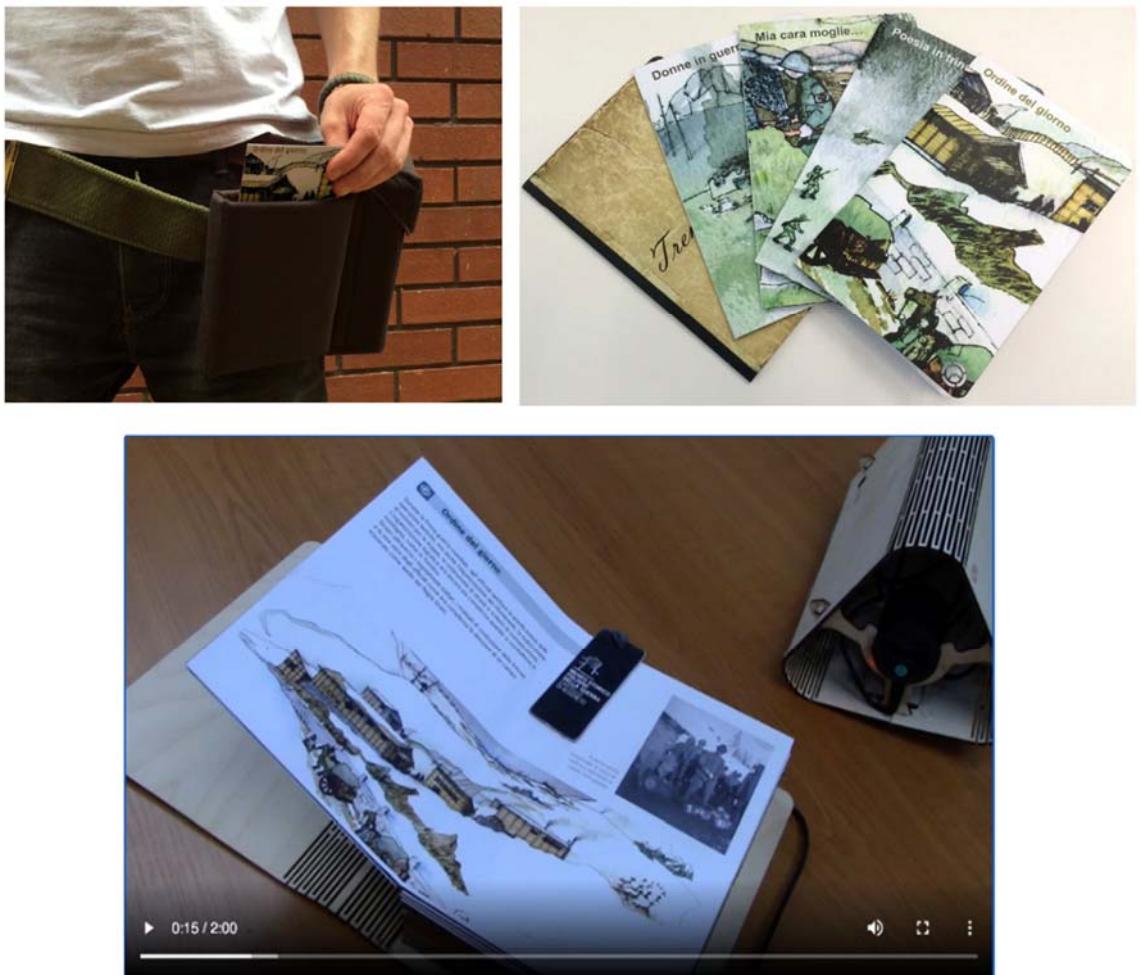


Figure 50. Examples of using meSch.

## I. Relevant aspects

Support: Windows 10. Unclear about Mac support.

Expected user: Two main types of users. On one hand, heritage professionals without specialized technical knowledge that want to design experiences for citizens with tangible interactive interface. On the other, a wide range of diverse end users/citizens, depending on the experience design. Example (WWI) was geared towards adults with no hearing problems.

Requirements: Any Windows 10 PC or mini PC can be used for the authoring platform as well as the IoT kit.

Is it hosted by the museum? No.

Is it open source? No. Some “recipes” for some of the provided technologies are free, others required login to the meSch network. (It seems that for full functionality it is necessary to contact Suggesto services<sup>47</sup>)

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<sup>47</sup> <https://www.suggesto.eu/en/progetto-mesch>

### 2.3.8 Muzing<sup>48</sup>

Muzing is a mobile app, launched in 2019, the aim is to connect each other museum lovers, it works like a dating app. The users add their preferences, the Geolocalization, indicate which museum or event would like to attend and find someone to go with. The app is also developed for institutions that could add content to engage visitors or news, gain insights into audience motivations and tastes.

The registered user can:

- discover new exhibitions, events
- insert event
- share the interesting exhibition
- find art lovers interested in the same shows

The institution user can:

- Insert the Institution profile
- Insert new event, exhibition
- Monitor the user interested in



Figure 62. Muzing as a dating app



Figure 63. Muzig museum dashboard

It is relevant for Spice because it is an example of a social network for art and museum lovers, the app has an interesting dashboard for institution helpful for discovering the audience. We consider it in the narrative group because through its social component the app supports the sharing of narrative between visitors with common interests.

<sup>48</sup> <https://www.muzing.org/>

## I. Relevant aspects

Support: App

Expected user: teenagers, young

Requirements: no

Is it hosted by the museum? No

Is it open source? No

### 2.3.9 Never Let Me Go<sup>49</sup>

With Never Let Me Go, two visitors guide each other's encounters with art. Through questions and prompts, the web app playfully fosters deep introspection. Never let me go in its current state is a prototype that has only really been tested on a few android phones. This means that there is no guarantee that it works on all phones. It's a two-player experience. To play it a partner is needed. Both partners' phones need to be connected to the Internet, and both of them need headphones. Never let me go is designed to be used in art museums or galleries with someone you know well.

Two rules are going to be played, the Avatar and the Controller. First, players need to decide which role they want to try. The controller will make a host using the web app, after that the web app will provide the controller with a unique 10 digit identification number that should be passed to the avatar to join the game. From this point, the avatar will be able to begin or end the game at wish. All the commands and more instructions will be played on the headphones for both players. This is a different kind of audio guide: One that is social, yet introspective. Visitors experience the art space in a new way and connect to artworks in a deeply personal and playful manner. There are sets of pre-defined commands or guides that help the players connect and feel each other emotions about an artwork or any other object at a museum or gallery. The app allows two visitors to guide each other's behaviors and reflections, thereby letting them co-create their experience of art.

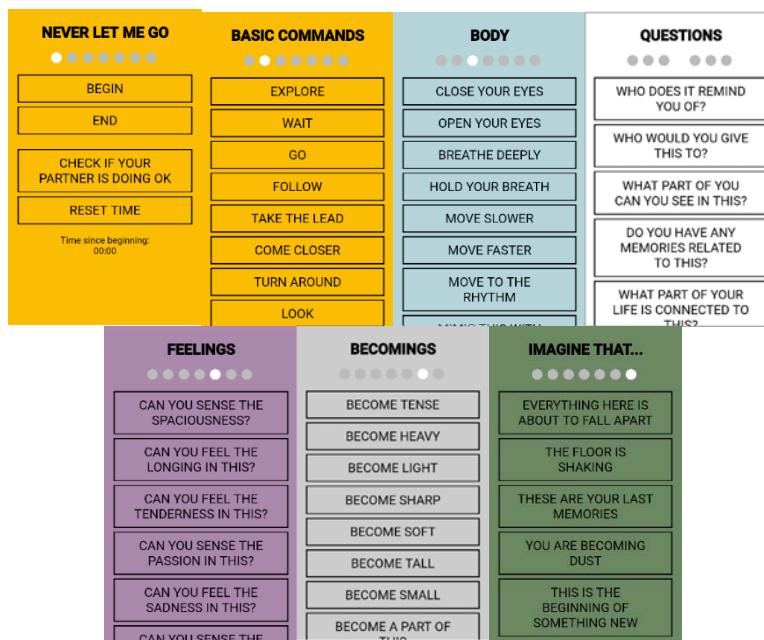


Figure 64. Set of Commands available in Never let me go

This application requires two people to use it in a gallery or museum. One will play the role of leader or controller and the other will be the follower. Using a set of control commands and communications the controller can narrate a story for the follower by guiding him/her through objects, share their feelings with them so they can see the artwork from their perspective and other functions. Helping another person with a storytelling narrative and make them interact with objects knowing the controller's interpretation of that object will put this application inside the Storytelling and narrative methods group.

<sup>49</sup> <https://gifting.digital/never-let-me-go/>

## I. Relevant aspects

Support: Web-based app

Expected user: Exactly 2 players, no age limit specified.

Requirements: Internet connection and two Headphones

Is it hosted by the museum? No.

Is it open source? Yes.

### 2.3.10 Story editor (National Gallery of London)

The story editor is another CrossCult tool developed as a CMS for curating stories related to work of art. It allows curators and experts to create thematic narratives that can be used in the CrossCult apps. The currently deployed version is connected to a Pilot backend and allows to create stories about the National Gallery of London Paintings or Artists. The story editor is a single-page app. Access to the app is protected by the CrossCult SSO so one needs a CrossCult account to be able to use it.

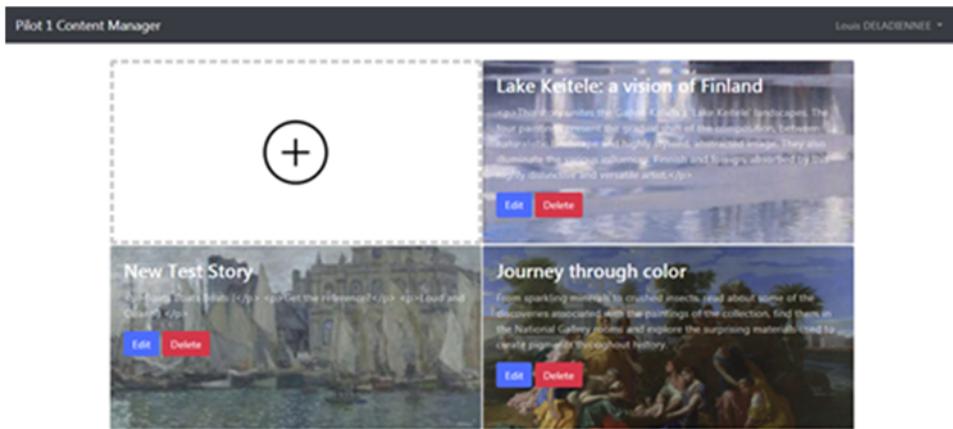


Figure 65. The story editor landing page, listing existing stories as tiles.

Adding a story is quite straightforward. All it takes is to click on the “+” tile. The user is then redirected to the story editor. The left panel of the screen presents the “story board”, i.e. the sequence of individual story elements. The root of the story board will be used as a “cover” for the story, i.e. a preview that can be used by apps to present the story and its content. The right panel allows to input data about the story and to link it to a media file from the collection.

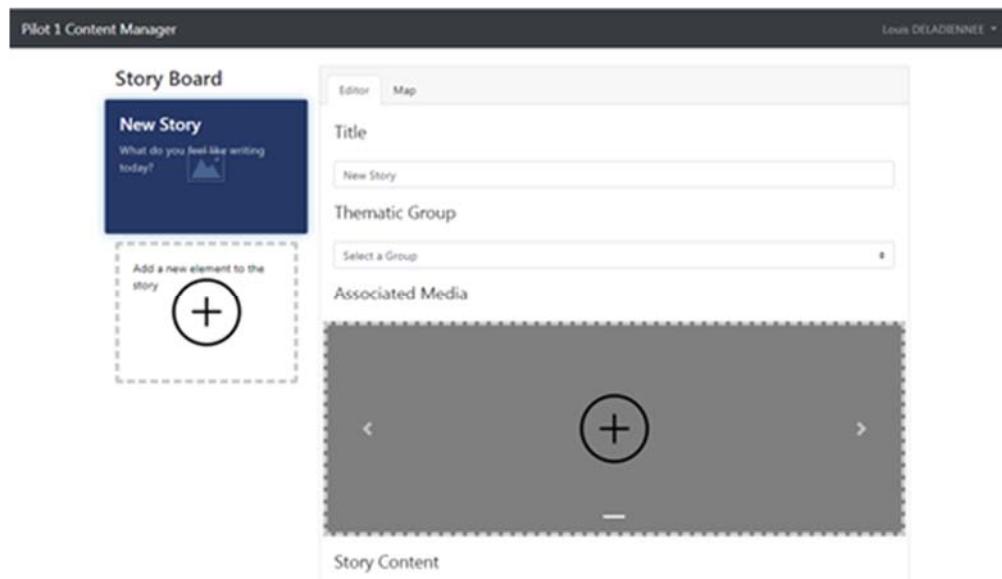


Figure 66. Story editor authoring view.

Since this tool allows for curating and creating stories related to work of art it could serve as an example of how to include storytelling and narrative methods into new interfaces. Although it was indeed designed to help curators and experts to create thematic narratives, its interface is pretty straightforward and could serve as an example for new interfaces for

users that are not experts as a way to creating stories from existing pieces of art recognizable by most of the people.

### I. Relevant aspects

Support: Windows/Mac for the host.

Expected user: not specified.

Requirements: Access to the app is protected by the CrossCult SSO so a CrossCult account is needed to be able to use it.

Is it hosted by the museum? Yes.

Is it open source? Yes.

### 2.3.11 Your Story, Our Story<sup>50</sup>

Your Story, Our Story is a national initiative of the Tenement Museum in New York City and its partners across the United States. It works with museums, colleges, schools, libraries, and community groups whom all contribute stories from their part of the United States.

Participation in Your Story, Our Story is designed to be open to all people in the United States. People are invited to share their story of an object or tradition that carries special meaning related to their personal experience. Stories shared on this site should relate in some way to cultural identity, migration, or immigration. Your Story, Our Story invites people to express their culture and identity through the objects and traditions in their everyday lives and to help others explore the evolution of American identity.

Objects can be added using the “Add Your Story” tab by anyone in the USA. The requirements will be having some good quality pictures of the object along with its detail and a story. These stories will be shared on the website and others would be able to read about them. For finding the stories, the “Explore” tab is provided for the users. Through this tab, users can navigate around various stories, categorized in Food, Religion, Fun, etc. The search can be made by tags or object type too or even based on a map and localizations. If the user finds a story interesting it will be possible to share it using third-party social media or make a print for a hardcopy.

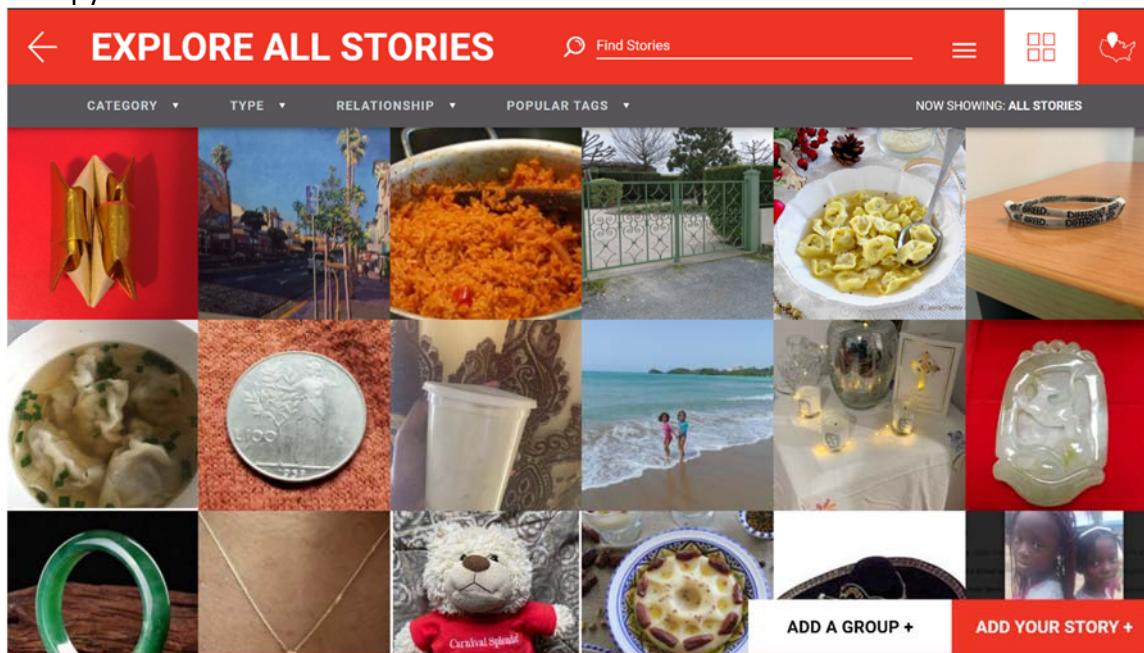


Figure 67. A set of Stories in Your Story, Our Story website

This website is designed and works in the USA for immigrants and people with diverse backgrounds and cultures. They don't need to be an immigrant themselves or be directly related to these cultures, they can simply share the stories of their parents or relatives. What makes this website to fit the storytelling category is the usage of it, any user can add a picture, voice, or other material along with their story about it. All these stories can be shared and found by other users. This website makes it possible to make a collection of these stories but what is more important is observing other cultures and how their background impacted their life and their view of a tool or any other object. Sharing cultural heritage with and by the

<sup>50</sup> <https://yourstory.tenement.org/>

diverse immigrant community in the USA makes this website belong to the Storytelling and narrative methods group.

### I. Relevant aspects

Support: Website

Expected user: Mostly immigrants in the USA.

Requirements: Internet access.

Is it hosted by the museum? No.

Is it open source? No.

## 2.4 Common aspects of existing tools

To be able to have a better comparison of the reviewed systems, more information about the system in each group was collected. For a few of the applications, there was not enough data available to fill the cells and they are excluded from the tables. Table 1, shows the information about the systems in the Artifact analysis group. They are mostly driven by research, single user with a need for a special device.

Name	Group	Type of Technology	License Type	Scope	Target Users	Multiuser	Requirements
An AR Museum Guide	Artifact analysis	Special handheld devices, AR	unspecified	Research Project	unspecified	Single	Special handheld device
ArsMeteo		website	unspecified	education, research	Artist, art lovers	no	Internet connection
Automatic Museum Audio Guide		computer vision device (EoT)	unspecified	Research Project	unspecified	Single	Special headphones
CC Microblogging Service		Web-based app	unspecified	social network	adult visitors	Multiuser	a CrossCult account is needed
Emotion Mapper		Android / IOS	open source	Research Project	unspecified	single	Smart device, internet connection
Gesture-Based Interactive Audio Guide on Tactile Reliefs		Special designed devices	unspecified	Research Project	blind and visually impaired (BVI)	Single	Special designed devices
LISTEN		Augmented reality (AR)	unspecified	Research Project	unspecified	Single	Special designed headset
NGAkids		IOS Windows and MAC	unspecified	unspecified	optimized for ages 9 to 11	unspecified	an iPad for users
One Minute		Android / IOS	open source	Research Project	unspecified	single	Smart device, internet connection
VRtefacts		Virtual Reality	unspecified	Research Project	unspecified	single	3D scanner, 3D printer, VR devices.

Table 1. Features of the Artifact analysis group

The technologies used in this group have the highest variation probably because mostly they are with research in mind and trying to observe the effect of using various devices on the users. Figure 68 . shows that these systems might use: web apps, Special devices, smart devices, augmented reality, virtual reality, or a personal computer as their base system.

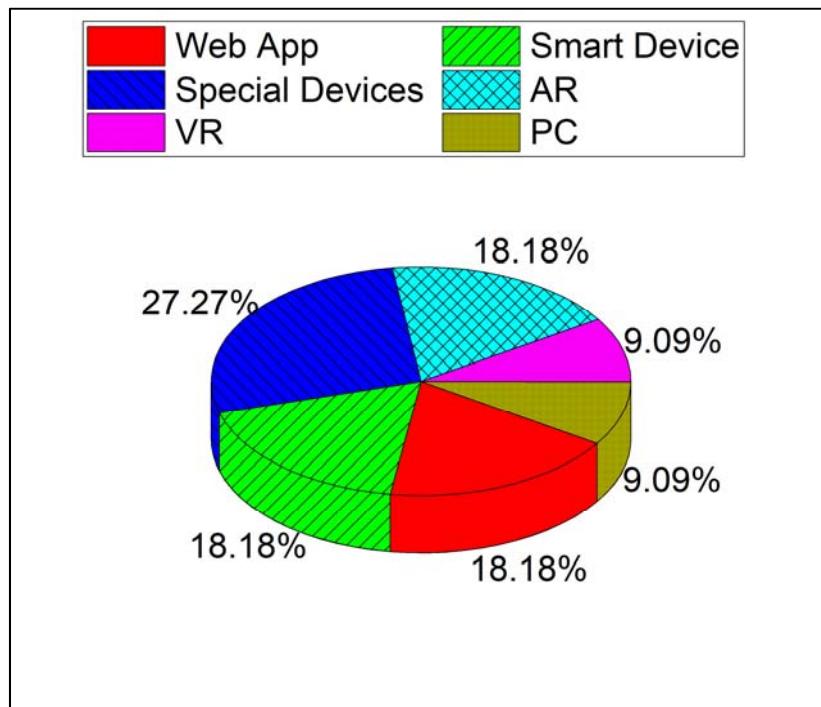


Figure 68. Technology contribution in the Artifact analysis group

The need of using these technologies becomes a requirement for these systems and since these are mostly can be used with one person at a time these systems do not have multiuser designs. As can be seen in Figure 68, eight out of the systems can be used by a single user at most at a given time.

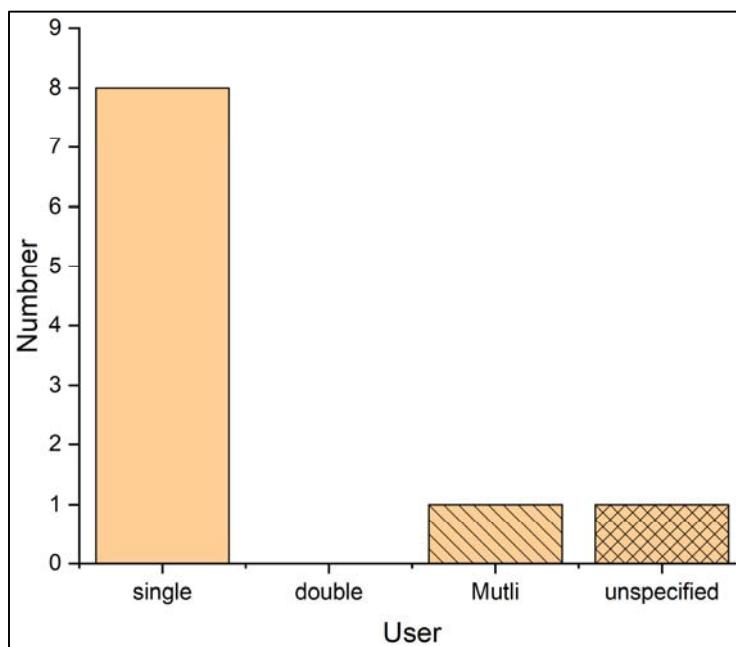


Figure 69. Maximum number of users capable of using a system in the Artifact analysis group at a time

As can be seen in the “scope” column, most of these systems were built having research purposes in mind by the developers. This might be the reason that the systems in this group have a high rate of Specifically designed devices for the users to be able to work with them. Figure 70. shows that 45.45% of the systems in this group need a Special device to run properly.

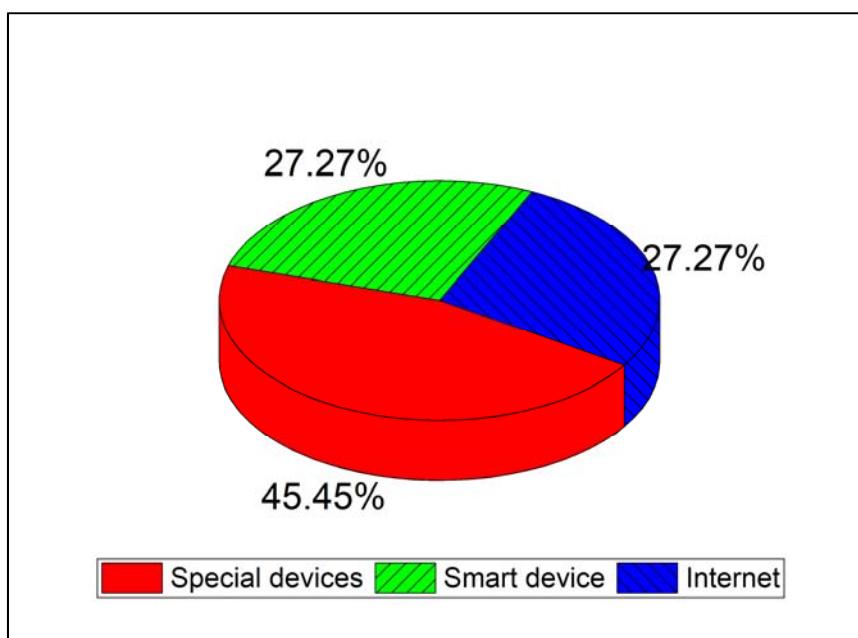


Figure 70. requirements for using systems of the Artifact analysis group

The next group that is studied is the collecting. The information gathered from the systems in this group can be seen in Table 2. The purpose of most of the applications here is to be able to create a personal collection and share it with other people. To be able to do such a thing one of the most important requirements will be the connection and capability of using that connection. This can clearly be seen in the “requirements” column as all of the systems in this group need an internet connection and some sort of smart device for functioning.

Moreover, not to be limited by the devices the developers prefer to use web-based applications in this group so users can connect to the systems using various operating systems and devices. This is also simply notable in the “type of technology” column of Table 2. Since these applications will connect people it is more probable that they might be used in real life like gaming, social media, and cultural centre and not just for research studies that might be the reason why there are more applications to buy or with in-app purchases in this group.

Logically, where there are connections and sharing, having a limited number of users is not desirable. As opposed to the Artifact analysis group, here most of the systems can be used by multiple users at the same time except for the treasure hunt games. Figure 71. shows these numbers on a column bar plot. Having this multiuser feature some of these applications preferred to put age limits so they can control their content based on age, some of them are for kids and some for adults. This variety in targeted user age was not observed in the other groups.

Name	Group	Type of Technology	License Type	Scope	Target Users	Multiuser	Requirements
Animal Crossing Art Generator	collecting	Game consoles	To buy	Game	unspecified	Multiuser	Game consoles, Internet connection
Artland		Web-based app	free, with in-app purchase	Business	unspecified	Single	Smart device, internet connection
Arsonia Kids Art Museum		Android / IOS	free, with in-app purchase	Game, Education	Pre-K-12	Multiplayer / Single user	Smart device, internet connection
Enigma MNCN		Android / IOS	unspecified	Game, Education	8 to 12	Single	Smart device, internet connection
GIFT		Web-based app	open source	Research Project	Adults and teenagers	Double	Smart device, internet connection
Google Art & Culture		Web-based app	Free	Cultural	unspecified	Multiuser	Smart device, internet connection
Labyrinth		Web-based app	Free	Research Project	unspecified	Multiuser	Computer system plus internet connection
Minecraft		Game consoles	To buy	Game	unspecified	Multiuser	Game consoles, Internet connection
Mozilla hub		Web-based app	Free	Business/ Education	unspecified	Multiuser	Smart device, internet connection
Occupy White Walls		Cloud gamin, steam	free, with in-app purchase	Game	(+)18	Multiuser	Computer system plus internet connection
Smithsonian Learning Lab		Web-based app	Free	unspecified	unspecified	Multiuser	Smart device, internet connection
Treasure hunt Game Generator		Android / IOS	To be Purchased	Game	Children	Single	Smart device

Table 2. Features of the collecting group

The other group related to SPICE is “Storytelling and narrative methods”. Table 3 shows the feature of the applications in this group. Similar to the collecting group, most of the applications here are based on connecting a group (or at least two) people to share their stories and points of view. Even if this mostly can be seen in the type of technology that has been used on this application, the features are not a uniform as the collecting group. Also, the scope of the applications is more diverse, there are researched-based applications as well as cultural and educational.

In the end, the features that are mostly can be seen all over these groups are the need for the internet connection to work with the web-based application, and the tool for doing that can be any type of smart device from mobile phones to smart devices.

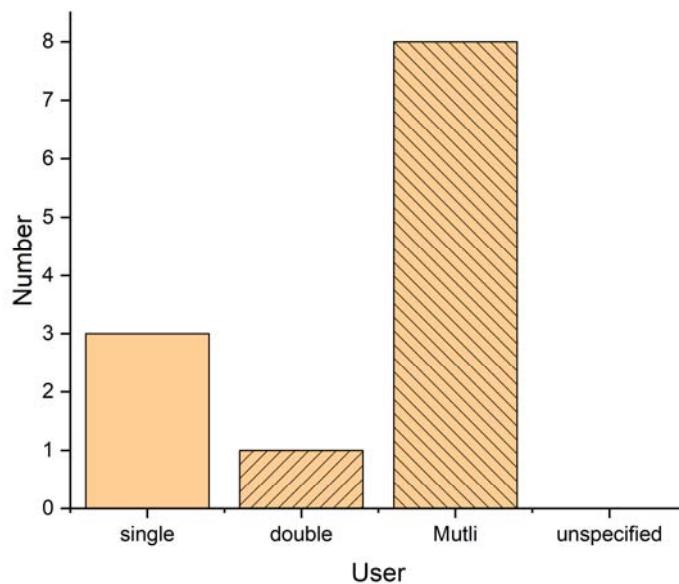


Figure 71. Maximum number of users capable of using a system in the Collecting group at a time.

Name	Group	Type of Technology	License Type	Scope	Target Users	Multiuser	Requirements
A Hollow Body	Story-telling	A mobile app, Android/IOS	Free	Cultural, entertainment	(+14)	Double	Smart device, internet connection
Artsteps		Web-based Android/IOS	unspecified	unspecified	artists, art organizations	Unspecified	unspecified
EMOTIVE Bot of Conviction		Web	unspecified	education, social	kids and young adults	Single	Internet connection
EMOTIVE Multiuser VR experience		Immersive VR	unspecified	education	18-25 years old	Double	VR setup
MESCH tangible - online framework		Windows app, IOT	unspecified	Research Project	heritage professionals	Single	Windows 10
Never let me go		Web based app	open source	Research Project	unspecified	Double	Smart device, internet connection
Your story, Our story		Web	unspecified	Cultural	Immigrants	Multiuser	Internet connection

Table 3. Features of the Storytelling group

## 2.4.1 Relevant aspects for SPICE

The common aspects in the introduced tools show a good hint on what features are more interesting for the applications to apply. There are also good hints about what opportunities

are neglected and can be brought to attention. As shown before these aspects are different depending on the group of Citizen curation method. In the design of SPICE, these aspects are going to be taken into account. It is shown that most of the introduced tools are preferring to use a web-based application to free the user from being tied to a specific device. This helps the users to be able to connect with other people without being worried about what type of device they are using. The other benefit is that many users can use the system at the same time and together as a multiuser platform.

For the Artifact analysis group, two aspects need more focus: interpreting and tagging. An application that does the interpreting in a very simple and effective way is "Emotion mapper". As it was mentioned before, the application guides the user with some brief information about the object they are visiting and later ask them questions about what they felt about that specific object and how it affected them. This feature is important since the users will take a short time to intake some information and later provide their own view and opinion for the museum.

The "CowdHeritage" tool does the tagging process by adding a gamification routine to it. This tool is introduced before and it can be a guide for designing the tagging feature. By giving the user some information, the museum will later be able to get the help of the user. It will be possible to ask the users to categorize the information based on their knowledge and opinion into various groups by tagging them.

Many of the introduced applications in the "Collecting" group are used as inspiration for different parts of the SPICE design. Creating collections, sharing collections and adding opinions are mutual parts in "ArtUK curations", "Google Art & Culture", "Riksstudio" and "Smithsonian Learning Lab". Most of these applications support all the mentioned activities inside them. This is a good guide for the designers to make sure that they are not missing any of these activities in SPICE. The application will need to provide users with tools to create their own art collection and be able to share their collection and opinions about the arts with other people and their friends using social media.

Another feature that was seen in the introduced tools is "treasure hunting". It is shown that this feature makes the experiment with the museums more fun, engaging, interesting and educative for the visitors especially the ones at younger ages. "Enigma MNCN" and "Treasure Hunt Game Generator" are two good examples of the tools applying this feature which are inspiring for the designer of the SPICE.

"Storytelling" has always been an integral part of museums and cultural collection curation, making them more relatable to audiences as narratives provide an accessible framework for individuals to become interested and emotionally engaged with the objects put on display. When the physical institution of the museum is taken away, curation takes a different form: digital. This becomes even more relevant in light of the pandemic, as cultural institutions are forced to close their doors to visitors. These stories can be about artworks in a museum or as shown in the "Your story, Our story" tool, about a personal object that the users can share their story about.

In Section 3, Lo-fi prototypes for the citizen curation activities in SPICE are introduced. These features are inspired by the tools investigated in this Section, their common aspects and what makes them more useful, interesting and engaging for the users.

### 3. Lo-fi prototypes for citizen curation in SPICE

In this Section, we describe lo-fi prototypes for the proposed interfaces for citizen curation: interpretation and reflection. More precisely, we will focus our attention on specifying the following elements:

- 1) The curatorially inspired **activity types** that museums will be able to run and citizens will be able to take part in. Each of these will be customizable (e.g., language, text, visual style) for different museums and different activities.
- 2) The **social structures** that can be built around the activities. Social structures support both the museum (e.g., being able to publicize activities, monitor responses, curate responses) and the citizen (e.g., being able to share your work with a friend or with the museum). The available social structures can be customized by the museum for any activity.
- 3) The user **profile** or identification associated with an activity. Citizens may be able to log in, contribute anonymously, set a profile, choose an avatar, etc. The available profile options can be customized for any activity.
- 4) Roles that **user modelling and the recommender** can play in supporting the museum to curate citizen responses and notify the citizen of the responses of others.

In the examples below, it is assumed that the museum makes citizen curation activities available that are then completed by citizens. However, we might also want to consider supporting specific citizen groups in creating citizen curation activities to be completed by others. For instance, we might support an ethnic minority group in making their own activity that guides the citizen in thinking about art from a different perspective. This could provide a way of supporting museum inclusion and introducing new voices.

The museum will have a dashboard interface for exploring the available activities. The available activities can be filtered according to several properties such as: intended audience, artworks, activity location, associated event or time of year, activity type.

### Citizen Curation activities

**Intended users**

- Children
- Adults
- Families
- Older people

**Artwork**

**Exhibition**

**Location**

- Museum
- Home

**Activity type**

- Interpreting
- Collecting
- Opinions
- Tagging
- Storytelling
- Treasure hunt

**Related events**

- Winter
- Summer
- Christmas

**School children sharing their opinions**

Status: Open  
Description: Children sharing their opinions across schools.  
Tags: Opinions, Children, Museum  
Unique users: 34  
Contributions: 56

**Making and sharing a collection**

Status: Closed on 23 October 2020  
Description: Making and tagging artwork collections and comparing collections with other visitors.  
Tags: Collecting, Adults, Home  
Unique users: 128  
Contributions: 103

**Sending a story to a friend**

Status: Not yet launched  
Description: Sending a story to a friend and choosing whether to share it with the museum  
Tags: Adults, Storytelling, Museum, Home

**Saddle by Dorothy Cross: Slow Looking**

Status: Open until 15 December 2020  
Description: Making and tagging artwork collections and comparing collections with other visitors.  
Tags: Saddle by Dorothy Cross, Slow looking,  
Unique users: 76  
Contributions: 81

Figure 72. An example of an interface for citizen curation

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The museum professional can select one of the activities, in the case below an interpretation activity that guides the citizen in slow looking at the artwork Saddle by Dorothy Cross. The museum professional can open (i.e., launch) or close the activity, edit the contents of the activity (e.g., media content, text prompts, input methods available to the citizen), make a copy of it, or make a blank version of the activity type/ template to be customized with new content. The museum professional can also monitor and curate citizen responses to the activity.

## Saddle by Dorothy Cross: Slow Looking

### Summary

Status: Open until 15 December 2020 [close](#)

Description: Making and tagging artwork collections and comparing collections with other visitors. [edit](#)

Tags: [Saddle by Dorothy Cross Slow looking Adults](#) [edit](#)

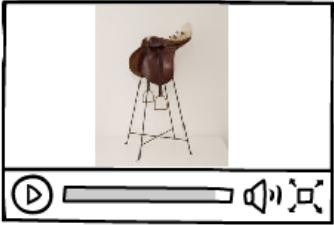
Unique users: [76](#)

Contributions: [81](#)

### Activity

[Create new activity of this type](#) [Duplicate activity](#)

---



So we can allow our eyes to wander over the piece. Nice and slowly, from top to bottom, from left to right. Nearly like we're writing an inventory, or a list of what we see. We keep it simple, just noticing colours, materials, shapes. There is absolutely no right or wrong way of doing this, but simply giving ourselves the time to notice and to discover this object.

[edit](#)

---

As we take our time to observe, what do we notice? What is our attention drawn to first? What is this sculpture made of? Are there several parts to it? What materials do you see? [edit](#)

Available input methods: audio, text [edit](#) [Curate responses](#) [View responses](#)

---

If you were given the chance of making a sculpture by mixing two or more everyday objects, would you want to do so? [edit](#)

Available input methods: audio, text [edit](#) [Curate responses](#) [View responses](#)

Figure 73. Example of a selected activity by the professional

In the next Section we describe the particular interfaces for the different citizen curation activities identified in the project.

## 3.1 Artifact analysis

### 3.1.1 Tagging

The tagging interface focuses on providing mechanisms to allow users to classify works based on a set of tags. These tags can be used to associate artworks with personal experiences and perspectives and allow to establish analyzable relationships in a structured way to understand in what way a work is interpreted (what emotions or experiences it evokes for different users, what communities are formed based on these similarities or differences between perceptions, etc.). The structure of this activity template is comparatively simpler than that of other activities presented in this section and basically involves choosing one or more works from a set of pieces previously selected by the museum curator around a given theme, for subsequent labelling.

The tagging process begins when a system user accesses the activity through a link shared through social channels or displayed on the museum's website under its activities section. The simplicity of this template also makes it suitable for display on fixed devices on the museum grounds (touch screens within a section of an exhibition, as an example). In an initial stage, the citizen observes a fixed selection of works potentially related to the theme addressed by the activity and selects those they consider most related to the idea proposed in the text or the question introduced by the museum curator. Then, for each of the chosen works, the user will have the opportunity to perform a systematic tagging based on a previously designed set of tags related to the theme of the activity, or optionally adding his own tags, if necessary (and if the option is enabled in the activity configuration). Additionally, and again only if this option were active, one could choose to select tags created by other users of the system for the displayed piece.

### Family

Which of these artworks fit with your idea of family?

What other family-related tags would you associate with them?

### Family

Family
Children
Marriage
Love

Disagreement
Divorce
Nuture

Growing up
Growing old

Add your own tags

Save

### Family: community tag cloud

Disagreement  
Children  
Family  
Divorce  
Love  
Growing  
Nuture  
Old  
Marriage  
Village  
Relationship  
Save

Figure 74. Tagging interface suggestion.

The process of creating a tagging activity by the museum curator begins by creating a new activity of this type from the system dashboard, or by duplicating an existing activity of this nature and then editing it. Here the curator, after entering the basic data such as the title or description of the activity, must define the topic to be covered, the list of works to be shown to the user, and a set of general tags to be offered to the citizens who decide to take part in the activity. Additionally, the curator will have to select configuration options regarding whether it is possible to write new tags that are not included in the initial set and whether other users can see and select tags created by other citizens.

The inclusion of this activity template aims to provide the necessary interfaces to be able to develop one of the use cases proposed by the **Design Museum Helsinki** (DMH), in which users were prompted to choose a series of pieces that they considered to be Finnish design from a selection of objects and tag them with different keywords to characterize the chosen items. In short, the tagging interface will support citizens in:

- Classifying artworks according to a set of tags, which can be used to associate artworks with personal experiences and perspectives.
- Visualizing the tags chosen by other users of the activity in order to explore how their opinion and/ or perspective resembles or differs from that of others.

Additionally, the tagging interface will support the museum in:

- Customizing the artworks used, the set of tags, whether the citizen can create new tags, and the supporting text and materials to guide the activity.
- Visualizing and aggregating the tags and artworks selected by the different users of the activity.

### 3.1.2 Interpreting

The interpretation interface is focused on providing mechanisms to motivate and inspire system users to develop their own interpretation of a given artwork or piece. The interpretation process of an artwork begins when a citizen accesses the activity previously prepared by the museum curator through a link, either shared through social channels or available on the system's website or the museum's public activities page. Initially, the user receives some prior information or context about the work in question, which can be given in the form of text, audio, video, or combinations of these formats. This contextualization does not necessarily have to be limited to the first stage of the activity, and can be distributed throughout different stages, and possibly interspersed with phases of input by the user.

After contextualization, the activity will prompt the user to respond to some kind of question that encourages interpretation of the artwork, usually in the form of audio or text. These questions may start by being more factual and concrete, and progressively evolve towards more abstract or reflective (or even creative/imaginative) questions. Depending on the configuration of the activity, it is possible to encounter instances of questions whose input is accompanied by some mechanism to support the user, such as a cloud of tags or closed answers, which smooth the passage to the more open-ended questions, potentially overwhelming for the citizen upon initial contact.

The process of creating an activity based on the interpretation template by the museum curator begins by creating a new such activity in the system dashboard, or by duplicating an existing similar activity for further editing. In this template, the activity designer, in addition to the usual data, can add different stages in any order desired, possibly alternating between user input and contextualization phases. For the user input stages, the curator can decide which types of input will be acceptable, and optionally activate the tag cloud option, entering in this case which words the user will be able to select in the corresponding phase. For the contextualization stages, the curator will be able to decide what combination of multimedia content to incorporate as well as the relevant files or text for the stage. A mock-up for the creation process may be found at the beginning of the "Citizen curation activity types" section.

The inclusion of this activity template is intended to provide the necessary interfaces for the development of the use case proposed by the Irish Museum of Modern Art (IMMA, "Slow looking"), with sample questions and content incorporated into the mockups in this section. Again, this template, however, is general enough to be suitable for use cases of a diverse nature, including, for instance, guided tours with multiple works or pieces where continuous visitor input is desired.

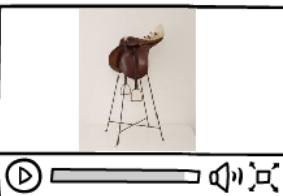
In short, the interpretation interface will support citizens in:

- Developing their own interpretation of an artwork, possibly with some help in early stages in the form of constrained input methods.
- Obtaining the necessary context to be able to critically and/or creatively understand and analyze a given artwork.

Additionally, the interpretation interface will support the museum in:

- Creating activities focused on an artwork or a set of artworks from the museum, adding information to support the interpretation of these works, and specifying the questions to be answered by the citizen during the activity.

## Saddle



So we can allow our eyes to wander over the piece. Nice and slowly, from top to bottom, from left to right. Nearly like we're writing an inventory, or a list of what we see. We keep it simple, just noticing colours, materials, shapes. There is absolutely no right or wrong way of doing this, but simply giving ourselves the time to notice and to discover this object.

## What would you make?

If you were given the chance of making a sculpture by mixing two or more everyday objects, what would you make?

Record your answer as audio   

Type your answer

[Next](#)

## What do you see?

As we take our time to observe, what do we notice? What is our attention drawn to first? What is this sculpture made of? Are there several parts to it? What materials do you see?

Record your answer as audio   

Type your answer

[Next](#)

## What do you see?

As we take our time to observe, what do we notice? What is our attention drawn to first? What is this sculpture made of? Are there several parts to it? What materials do you see?

Select from the following:

saddle	chair
udder	<input checked="" type="checkbox"/> leather
stirrups	<input checked="" type="checkbox"/> horse

[Next](#)

Figure 75. A set of questions that can be ask from a user about their experience.

## 3.2 Collecting

### 3.2.1 Collecting

The first of the proposed activity types is the collection template, and as its name suggests, it will be focused on allowing system users to select a series of artworks from a set of elements provided by the museum curator at the time of creation. The selected artworks will become a personal collection that the user will be able to complement with their own comments (in the form of audio or text inputs) and a title to name the presentation. These contributions can be shared with the user's friends through the usual channels (social networks, email, etc.), or anonymously with the corresponding museum so that they may be viewed publicly by future users of the system.

The process of creating a collection begins when the user accesses the address of the activity either through a direct link or by browsing the public activities offered by the museum: on its website, through social networks, etc. Once inside the collection interface, the user must orderly enter the information needed to define a presentation, including the theme to be explored (which, depending on the configuration of the activity, can be provided by the museum curator or freely chosen by the user at this point), the pieces that will make up the final collection, a commentary in one of the formats allowed in the activity options (usually audio or text), a personalized title for the presentation, and whether the user consents to their work being shared anonymously with the museum hosting the activity.

#### Selecting your theme

You might find it helpful to choose a theme for your collection such as family, friendship, leisure time, work, etc. You can edit the theme later.

Theme:

Next

#### Adding a comment

Record your comment as audio:



Enter comment as text:

Next

#### Sharing your collection

You may choose to share your collection with friends either via email or through social media.



Next

#### Selecting your artworks

Select artworks for your collection. For each friend, include one artwork that, for some reason, connects to them.

Search:



Add



Add

Head of a Girl, Lucian Freud, 1975

Magnificent Seven, Ellen Gallagher, 1997



Add



Add

Little Miss Muffet, Paula Rego, 1989

The Baker's Wife, Paula Rego, 1989

Next

#### Adding a title

Enter a title for your collection.

Title:

Next

## Sharing your collection

Share your collection anonymously with the museum  Agree  
 Disagree

[Next](#)

Figure 76. Suggested interface for the collection process.

The process of creating a new collecting *activity* begins when a museum curator decides to generate a new activity from the collecting template in the museum's dashboard system (or duplicates an existing activity of the same type). Once inside the creation interface, the curator will be able to enter the most relevant data to define and configure the activity, such as its title, a brief descriptive text to contextualize it, the allowed comment entry methods, and, most importantly, which works the users will be able to select when creating their collections. The selection of available works will have a similar format to the one provided for the user in the collection creation workflow, although advanced options may be made available to allow for more specialized filters to be applied.

## Collecting artworks for friends

**Summary**

Status: Not yet launched [close](#)

Description: Make an artwork collection around a theme and send it to one or more friends. For each friend, include one artwork that, for some reason, connects to them. Find out if they can guess which one it is! [edit](#)

Tags: [Adults](#) [Friends](#) [Museum](#) [Connections](#) [edit](#)

---

**Activity** [Create new activity of this type](#) [Duplicate activity](#)

Select artworks for your collection. For each friend, include an artwork that, for some reason, connects to them. [edit](#)

---

**Comments**  
Available input methods: text, audio [edit](#)

**Theme**  
Allow user to choose theme freely: yes [edit](#)

**Available artworks**  
50 Artworks available [edit available artworks](#)

**Maximum number of artworks**  
How many artworks (max) may the user include in their collection: 10 [edit](#)

**Option to share activity via social media**

Twitter  Facebook  Instagram [edit](#)

[Curate collections](#) [View collections](#)

Figure 77. Interface to share a collection with a friend.

The inclusion of this activity template aims to provide the necessary interfaces to be able to develop the use case proposed by the **Design Museum Helsinki** (DMH, "Collecting and sharing design"), in which the use of this activity type was proposed to enable communities of design enthusiasts to collect design objects and share their collections at workshops, museum pop-ups and social media. This template, however, is suitable for use in more general contexts. An example of an alternative use case would be directed storytelling in which the user is prompted to record a story taking their selection of artworks as a starting point. In short, the collection interface will support citizens in:

- Selecting artworks from a set of supplied artworks.
- Organizing them into a presentation.
- Including a title and additional text in their presentation.
- Sharing their presentation with chosen friends or anonymously with the museum.

Additionally, the collection interface will support the museum in:

- Choosing the set of artworks that can be used in the activity.
- Specifying the prompts and guidance given to the citizen assembling their collection.

### 3.2.2 Treasure hunt

The treasure or scavenger hunt interface supports a museum curator in generating multi-stage interactive experiences in which the visitor must walk through different parts of the museum to find a given set of pieces of artworks. Between search stages, the curator may include different sub-activities in which a certain input is requested from the visitor (open-ended or multiple-choice questions, drawings, reflections, interactions with maps and pictures, etc), or information about a topic or piece is provided in the form of text, audio, video, etc.

These treasure hunts can be designed by curators or museum educators (remembering here that these will be aimed mostly at groups of children and young people on educational school visits) and offer multiple mechanisms for exploring inputs and contributions of a very varied nature. On the one hand, multiple-choice questions provide factual information to the educator on the level of understanding of the key topics addressed in the treasure hunt, while more open-ended questions allow for an in-depth understanding of the different opinions and points of view of the participants in relation to the topics being discussed.

The following is an example of creating a simple phase in a treasure hunt that contains just a search item (that must be found through QR Scanning) and an input item (drawing a picture in response to a given prompt):

### Discovering Fossils: Treasure Hunt

**Summary**

Status: Open until 30 May 2021 [close](#)

Description: This activity guides the visitor through the most important pieces of the exhibition "Minerals, fossils and human evolution", with different activities and questions along the way. Aimed at visitors between 6 and 15 years old. [edit](#)

Tags: [Fossils](#) [Minerals](#) [Young Visitors](#) [Schools](#) [Evolution](#) [Natural Science](#) [edit](#)

Unique users: 27  
Times completed: 43

**Activity** [Create new activity of this type](#) [Duplicate activity](#)

Phase 1 Select a piece for this phase

Which piece would you like to use for the current phase?  
Please use the search tool provided below:

Search:



trilobite specimen - paleozoic exhibit

[Remove this phase](#) [Choose this piece](#) [Add Phase to treasure hunt](#)

### Discovering Fossils: Treasure Hunt

**Summary**

Status: Open until 30 May 2021 [close](#)

Description: This activity guides the visitor through the most important pieces of the exhibition "Minerals, fossils and human evolution", with different activities and questions along the way. Aimed at visitors between 6 and 15 years old. [edit](#)

Tags: [Fossils](#) [Minerals](#) [Young Visitors](#) [Schools](#) [Evolution](#) [Natural Science](#) [edit](#)

Unique users: 27  
Times completed: 43

**Activity** [Create new activity of this type](#) [Duplicate activity](#)

Phase 1 Add a clue to help visitors find the piece

Please write a clue to guide visitors to the piece you've selected:

Search for an arthropod with a shell that lived during the middle Paleozoic Era...

Detection method:  Image Recognition  QR Scan



trilobite specimen - paleozoic exhibit

[Change piece](#) [Remove this phase](#) [Save](#) [Add Phase to treasure hunt](#)

**Activity** [Create new activity of this type](#) [Duplicate activity](#)

Trilobites [Q](#) Clue: Search for an arthropod with a shell that lived during the middle Paleozoic Era [Pencil icon](#) [Delete icon](#)

Piece Search Detection method: [QR scan](#)

[Remove this phase](#) [Add item to phase outline](#) [Add Phase to treasure hunt](#)

**Activity** [Create new activity of this type](#) [Duplicate activity](#)

Add a new activity to phase

[Multiple Choice](#) [Map](#) [Drawing](#) [Open Question](#)

[Go back](#) [Add Phase to treasure hunt](#)

Figure 78. Primary interface for the treasure hunt process

A second example contemplates the creation of an additional phase with a search to be confirmed through image recognition (when the user focuses on the piece with the device's camera), and a map-type input in which the user must place pins on different regions to answer a given question:

Figure 79. Map activity in treasure hunt

On the visitor's side, there would be the following interfaces encountered sequentially throughout the treasure hunt:

## Piece Search

Clue: Search for a display case with a large number of mineral samples.

When you find it, press "Scan Piece" and use the camera on your device to take a picture of the piece. Good luck!


  
Scan Piece

## Map Activity

Search the room and locate on the map of Spain the main deposits of gold, silver, copper and platinum.



Figure 80. Visitors view for the treasure hunt

The inclusion of this activity template aims to provide the necessary interfaces to be able to develop the use case proposed by the **National Museum of Natural Sciences** in Madrid (MNCN), in which the use of this activity type was proposed to motivate young children to explore and interpret a series of different objects displayed in the museum as a way to play an active and critical role in the visit. This template may also be used as a way to structure-guided visits where interactivity and dynamism are a requirement, by incorporating explanatory text- or audio-based phases before or afterpiece search tasks.

Finally, although activities of this type are primarily intended to be carried out simultaneously during a controlled visit (usually by school groups) to the museum, there is nothing that prevents them from being used as an additional museum resource offered as an alternative or complement to other types of visits to the general public. Additionally, it would be possible to incorporate some notion of "class" or "group" to be entered by the visitor or student at the beginning of the scavenger hunt (for example, by requesting an ID provided by the teacher or educator) in order to allow the corresponding educator to be able to identify the responses of their associated group and obtain feedback on the group in question. From the museum curator's point of view, this notion of group code opens the door to an inter-and intra-community analysis of the different individuals and groups that have taken part in the visits. In short, the treasure hunt interface will support citizens in:

- Exploring a set of pieces or artworks in a guided way.
- Reflecting on different questions related to those pieces and their importance in the current world.
- Acquiring factual information and testing their understanding of it in gamified tasks.

Additionally, the treasure hunt interface will support the museum in:

- Choosing the set of pieces that will be used in the activity.
- Specifying the prompts, activities and guidance given to the citizens taking part in the scavenger hunts.
- Analyzing the different inter-and intra- community points of view and responses by exploring the inputs of the groups partaking in the activity.
- Detecting confusing or potentially unclear key points regarding the explanations about the objects included in the visit.

## 3.3 Storytelling and narrative methods

### 3.3.1 Sharing Opinions

The opinion-sharing interface focuses on allowing users of the system to respond to various questions reflecting their personal opinions on a given topic. This activity template is relatively simple in the sense that it is limited to alternating stages of audio-visual material (previously specified by the museum curator) and question and answer phases for the user to interact with. In the audio-visual material stages, the activity designer provides the necessary resources to contextualize an artwork or a museum theme by means of videos, images, texts, audios, or web links, and may also add generally brief questions to request a first opinion from the user after viewing the corresponding resource (for example, employing multiple-choice questions). The question phases request the user's opinion more extensively, usually in the form of audio and text boxes in which the citizen can elaborate their thoughts in detail. Additionally, these phases may request other types of multimedia material from the users of the activity, for instance, in the form of images. Here it is important to note that while this type of template is naturally suited to opinion-requesting contexts, it is general enough to be employed in other related use cases, such as asking users to share their thoughts on work or topic, as in the traditional food example below.

The inclusion of this activity template aims to provide the necessary interfaces to be able to develop one of the use cases proposed by the **Hecht Museum**, in which users were asked to develop their opinions on a given topic, and then exposed to opposite points of view in order to better understand the contrast and similarities between trains of thought. The example below probes citizen opinions about rebellion inspired by the Hecht Museum exhibition.

Rebellion

What do you think of the view expressed in the video?

Agree  
 Disagree  
 Don't know

Next

Rebellion

What do you feel about armed rebellion?

Record your answer as audio

Type your answer

I don't think armed conflict is a solution

Next

Figure 81. An example of opinion sharing interface

The example below probes opinions about food inspired by Anthony Key's exposition at IMMA "Bok Gwai/White Ghost" in 2005<sup>51</sup>.

<sup>51</sup> <https://imma.ie/whats-on/anthony-key-bok-gwai-white-ghost/>

## What food would you miss? What would you take?

If you moved to a new country what traditional food would you miss? Why would you miss it? It is the taste? It is because you associate it with a particular person or celebration?

Record your answer as audio 

Type your answer

Share a photo of your favourite food

If you could take an ingredient or kitchen utensil with you when you moved, what would you take?

Record your answer as audio 

Type your answer

Add a photo

Figure 82. Sharing opinion can be about anything, including food.

In short, the opinion-sharing interface will support citizens in:

- Answering questions asked by the museum curators that probe their own opinions.
- Offering audio-visual materials and contrasting views to better understand the context of the topic at hand and the different opinions with regard thereto.

Additionally, the opinion-sharing interface will support the museum in:

- Specifying the prompts and context given to the citizen partaking in the activity.

### 3.3.2 Storytelling

The storytelling interface supports the citizen in telling a story about one or more artworks. The museum can decide which artworks can be used for storytelling, the types of story input that can be used (e.g., text or audio), and the prompts that guide the citizen in telling a story. The storytelling interface focuses on providing flows and mechanisms to allow citizens to tell a story involving one or more works of art (a story about them, or a story that uses them as inspiration). The process of creating a story begins when the user accesses the activity through a social channel or through the museum's website, under the offered activities section. This activity is also appropriate in the context of workshops, or as a task of an interpretive/creative nature that acts as a complement to a guided tour, for example, for school groups. Upon entering the activity, the user will be able to visualize a set of works from which they must choose a certain number within a range predefined by the museum curator. Since the user may initially lack context about the works shown, it is possible here to obtain additional information about each piece and explore it in detail by clicking on it. The works have to be selected chronologically according to their order of appearance or use in the story to be told. Once the pieces that will form the basis of the activity have been chosen, the user can go through them one by one, adding comments, tags, or personal multimedia material to complement the narration. This also acts as a "warm-up", offering a more limited and potentially less overwhelming set of interaction options than a blank text box or a daunting recording interface right at the start of the activity. After completing this first contact phase, the user can proceed to record or writing the actual story, depending on the input method settings defined by the curator at the time of activity creation. Lastly, the user may choose to add a title to their story, additionally deciding whether they wish to share it publicly or with a friend or acquaintance via social channels.

#### Selecting your artworks

3

1

2

Choose 3 artworks from the left to tell a story of the time when you were a teenager.

Select them in the order in which you would like to add them to your story.

[Next](#)

#### Adding a personal touch

How about...

[adding a comment?](#)

[uploading a picture?](#)

[adding some tags?](#)

[adding a reaction?](#)

[Next](#)

#### Creating your story

1

2

3

Think back to when you were a teenager and something happened related to the ideas in the works you've chosen. Tell the story of what happened.

Record your story as audio

Type your story

[Next](#)

Figure 83. Steps of building a story

The process of creating a storytelling activity begins when the museum curator decides to create a new such activity from the system's dashboard, or after duplicating an existing similar activity for further editing. In addition to the usual basic information, the designer must write a question or prompt that contextualizes and directs the activity and select the works that will be offered to the end-user to use in their story, as well as the number or range of pieces that should be employed in a narrative. After this, it is necessary to define which methods will be acceptable both for the input of the stories (generally audio, text, or both) and for the annotation of the works in the first contact phase (attaching personal images, tagging, using emojis and reactions, etc.). Lastly, it is possible to specify whether to recommend new works for the user's story based on the works already selected or the user's personal profile.

The inclusion of this activity template aims to provide the necessary interfaces to be able to develop one of the use cases proposed by the **Galleria d'Arte Moderna** (GAM), in which users were asked to create stories based on a selection of artworks from the museum, adding personal comments, tags, reactions and multimedia elements to their works.

In short, the storytelling interface will support citizens in:

- Selecting artworks from a set of supplied artworks to be used as a base for a narration.
- Organizing them into a storyline.
- Recording or typing a story based on the selected artworks.
- Personalizing artworks used in the story by adding comments, reactions, multimedia assets or tagging them.
- Sharing their presentation with chosen friends or anonymously with the museum.

Additionally, the collection interface will support the museum in:

- Choosing the set of artworks that can be used in the activity.
- Specifying the number or range of artworks to be used in the stories, the types of interactions the citizen may choose from for chosen artworks, the types of allowed inputs for the user stories, and the supporting text, prompts and materials to guide the activity.
-

### 3.4 Social support

Each activity will have the following types of customizable social support.

The museum will be able to publicize open (launched) activities via social media. The museum will also be able to curate anonymized outputs from the citizen contributions. These can be shared on social media, and notifications can be sent to anyone who subscribes to follow the activity.

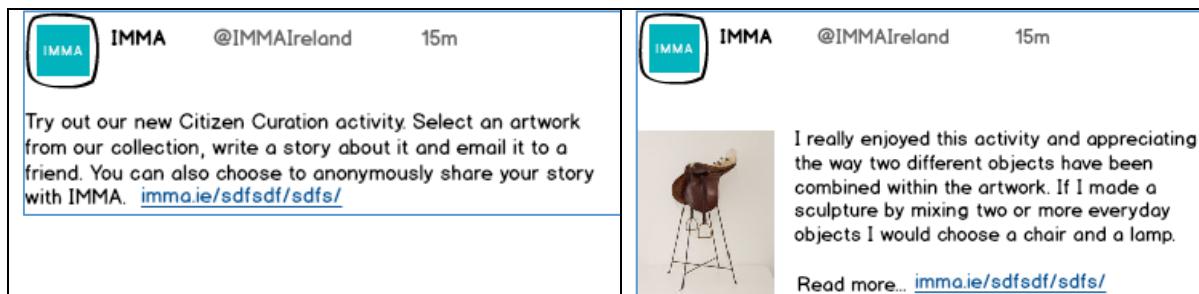


Figure 84. Sharing ideas on social media can be supported

The citizen can choose to share their work (e.g., story, collection, etc.) with the museum. They can also choose to receive updates on the activity and publicise the activity to others via social media.

The image displays three sequential steps for sharing a work on social media:

- Sharing your story:** A section titled "Sharing your story" with the instruction "Share your story anonymously with the museum". It includes two radio buttons: "Agree" and "Disagree", and a "Next" button at the bottom.
- Keep in touch:** A section titled "Keep in touch" with the instruction "Receive updates on this activity from the museum". It includes two radio buttons: "Agree" and "Disagree", and a text input field for "Your email address" followed by a "Next" button.
- Invite others:** A section titled "Invite others" with the instruction "Use social media to invite others to try this activity". It features icons for Twitter, Facebook, and Instagram, and a "Finish" button at the bottom.

Figure 85. various ways and steps to share a work on social media

Any of the citizen curation activities can be configured so that the citizen is not just sending their contributions to the museum but also to named friends and family. For example, the citizen could send their story or collection to someone they know and invite them to try the activity for themselves.

## Creating your story

Who are you writing your story for?

Name:

Email address:

**Next**

## Creating your collection

Add the names and email addresses of the friends who will receive your collection.

	Name	Email address
1	<input type="text"/>	<input type="text"/>
2	<input type="text"/>	<input type="text"/>
3	<input type="text"/>	<input type="text"/>
4	<input type="text"/>	<input type="text"/>

**Next**

Figure 86. Sharing can be done with friends

The recipient could view what their friend had done and possibly reply and try it out for themselves.

## Artwork collection

Hi Peter

I made this collection of artworks. The theme of my collection is family. One of the artworks made me think of you.

Head of a Girl, Lucian Freud, 1975

Magnificent Seven, Ellen Gallagher, 1989

Little Miss Muffet, Paula Rego, 1989

The Baker's Wife, Paula Rego, 1989

## Send a reply

Thank Joe for sending you a collection.  
Let Joe know which artwork you think is connected to you and why.

**Send**

Figure 87. The option to reply to a shared work is available

### 3.5 Personal Profiles

Activities can be configured so that they can be carried out anonymously and/or require a login.

If a citizen logs into the activity, then their work can be added to their user model. The user model could potentially be built across a number of different activities. They also might be able to manage, edit or delete any of their contributions at a later time.

**Sign in**

User name

Password

**Don't have an account?**

[Sign up](#)

[Continue without an account](#)

Figure 88. Each user can have their own personal profile

For a particular activity or museum, the process of creating an account could be customized. This could involve, for example, choosing an avatar as well as adding demographic information or community membership. The sign-up process could also potentially involve other surveys or questionnaires related, for example, to personality or human values.

### Choosing an Avatar

Select the avatar that will represent you in the system:

[Browse avatars](#)

Enter the name that you would like to see on your profile:

### Basic information

Tell us a little more about yourself:

Peter

Gender: 
  
 Age: 
  
 Religion: 
  
 Nationality:

Figure 89. More than a profile, user can use avatars and add information about themselves

## 3.6 Recommender and user/ community modelling

The ways in which the recommender/modelling components could support the process include the following.

### I. Recommending the contributions of other citizens

When a citizen has completed an activity, they may choose to receive further updates on the activity from the museum. These updates could be automated or semi-automated by the recommender. For example, the recommender could choose to notify the citizen of contributions that are more or less diverse or from different communities.

### II. Assisting the museum in curating citizen contributions to an activity and sharing these with the public

The recommender/modelling component could assist the museum in understanding/visualising the range of contributions received for a particular activity. This could help the museum to identify different communities among the contributions and decide which content it should share with other visitors.

## Rebellion

### User interactions

Responses to question 1: What do you feel about armed rebellion? [Next item](#)

**Answer type**  
 Audio  
 Text

Peter Schm

---

Anonymous
Anonymous

## Rebellion

### User interactions

Responses to question 3: What do you think about the view expressed in the video? [Previous item](#) [Next item](#)

**User type**  
 Registered  
 Anonymous

**Age-range:**  

25

50

Agree Disagree Don't know

Figure 90. Museums can observe the user responses

### III. Visualizing communities and activities for the citizen

The same recommender/modelling components could be used to produce a visualisation of a community or contributions to an activity that the citizen could explore directly.

## Rebellion

### Community profile

Thank you for participating in this activity. Take a look at the answers from people who are demographically similar/ different from you:

Agree	Disagree	Don't know
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My community

Agree	Disagree	Don't know
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Other communities

[Next](#)

Figure 91. Museums are able to observe a visualization of the activities' analysis

#### **IV. Customizing or suggesting new activities for the citizen**

The recommender could be used to suggest new activities to the citizen or customise those activities for the citizen. For example, if in an earlier activity the citizen had stated that they were against rebellion, this information could be used to select a pro-rebellion video (rather than anti or neutral) in a future activity and ask them why they agree/disagree with it.

## 4. Interface architecture

In a high-level point of view, the application is composed of two big building blocks, each one executed in a different environment. On one hand, the *backend* will run in one or more servers, and will be responsible for the storage and search services. It will provide a Rest API with endpoints to access those services, so they will be remotely available. On the other hand, the *frontend* will be the web-based application the user interacts with and will be executed in their own device. It will communicate with the *backend* throughout the Rest API web services to access the museum data and will show a user interface with the information and interaction options, if any.

The Rest API must use a data model rich enough to serve as an exchange mechanism between both parts. This data model will be responsible for defining the different citizen activity types or, in other words, what information constitutes them. As an example, the data model for a collection activity will include its name, description and the list of artworks selected by the museum curator among other things. It will also define the data model associated with a concrete *citizen curation experience*, that is the information collected when a visitor explores an activity created by a museum curator. In the example of the collection activity, this will include the specific artworks selected by the citizen for their *personal collection* among those included in the activity.

The backend is related to the SPICE Linked Data Hub (D4.1), that will provide access to the information of the museum artworks so curators can choose between them when creating new activities. It will also be responsible for storing all the information with the *activity definitions* and their uses. For example, it will store that a museum curator created a collecting activity and their definition according to the data model: title, description and set of artworks. The backend will provide a Web API to manage the activity collection, so museum curators can, using an application that invokes that API, search in the collection using different criteria, create new activities, clone or delete old ones, etc.

The backend will also store the *visitors use* of those activities, that is the result of the citizen curation itself. As an example, for a collecting activity the backend will store the user chosen artworks between those available in the activity, the theme, title and comment (as audio or as text) provided, and whether the citizen allowed to share their collection with the museum. All this information will follow the mentioned data model associated with a concrete *citizen curation experience*. In case the museum provides personal profiles, they will also be stored in the *backend*, and each citizen curation activity data could be linked with one of them. Internally, the backend could be split in different parts, executed in different servers, and even use an architecture based in microservices. Nevertheless, the backend is out of the scope of this section.

The second element in this high-level view of the architecture will be the *frontend*, that is the application the user interacts with. It will be web-based and will communicate with the backend server using the defined Rest API and its data model.

The more basic interface elements are *widgets*: labels, buttons, images, check boxes, etc. Being a web-based user interface, the widgets will be provided by the HTML renderer embedded in the application or in the browser. Museums could adapt the global aspect of the interface (for example the color scheme) using the techniques usually found in web applications (mainly Cascading Style Sheets, CSS).

Widgets are general low-level elements. The interface will be composed of *web components*, software artifacts that connect a set of *widgets* with *data*, providing encapsulated functionality that can be configured and reused. Web components provide the *building blocks* for the user interface and are extracted from the lo-fi prototypes. As an example, one of the web components will be used for showing an artwork. The component will receive the information of the artwork using the data model specified by the Web API and the SPICE linked data hub, and some configuration parameters. It will create the HTML widgets to show the artwork image, the name, a description as *tooltip* when the mouse is over the picture, and so on. The web component could be configured to ask not to show the name, for example. This component will be used in nearly all the curation activity types.

Other web components will be much more specific such as a social button to share some content (link) or a web component for showing a word cloud (used in the tagging activity). Finally, web components can be aggregated. For example, there will be a component for showing a list of artworks and, optionally, let the user select some of them. This component will use the artwork component internally.

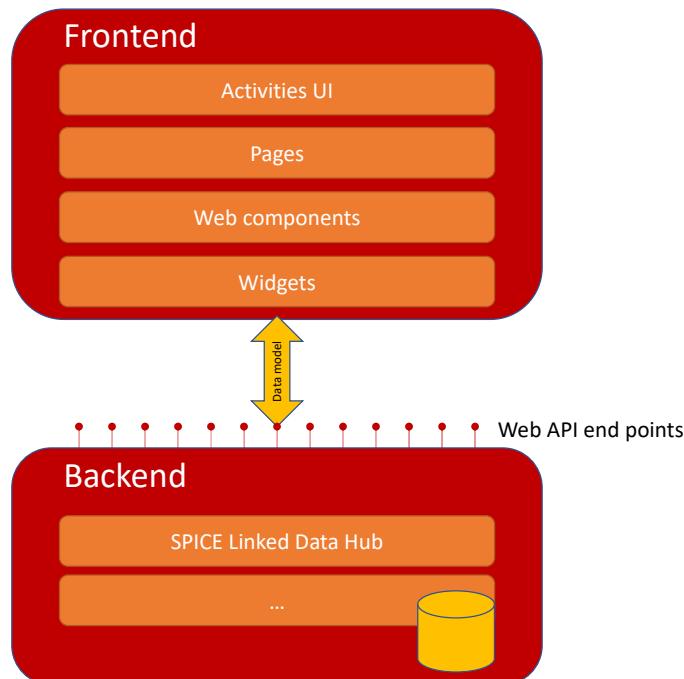


Figure 92. Interface architecture scheme

Web components are grouped together in *pages*. Each page provides an interaction step to the user. For example, a page could allow the user to select one or more artworks between a set. The page will have different configurable elements, such as title, description, the set of artworks available, the maximum number of them the user can select, if a search box should be shown, etc. Pages are inspired in the lo-fi prototypes and, at runtime, will receive the configuration information and return the data provided by the user.

Pages could be reused between activities. For example, the *sharing page* with social buttons to share the experience with others will be used at the end of many activities, although showing different texts. The reuse of web components and pages and the use of a uniform visual aspect between widgets will create a coherent user experience.

Finally, activity types are a succession of pages. Activities provide the general flow of the user experience, that will be specific for each concrete activity. An activity type is tied to the data model that *define* the activity, and each piece of data defining a concrete activity will affect a component shown to the user. On the other hand, when a user runs an activity, they will generate content that will be sent back to the server using the data model associated with the *concrete citizen curation experience* for that kind of activity.

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