



## D5.1

# Pilot end-user applications

2017-10-30

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WP5 is dedicated to pilot implementation and experimentation, using and assessing the CrossCult platform in the context of four different applications involving venues in the UK, Spain, Portugal, Italy, Greece, Luxembourg and Malta. Deliverable 5.1 documents the first version of the mobile applications developed for the pilots, in relation to the designs previously included in D2.1 (“Pilot specifications”).



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# 1. Introduction

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## 1.1. CrossCult overview

CrossCult ([www.crosscult.eu](http://www.crosscult.eu)) is a three-year H2020 research project, which started in March 2016. It consists of 11 European institutions and 14 associated partners, from Computer Science, History and Cultural Heritage.

The goal of CrossCult is to spur a change in the way European citizens appraise History, fostering the re-interpretation of what they may have learnt in the light of cross-border interconnections among pieces of cultural heritage, other citizens' viewpoints and physical venues. The project aims at enabling a unified, IT-facilitated history approach, which goes beyond the conventional silo presentation of historical data, in order to trigger a substantial reflection on history as we know it. Thus, it focuses on aspects that are cross-cultural, cross-border, cross-gender and cross-ethnic, as well as on grant societal challenges, such as population movements, access to health services, women's place in society, power structures and others.

To demonstrate its findings and potential impact, CrossCult uses four flagship pilots, each of which takes place in different venues of historical interest, triggers different elements of history reflection and uses different (but often overlapping) sets of technologies:

- **Pilot 1: Large multi-thematic venue.** This pilot takes place in the National Gallery, London in the United Kingdom (UK). It aims at using the broad collection of a single, larger institution to illustrate the connections among people, places and events across European history, through Art.
- **Pilot 2: Many small venues.** This pilot connects 4 small venues, i.e. the Roman healing spa of Lugo in Spain, the Roman healing spa of Chaves in Portugal, the Archaeological site of Montegrotto Terme in Italy and the sanctuary of Epidauros in Greece. It highlights the inherently cross-border nature of History by engaging people of multiple nationalities, in the discovery of connections between their respective bodies of cultural heritage.
- **Pilot 3: One venue, non-typical transversal connections.** This pilot takes place in the Archaeological museum of Tripolis in Greece. It aims at offering non-typical, crosscutting and transversal viewings of the museum items, in order to allow the visitors to go beyond the typical level of history presentation (e.g. type of a statue, or its construction date), into deeper levels of reflection, over social aspects of life in antiquity, power structures etc.
- **Pilot 4: Multiple cities, “Past & Present” interplay.** This pilot takes place outdoors, in two cities: Luxembourg City, Luxembourg and Valletta, Malta. It aims at connecting contemporary and past history, with focus on migration and its impact. Through a unique combination of digital cultural historical objects alongside contemporary objects (like statistical data), this pilot challenges the visitors' current perceptions on migration as a contemporary emotive topic and engages people in exploring the past to understand the present.

Each pilot is developed as standalone within the project, but their underlying principles, evaluation framework and supporting technologies are developed in a modular way: they are connected through the CrossCult platform, which provides a common set of technologies and services upon which the mobile applications are built. a set technologies. The pilot apps presented in this deliverable are built to demonstrate different aspects of the CrossCult platform, in the different settings provided by the pilots.

## 1.2. Context of the Deliverable

Work Package 5 (*“Pilot development and evaluation”*) gets input from WP2 (*“Pilot specifications, digital resources and models”*), WP3 (*“Technological modules”*) and WP4 (*“CROSSCULT platform”*), seeking (i) to develop the end-user applications for each pilot, (ii) to implement, set up and run the pilots, and (iii) to evaluate the pilots and the Return on Experience of the end users. Deliverable 5.1 focuses on the first task, taking as a reference the requirements, technology expectations and designs given in Deliverable 2.1 (*“Pilot specifications”*) in August 2016 (M6 of the project).

The preparation of D5.1 now gives way to a first round of experimentation with the four pilots in controlled environments, whose results will be gathered into D5.2 (*“Evaluation & best practices report –First version”*) by M26, prior to uncontrolled experiments that will be conducted until the last-but-one month of the project –documented in D5.3 (*“Evaluation & best practices report”*) by M35 (January 2019).

## 1.3. Structure of the Deliverable

Deliverable 5.1 is of *“Demonstrator”* type. This document serves as a guide to understand what has been implemented in each pilot, what has been added since the submission of D2.1, and what has been reconsidered or postponed. Sections 2, 3, 4 and 5 present the first release of the end-user apps in Pilots 1, 2, 3 and 4, respectively. Section 6 contains instructions on how to download and test the apps, and Section 7 provides conclusions.

## 2. Pilot 1: Large multi-thematic venue

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This pilot takes place in the National Gallery (NG) in London, UK, a large multi-thematic venue. It aims to use the broad collection of a single large institution to illustrate the connections between paintings, painters, places and events across European history, through art. The processes and technologies included in this pilot aim to demonstrate new approaches to improve the accessibility and experience of European cultural heritage. This will be achieved through increasing the visibility and exploitation of the complex and diverse connections that exist between works of art. The pilot will facilitate user reflections and interpretation associated with, for example, the relationships between painters, schools, periods, materials and places. Furthermore, with the app, users will be able to search and explore the entire NG art collection to select their preferred artworks. This serves two purposes: (i) development of personalised gallery experiences based on user preferences, and (ii) self-discovery of the collection through three main reflection topics: Materials, Historical Events and Social Connections, which will reveal the interconnections at play.

The app developed in Pilot 1 will provide multiple interconnected methods to enable new experiences in exploring and searching gallery collections. Pilot 1 will allow users with differing levels of experience and knowledge to interact with the NG collection. Users are able to engage and reflect on the information presented and the diverse works of art in the collection based on their own knowledge, choices and experience rather than being forced along a more traditional single choreographed route through the Gallery.

### 2.1. The App in relation to Deliverable 2.1

#### 2.1.1. Pilot 1 app ecosystem

The current version of the pilot 1 app package, released with D5.1 features two complementary applications:

- The main application which focuses on delivering content to the user during the visit.
- The “moving paintings” app which extends the main application by offering a virtual world where the visitor can rearrange the paintings into a fully personalised exhibit.

The decision to start with two apps has been taken for several reasons. First, to quote a certain billionaire, we truly believe that “on mobile, each app can only focus on doing one thing well”. Indeed, we feel that both apps target different temporalities and complementary usage: the primary objective of the main app is to assist the National Gallery visitor during their visit by enabling them to access the collection’s items in a way that reflects the physical organisation of the gallery (through the use of a map). On the other end, the game can be used by the user before, during or after the visit to familiarise themselves with the paintings in the collection; it and is more of a creativity tool that may be relevant only to some of our users.

This choice also allowed us to select the best technology to develop each functionality, and removed the technical constraints of a “one size fits all” app. As a result, the main app, being built with standard web technologies, has a relatively small footprint on the visitor’s smartphone, with only a few MB of the device space consumed. This appears as a particularly important thing to us as we designed the app to be installed directly on the visitor’s personal device which might already be cluttered by more important things. On the over end, the game which is expected to have a longer usage period can justify being more storage consuming. It is developed using a first-class game engine which provides us with more freedom in term of experiences.

Finally, the two apps don't mean two standalone experiences and we expect to leverage the CrossCult platform as a mean to create a consistent user experience between the two, and possibly integrate the two apps by adding links to go from one to the other, before the end of Milestone 2.

The following subsections details the state of the Pilot 1 app ecosystem as of the first release made for this deliverable. From the features detailed in Deliverable 2.1, the postponed ones are to be implemented after the second round of controlled user experiments (early 2018). Revisited or discarded features will be reconsidered accordingly to the user's feedback from the first and second round of experiments.

### 2.1.2. Current state of the main application

The initial development of the app was produced with a "functionality-first" mind-set, concentrating effort on the core technologies of the app for the first round of internal experiments (end of 2017). The general look, feel and flow of the app will change based on the first round of tests and user's feedback to ensure smooth experiences for users of the final system.

The initial profiling steps have been implemented and the responses gathered from the profiling questions are already streamed to the platform so they can be consumed by the different platform services, in particular by the recommendation service. This data is also logged by the platform to allow offline analysis which is mandatory to support the experiments evaluation process.

For this first version of the main' app, work has focused on the backbone of the main Pilot 1 app, the map and the initial profiling process. Through the map, visitors can virtually explore all of the public rooms within the National Gallery, complete with up-to-date dynamic lists of the paintings on display in each room. Users can explore these lists and further access images, descriptions, metadata and subject keywords related to all of the National Gallery paintings. Additional methods for users to interact with the collection have also been provisioned, though not currently functional in this first version, and will be included and tested during the first round of pilot 1 experiments. These include, but are not limited to; users generated or curated groups of paintings, beginning with a traditional "My Favourites" list, allowing users to explore "similar" or related items semantically linked via the platforms KB and even be presented with connections to external sources of information and items from other collections.

At the time of writing, the app has been connected to the "initial recommendation" system: this produces an initial set of paintings that matches a user's personal interests and visit expectations, as declared during the initial profiling. The profiling system will also take into account any specific narratives or themes a user indicate they want to concentrate on. This initial set constitutes the backbone of the visitor journey through the Gallery. The narrative elements still need to be refined and integrated with the rest of the National Gallery content. This work is still ongoing, involving experts from the related research Departments (such as Scientific, Curatorial & Education) and will be included within in the app once completed.

On selecting a specific set of recommended paintings, the visitor can visualise the location of each painting on the map and is presented with a first "naïve" route, generated based on the visitor's indicated position. The final version of the app will include a more complete recommended route, with a specific order. This route will also be augmented, were appropriate, with additional "intermediary" steps highlighting further paintings, identified and recommended by the system, as a user's profile is continually, automatically refined during their visit. In the same spirit, if required, the overall route will also be dynamically adapted as a visit progresses, updated according to how changing conditions, such as the number of other visitors or the passage of time, might relate to the user's predefined visit tolerances, a form of smart routing. Before they can be correctly implemented, within the main app, these "enhanced" recommendation routines, need to be checked in the field so that the flow of necessary data, which would need to be captured during a



visit, can be observed and documented. This work will be carried out as part of the first round of live experiments.

An important technology that remains to be integrated in the app is the indoor positioning system (geo-located content delivery). Its integration had to be postponed as the software still requires some fine tuning before any large-scale infrastructure effort, to install the necessary hardware, could be scheduled with the required National Gallery services and staff (Art Handling, Buildings & IS). To address this missing automation, the currently app relies on a manual location indication process performed by the user. This doesn't prevent to use the other app's features though it impacts the overall user experience and lower the amount and quality of location data that we can gather during a visit. This also makes the "dynamic" recommendations more difficult to produce.

### 2.1.3. Current state of the game (moving paintings app):

The core goal of the gallery creation game, as specified in Deliverable 2.1, is to rearrange the paintings in an existing room or to fill an empty room with paintings. In the current prototype, a sample wall is provided with sample paintings from the National Gallery. The prototype is intended as a demonstrator of the functional properties of the game, evaluating primarily: (i) the usability of the app on mobile devices, on-site and off-site; (ii) the rewarding mechanism (badges) and its effect on player motivation; (iii) the expressive range in terms of player-created content; and (iv) the user reflections captured within user-provided titles and descriptions for each wall.

Motivating self-expression was deemed important since the submission of D2.1, and the priority of the game prototype was to provide an autotelic creation experience as described in Section 6 of that document. Therefore, some of the more advanced functionalities described in D2.1 Section 4.1.2 such as that *"the app gives her clues on how to rearrange the location of the paintings to achieve the best score"* have been omitted. However, these features can be added to the basic functionalities of this prototype following user and curator feedback.

The app released with D5.1 implements most of the features announced in D2.1, including the following:

- The player can start from an empty room, and add any painting in the current prototype to its (single) wall.
- The player can add paintings from a collection to the wall. Doing so removes the painting from the collection.
- The player can move paintings already on the wall, to different locations.
- The player can remove a painting from the wall, placing it back into the collection.
- The player receives visual feedback if placement of a painting is not permitted due to other paintings or screen borders. If the player attempts to place a painting in a non-permitted area, the move is cancelled and the painting is restored to its previous location (on the wall or in the collection).
- The player receives 'rewards' in the form of badges for completing specific challenges associated with each badge. The badges are shown when the player finishes their editing, and also shown on the gallery of previously created walls.
- The player can filter paintings in the collection based on categories provided by experts, including the room that the painting is in. This allows them to recreate walls of specific rooms, as identified in D2.1.

During beta tests and final content preparation efforts, the following features were added:



- The player can move the camera left and right along a specific wall.
- The player can load an existing wall previously created, and edit it by adding or removing paintings.
- The player can view all their previously created creations in a “gallery”, along with associated awards.
- The player can delete any of their creations from the “gallery”.
- Once the player finishes their editing, the player’s wall is automatically stored locally on the user’s device, and can be viewed and edited further, at a later time.
- The player can save their wall, giving it a title and description. This gives the player the opportunity to identify and reflect on the themes of their wall and the connections of the paintings within it, and verbalize it to themselves and the curators. The wall, paintings, title, and description (and other relevant data) are stored in an online database. Currently, this is only used for internal processing within the CrossCult consortium but it could become available for public viewing in the future (see discarded or postponed features, below). Moreover, walls saved by the player in this fashion are stored locally on the user’s device, and can be viewed and edited further, at a later time. This means that the user only has access to their saved walls, not those of other users in order to provide a personal experience and not be overwhelmed with large amount of content generated by other users.

Finally, the following features announced in D2.1 have been discarded or postponed:

- Cues before starting to create a wall (such as a randomly chosen topic) have currently been removed. Instead of *a priori* priming the creativity of the user towards specific themes and associations, the current prototype instead promotes *a posteriori* reflection on the associations they chose for their wall through the title and description when saving the wall. This feature has been postponed until the first round of internal experiments (end of 2017) has taken place, and will be considered following curator and user feedback.
- As noted above, the current app does not provide the goal of explicitly recreating a NG room, and thus functionalities such as editing a wall with the precise dimensions of a NG room are omitted. Similarly, assistance and cues from the app, regarding the paintings actual current locations are, is only provided on a more abstract level (e.g. in terms of category “Room 55” rather than exactly their position on the wall). The game design will be revisited following the first round of internal experiments to explore how and which additional features should be prioritised for the next stage of testing. Online peer evaluation in the form of an online gallery of all players’ walls is currently postponed since the focus is on the functionality of the game as a mobile app for a single player rather than as an online ecosystem of players. However, this functionality is likely to be explored in future versions.
- There are currently no additional levels (e.g. the Curator level mentioned in D2.1). The added complexity of a levelling system will be discussed after the first round of internal experiments with curators and users take place. There are possibly simpler ways of engaging and motivating users than increased functionality.

## 2.2. Sample scenario

The following scenario shows an execution of the Pilot 1 app that is very close to the activity diagram included in Deliverable D2.1, including both the main app and the game. The current

version implements the backbone of the final app, with a strong focus on the earliest stages of the visit (initial visitor profiling and recommendation of tour).

### 2.2.1. National Gallery Main app

#### 2.2.1.1. First steps

When the visitor first installs the app, a series of explanatory slides are presented, highlighting the key features of the app (Figure 2-1, Figure 2-2). These slides are also available at any time via the “Help” option in the app menu. After this short introduction, the user lands on the Login page, where accepting the general terms of condition is necessary to access the rest of the app (Figure 2-3). Once the Terms and Conditions are accepted, the user is offered to either sign in with a CrossCult account or continue as a guest (Figure 2-4). Choosing to sign in redirects the user to the CrossCult general login form (allowing the creation of a new account or to connect with via Facebook account); see Figure 2-5.

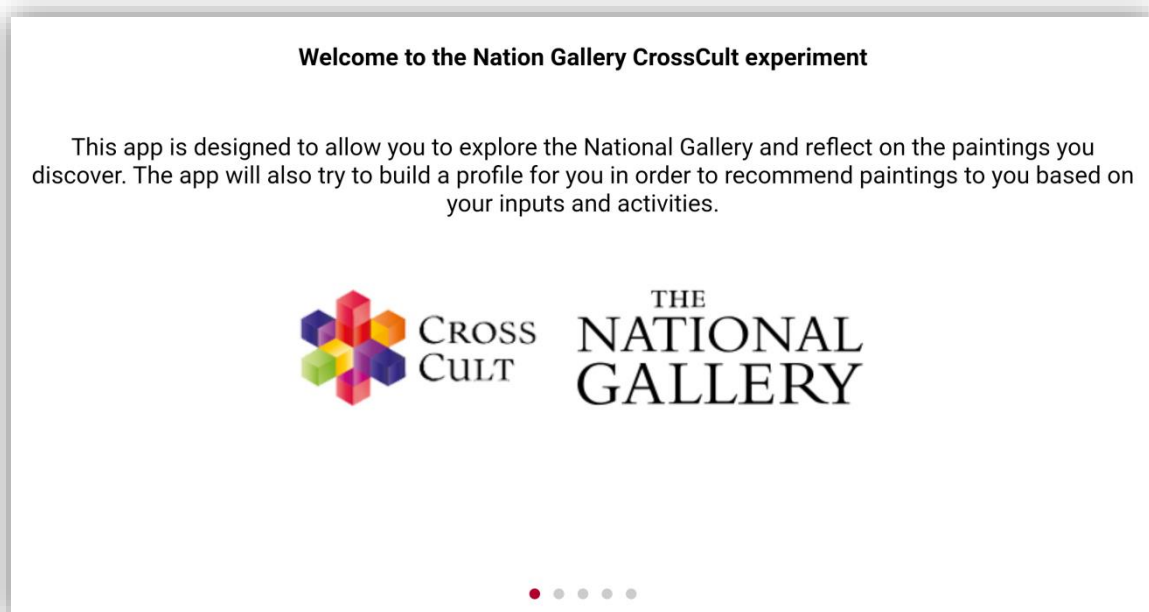


Figure 2-1. The first of explanatory screens also available via the Help option at the main app menu.

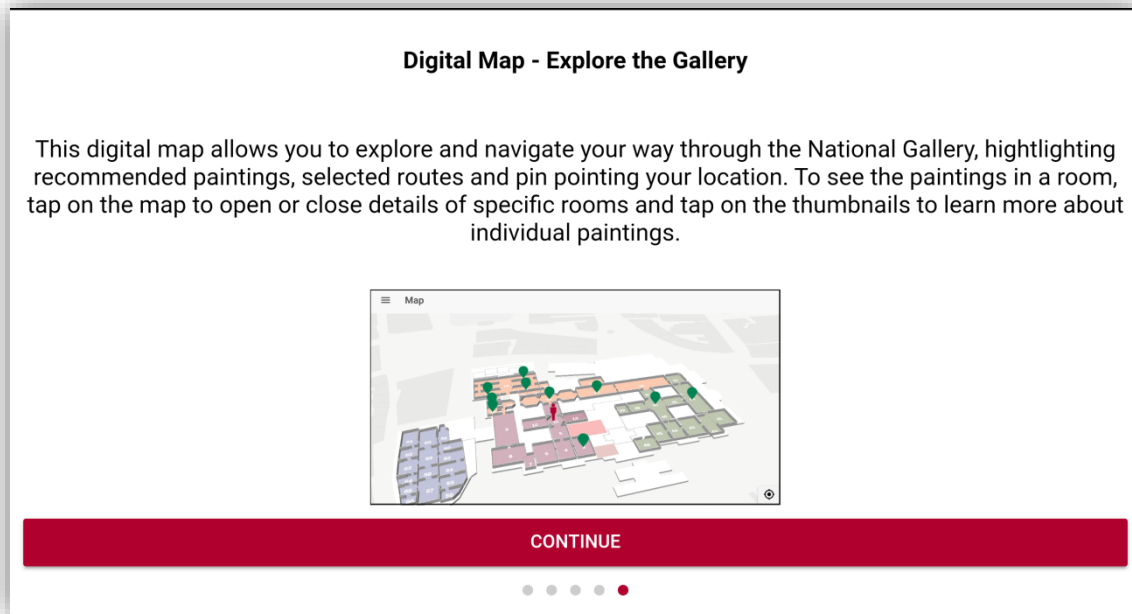


Figure 2-2. Second explanatory screen of Pilot 1 app.



Figure 2-3. Login page - Conditions of use.

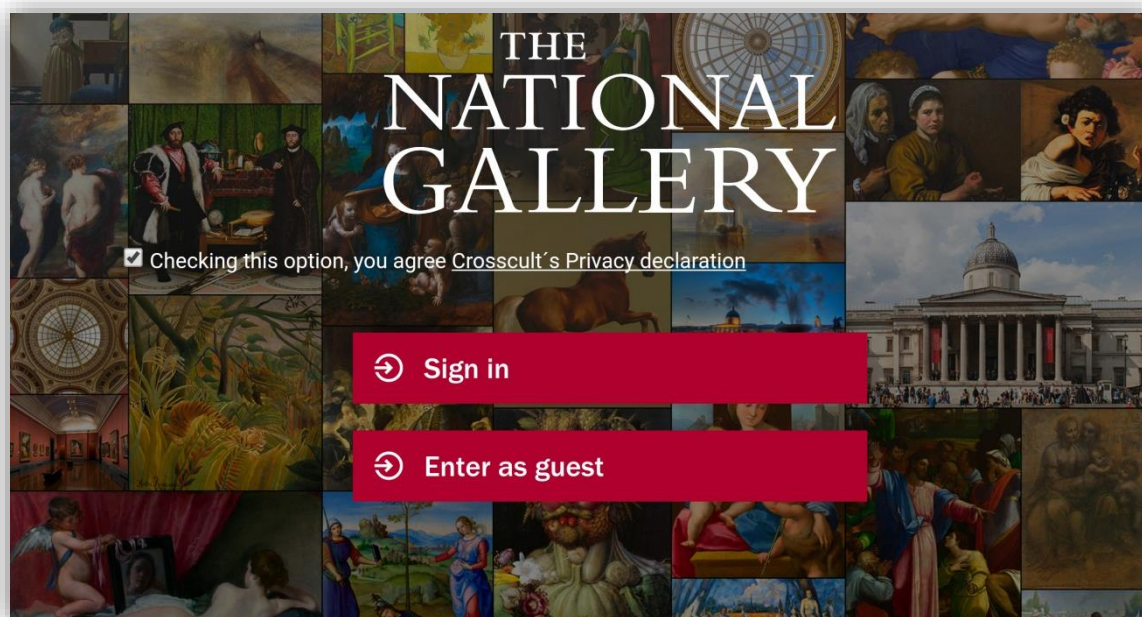


Figure 2-4. Log in screen of Pilot 1 app.

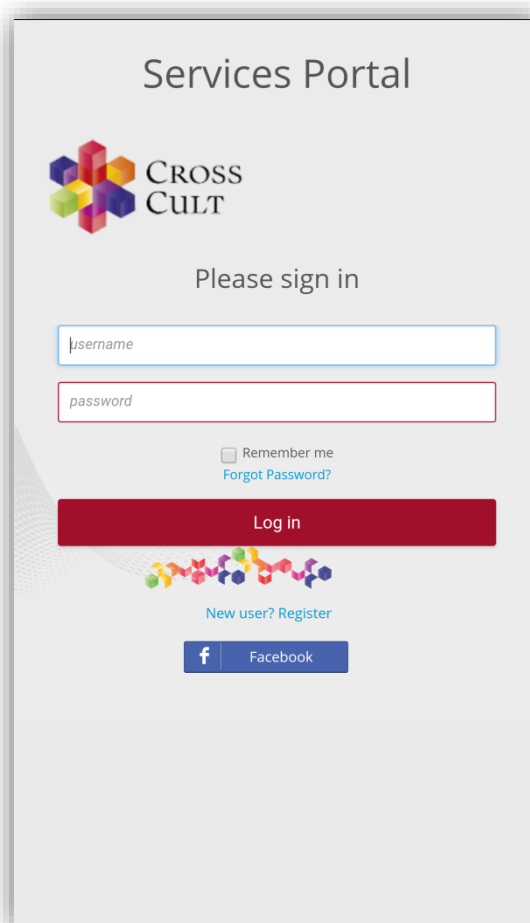


Figure 2-5. Sign in screen.

After logging in, or if the user selected “enter as guest”, the app displays the initial profiling form. This form features two main parts (see Figure 2-6):

- The “My interests” invites the user to select from a list of pre-curated terms the ones that present an interest to them. These are the primary initial source of information for the recommendation.
- The “My tolerances” section allows the visitor to indicate their tolerance to different visit-related conditions (e.g. distance, crowd).

Pressing the “continue” button brings the user to a carousel of paintings where they can express their preferences (Figure 2-7). The app presents a stack of paintings which the user can like or dislike. The result of this process also feeds the recommendation process. A third option “must see”, denoted with an eye, is also provided allowing the user, during the first experiments, to specifically indicate that they would like to see the indicated painting during their visit. At the end of the process, the user go back to the Home page.

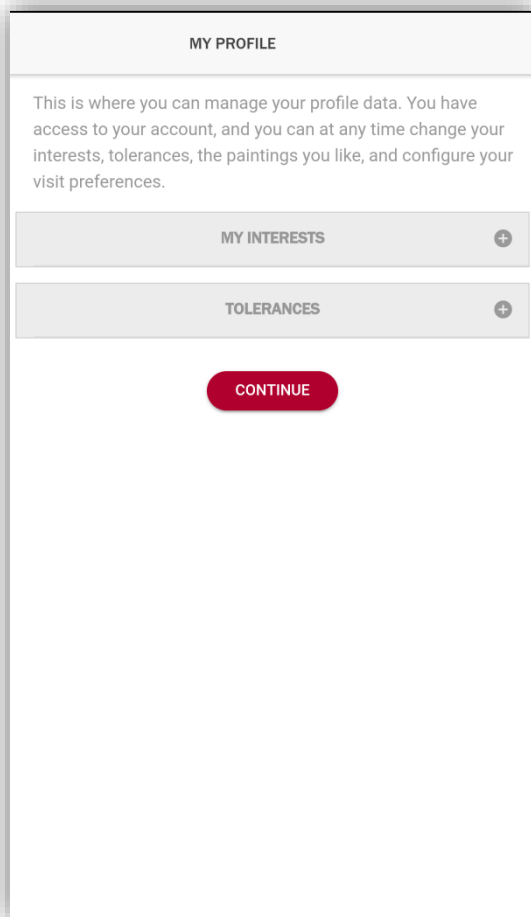


Figure 2-6. My profile screen.

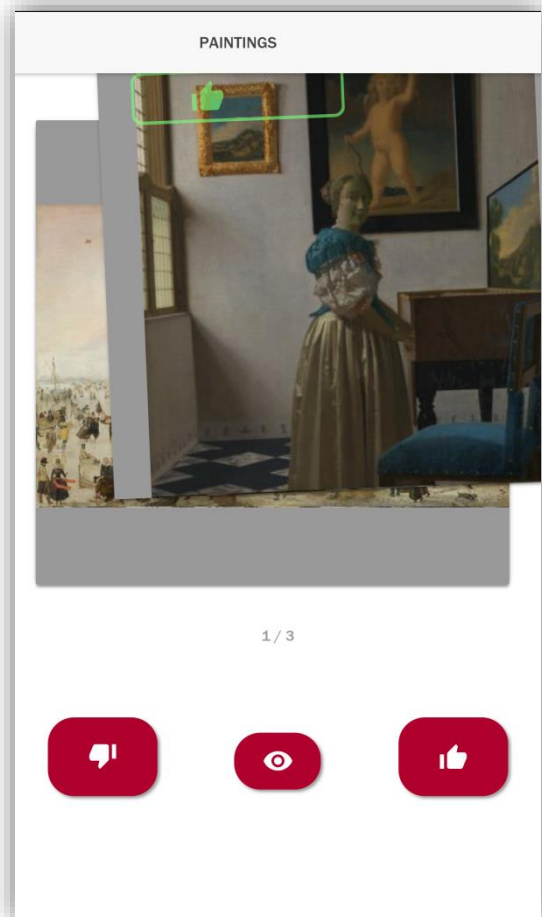


Figure 2-7. Liking an image in the carousel of paintings.



### 2.2.1.2. Home page

The Home page (Figure 2-8) currently offers two main entry points: “Explore the gallery”, and a “Visit” section which changes dynamically during the app use. The “Browse Collection” option is not available for now but will provide access to searching functionality in a next release. A main menu, accessible via the menu icon, top left or by swiping in from the left, is also present to provide quick access to all the app functionalities (see Figure 2-9).



Figure 2-8. Main page of Pilot 1 app.

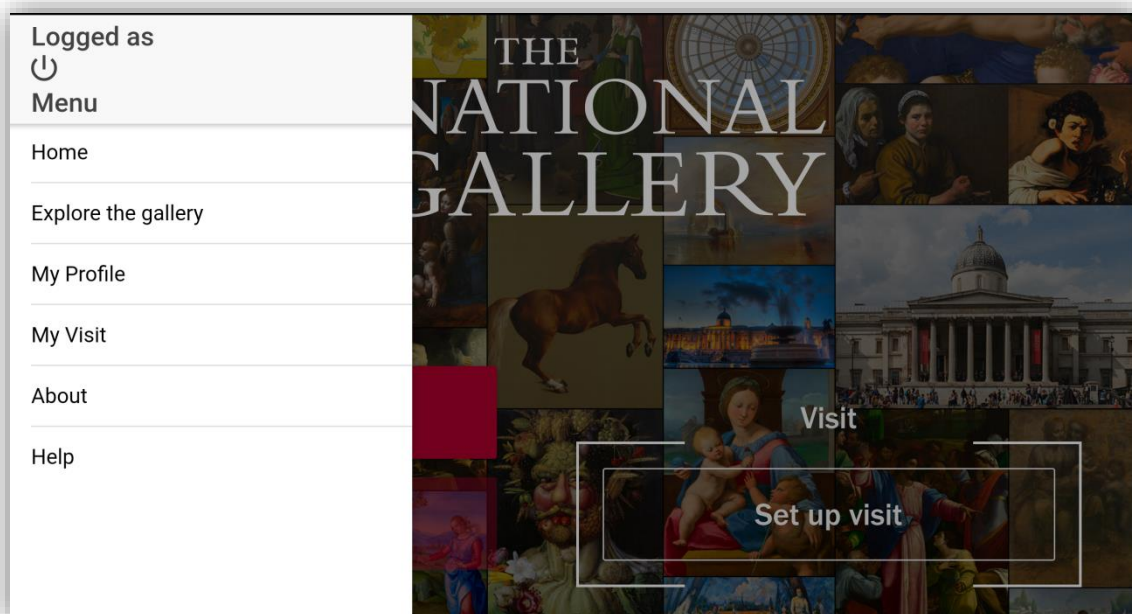


Figure 2-9. Menu of Pilot 1 app.

### 2.2.1.3. Explore the gallery

The “Explore the gallery” button leads the user to the National Gallery map (Figure 2-10). It displays the different rooms and offers access to the paintings that are currently in each room (see Section Map interactions 2.2.1.5).



Figure 2-10. The National Gallery map in Pilot 1 app.

### 2.2.1.4. Start a visit

“Set up Visit”: this starts the process of the visit configuration displayed in Figure 2-11. First, the visitor is invited to answer a few simple questions (e.g. their available time, what they expect from their visit). This information is used to help formulate the recommendations during the visit. Pressing the “Start visit” button in the “My Visit” screen leads the user to the home screen and the option of ‘set up the visit’ has now changed into ‘My recommendations’ (see Figure 2-12).

Figure 2-11. Visit configuration.





Figure 2-12. Home screen of Pilot 1 app with access to recommendations.

Pressing the 'My recommendations' button leads the user to a list of recommended groups of paintings. Figure 2-13. Recommended paintings shows one such group. By selecting a group, the user can review the full list of associated paintings and then access the full details of any of the listed paintings (Figure 2-14).

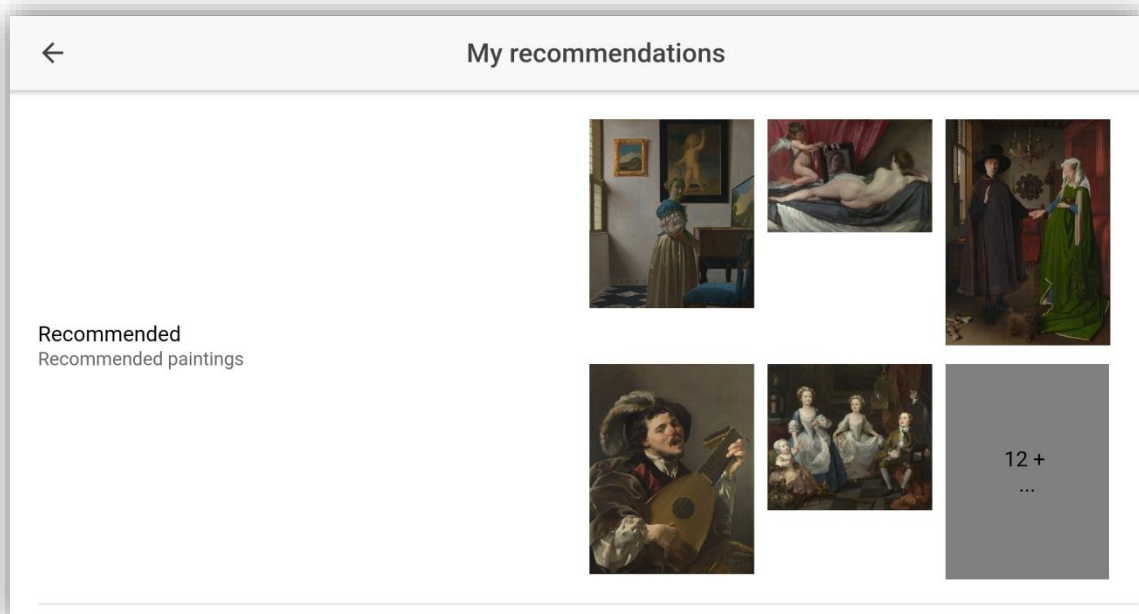


Figure 2-13. Recommended paintings.

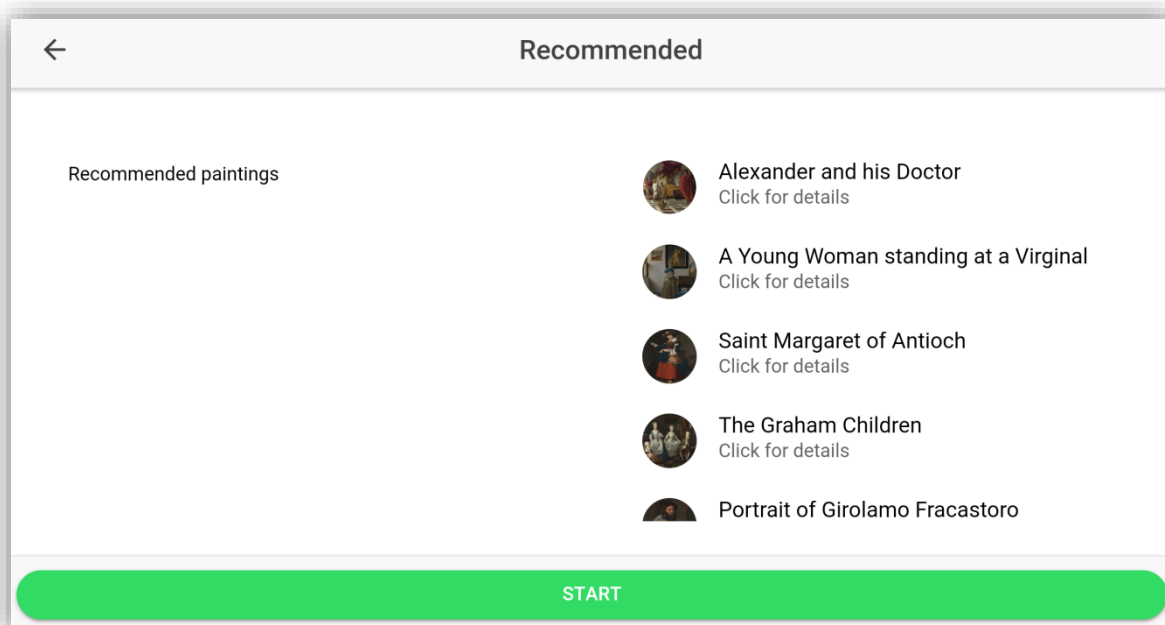


Figure 2-14. Details of a recommended painting group.

Pressing “start”, from the full list presentation screen, opens the map and actually starts the visit. The app asks for the current visitor location on the map which will be used as the visit starting point (Figure 2-15). In future releases, this will be replaced by automatic positioning. Once the position is set, the app generates a route that goes through each recommended painting (Figure 2-16).

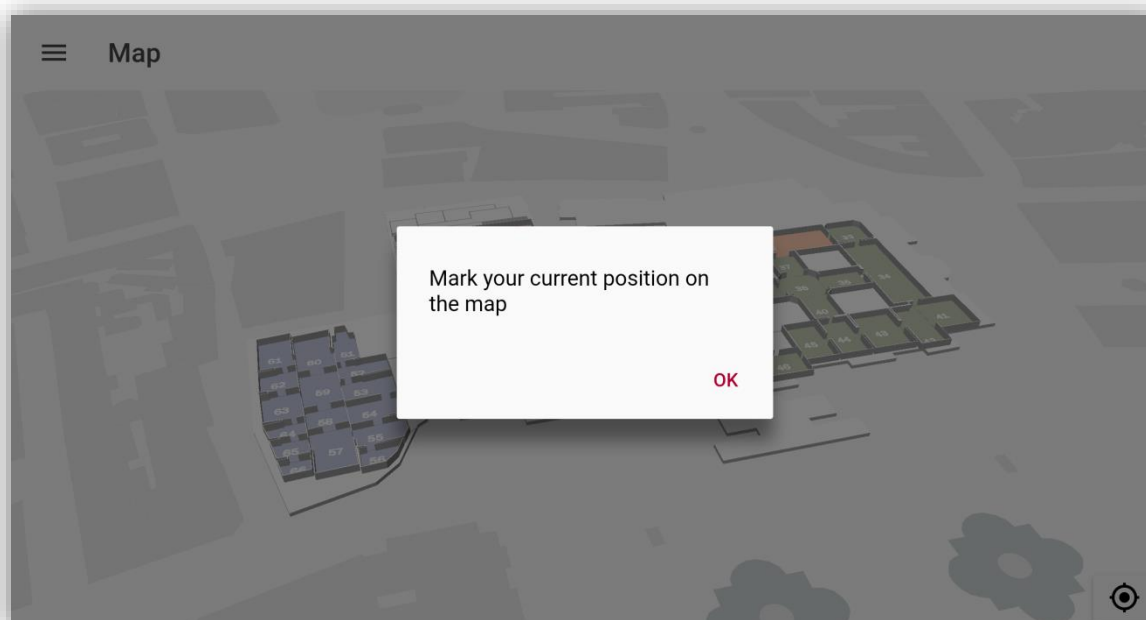


Figure 2-15. Mark your position in National Gallery.

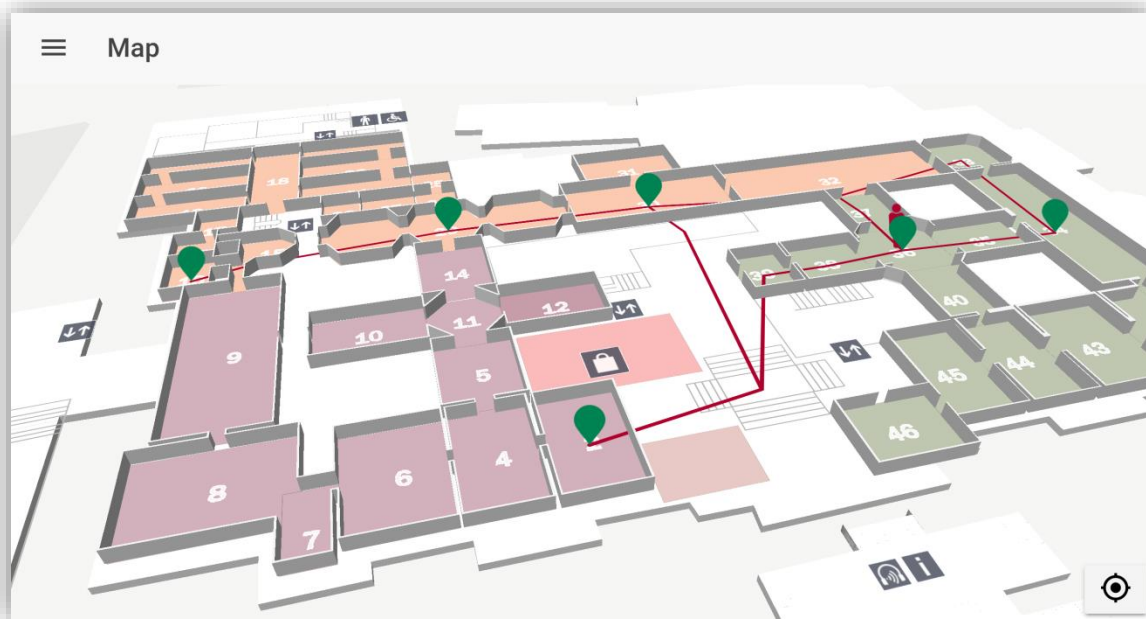


Figure 2-16. Route from user location to recommended paintings.

#### 2.2.1.5. Map interactions

While on the map, the user can “click” a room to see a simple popup showing a few of the current paintings (Figure 2-17), clicking on the more, or three dots, option accesses the full room details. This includes the official (curated) room description and the list of paintings currently on display in this room. It is important to note that when the visit is started, if the room contains recommended paintings, these are promoted to the top of the list.

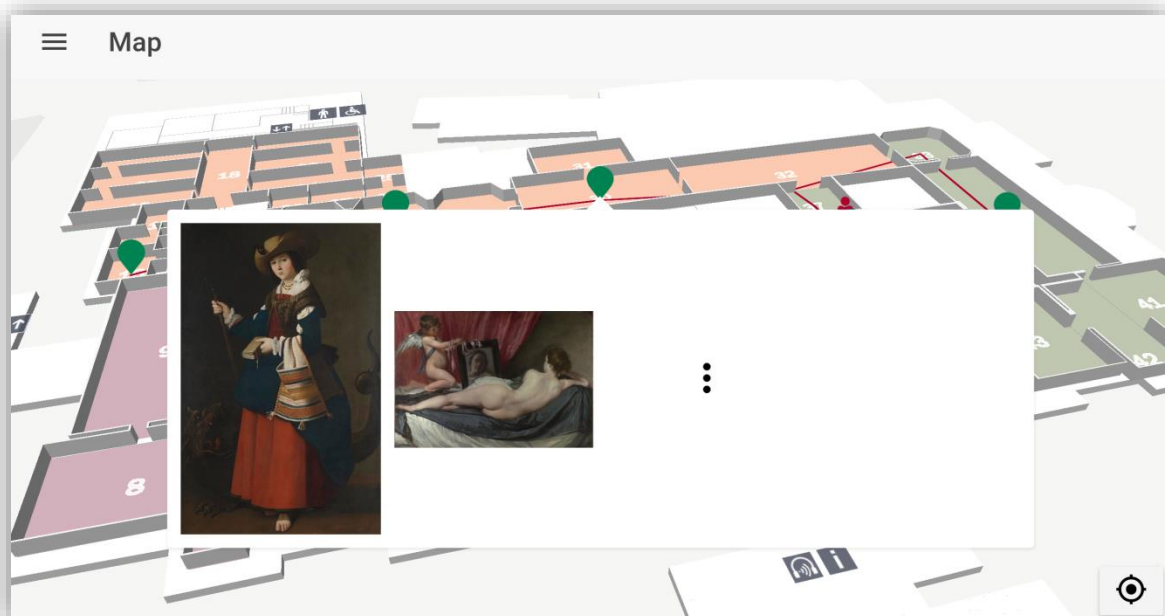


Figure 2-17. Paintings present in a selected room.

When “clicking” a particular painting, the app displays a full screen preview of the painting (Figure 2-18), with an action button. Clicking on the action button displays additional options (see Figure

2-19). For the time being, only the “book” option/button is connected and activates the display of the current painting’s details and description (Figure 2-20). The other two are provisioned buttons that will trigger different actions to be tested during the first experiments.

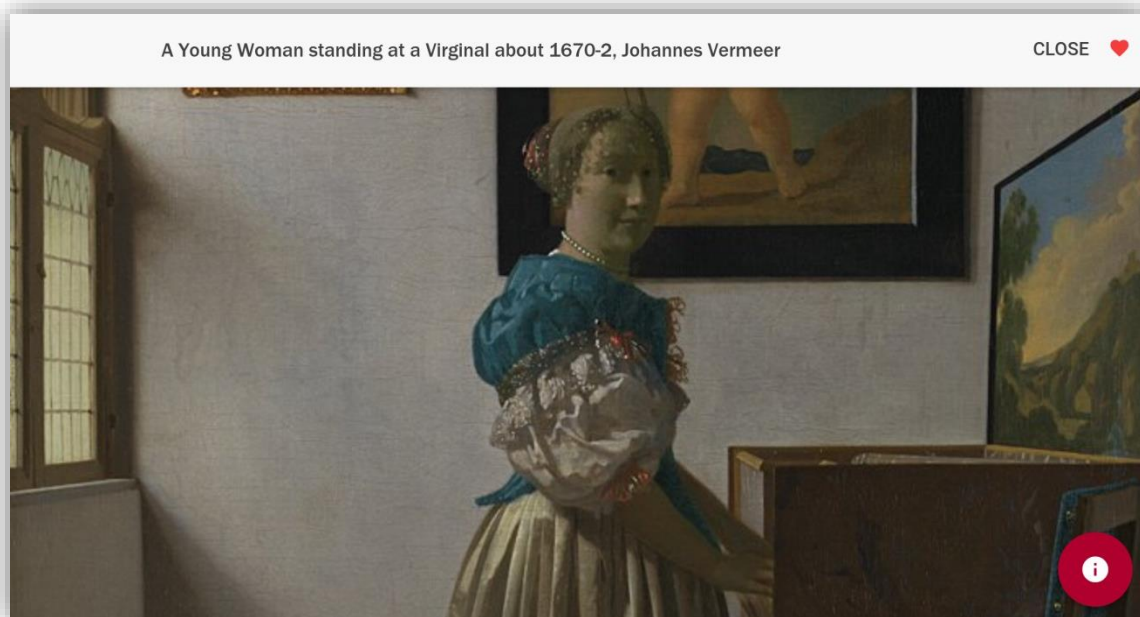


Figure 2-18. Preview of a painting.

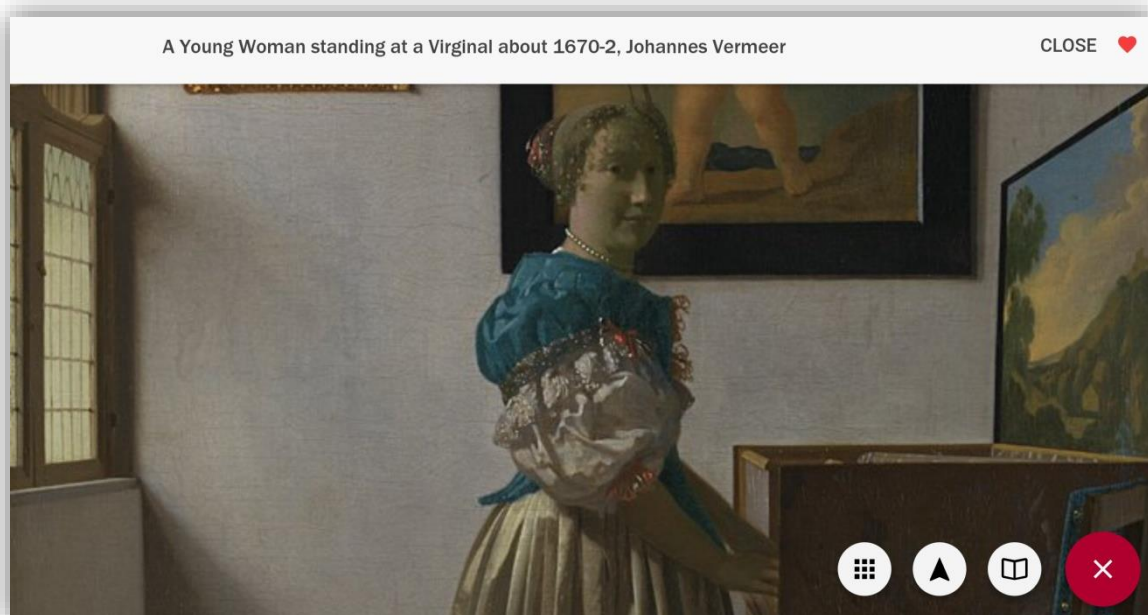


Figure 2-19. Preview of a painting, additional options.



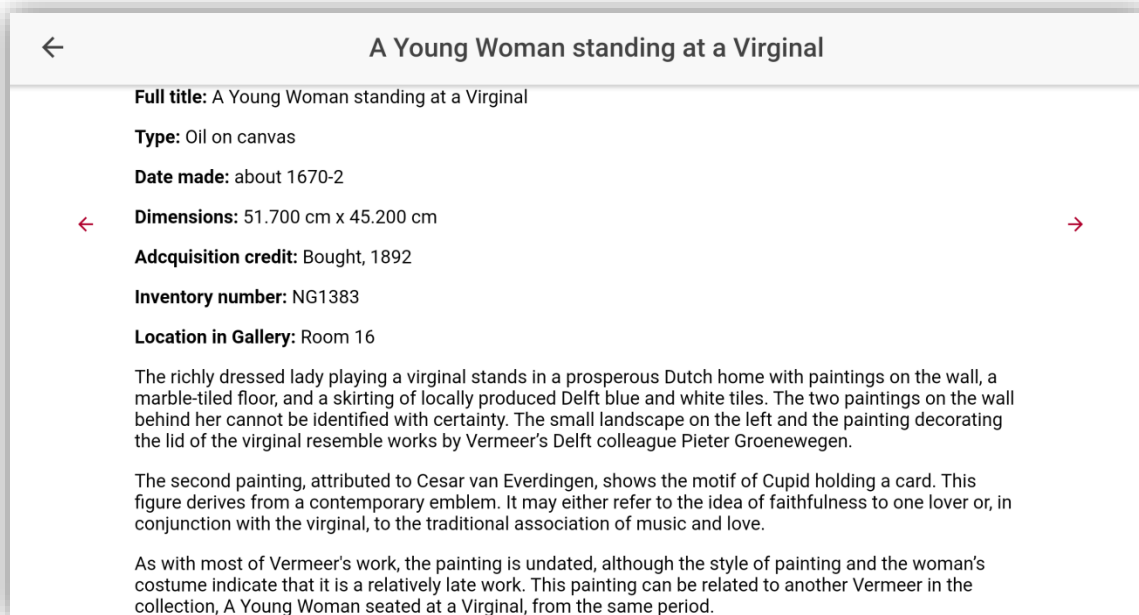


Figure 2-20. Paintings details and description.

### 2.2.2. The 'Moving paintings' game app

The game flow described in the following subsections follows the structure of the high-level scenario provided in Deliverable 2.1, incorporating however several additional functionalities.

#### 2.2.2.1. Welcome screen

The welcome screen displays particular instructions on how to use the game. Two buttons are found at the bottom of the screen, allowing the player to start with a completely empty wall (*Start* button) or to view their previously created walls (*Gallery* button).



Figure 2-21. The intro screen provides easy access to the main modes of interaction with the app, as well as some helpful information on how to use the app.

### 2.2.2.2. Main Creation/Edit screen

This screen (Figure 2-22) features the main gameplay loop, i.e. the creation of the player's custom wall. The screen is split into two sections: the *Collection* and the *Wall*. When starting an empty wall, all paintings available to the player are placed in the Collection, on the left, in multiple rows of two columns. Paintings in the collection are automatically scaled in order to fill their allocated space, avoiding any overlapping issues. The Collection section features two buttons at the top, which allow the player to filter the paintings based on expert-provided categories (*Category* button), and to submit their wall and finish the editing process. The Wall section, to the right, is where paintings from the collection are placed. The wall in this prototype stretches left and right, and players can scroll to the left or right by dragging on the wall's empty space (i.e. section not covered by paintings). Paintings can be moved, from the Collection to the Wall, by tapping on a painting once, to select it (Figure 2-23). The selected image is then scaled to its correct dimensions, relative to the wall, and is left hovering over the other paintings still in the Collection (Figure 2-23). The re-sized selected image can then be dragged across to the Wall and dropped in place. As it is being dragged, the selected painting will be highlighted in red when its position would be invalid or overlap an existing painting. Dropping a painting in invalid positions will result in the painting returning to their previous position, back in the Collection or on the Wall (Figure 2-24). Different groups of paintings can be displayed in the Collection by selecting different categories (Figure 2-25). Finally, submitting or finishing the editing process will take the user on to the Vanity screen (Figure 2-26).

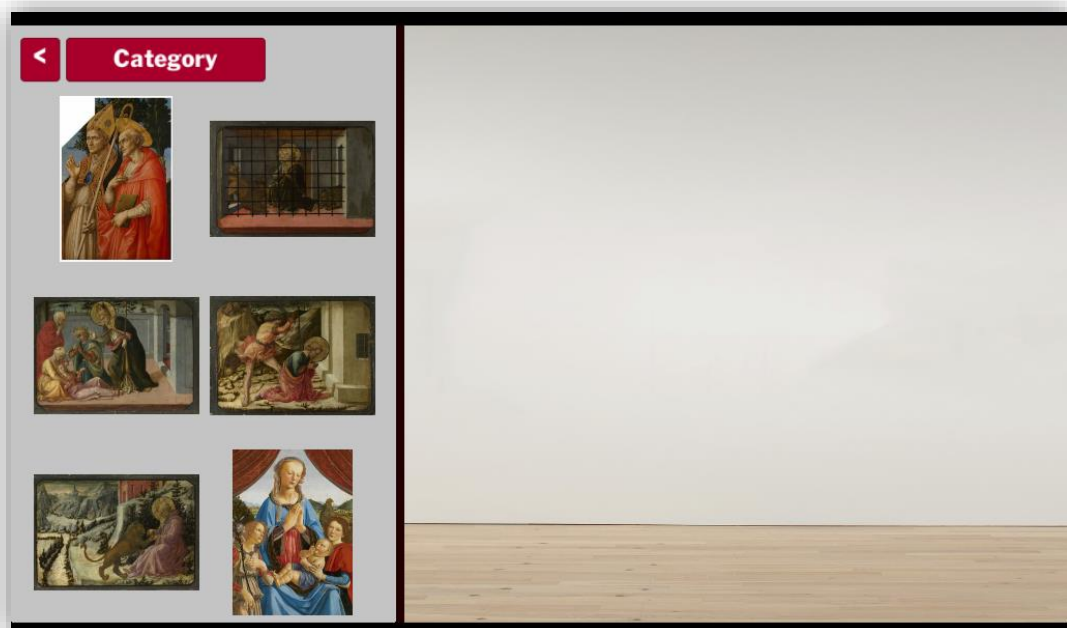


Figure 2-22. Edit screen at the start of the editing process.

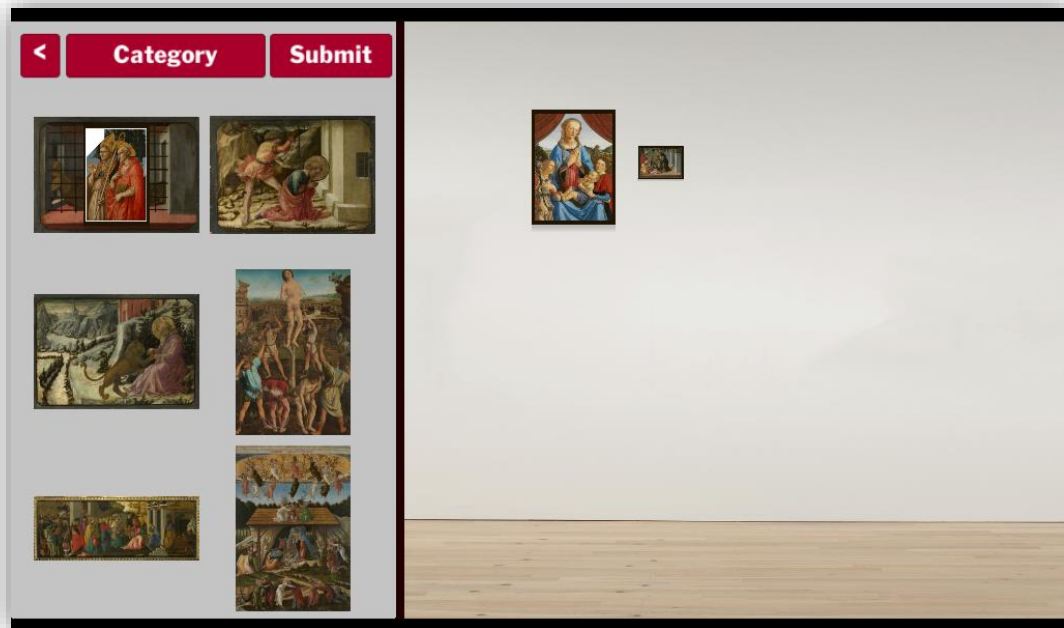


Figure 2-23. Adding a painting by first tapping on it from the collection, which ‘pops’ it out and scales it to the correct relative dimensions (left).

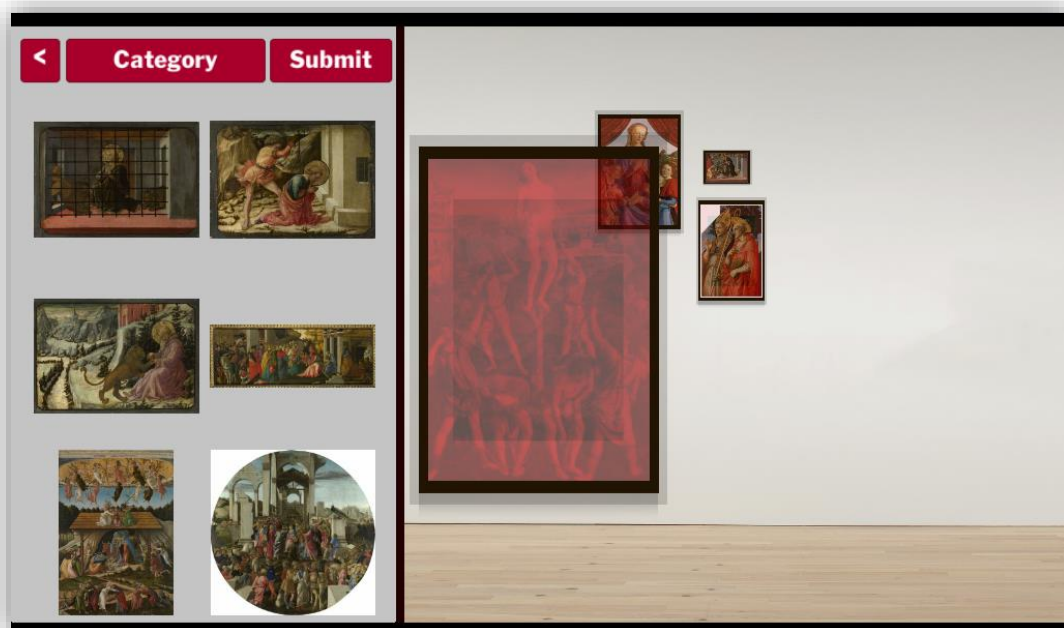


Figure 2-24. Cues for collision (red). If the user leaves the painting there, it will revert to its original position (in this case, move back to the Collection section).



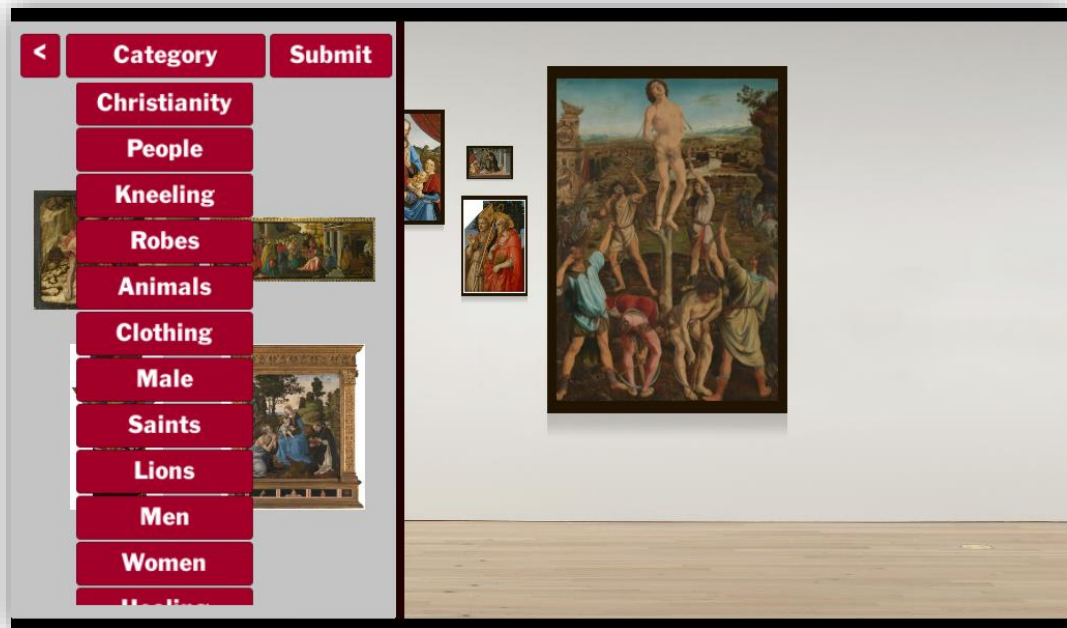


Figure 2-25. The user can filter the Collection section based on predetermined categories.

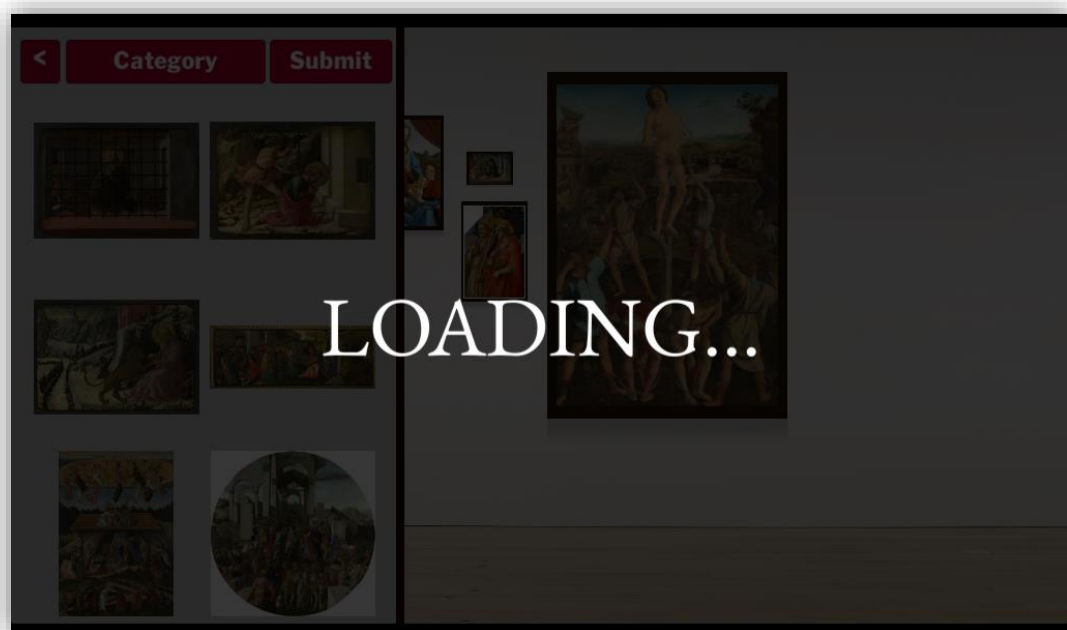


Figure 2-26. The user has clicked on the Submit button, and is moved to the Vanity screen.

### 2.2.2.3. Vanity screen

This screen shows a larger version of the wall, after the user has finished editing it. It also notifies the user of any reward or achievement badges collected as a pop-up menu. Four buttons allow the user to view previous creations (*Gallery* button), start again (*New* button), navigate back to the editing screen (*Edit* button), or to save the wall to the user's Gallery (*Save* button). The vanity

screen is shown also for the existing walls in the gallery: in that case, the “new” option is replaced with an option for the user to “delete” that entry in the Gallery.

The badges button, off to the left, creates a pop-up window (disabling all other game UI elements) which shows which badges, if any, the player has collected while creating this wall. Badges currently implemented feature a few challenges such as covering at least 50% of the wall, having paintings from all categories, or having paintings from the same category. More badges are planned based on user and curator feedback.

The save button creates a pop-up window (disabling all other game UI elements) where the player can give a title and a short description to their wall, using the device’s keyboard and auto-correct elements. Giving a title is intended to prompt reflection from the user to identify (and verbalize in a concise way) what criteria they used to associate paintings on the wall, generally or spatially (e.g., which painting is next to which). This is an unstructured reflective process, which is not mandatory but recorded data will be tested for the quality of titles collected and based on the evaluation protocol used to assess reflection. At this time it is not possible to view the recorded titles and descriptions, but this functionality will be added during the next stage of development.

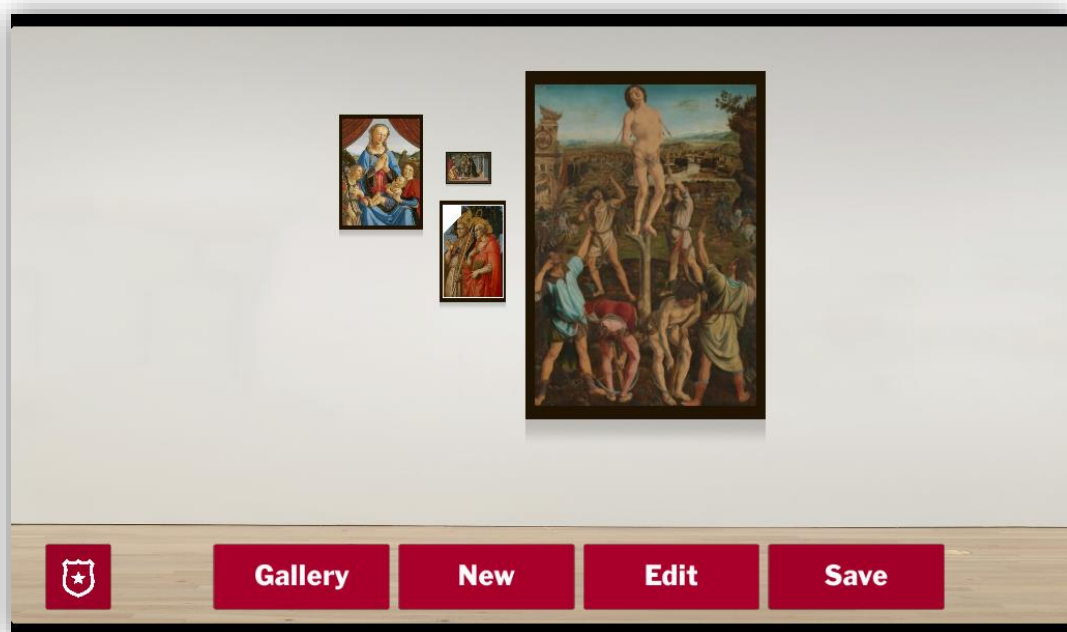


Figure 2-27. The vanity screen after the user has submitted the wall.

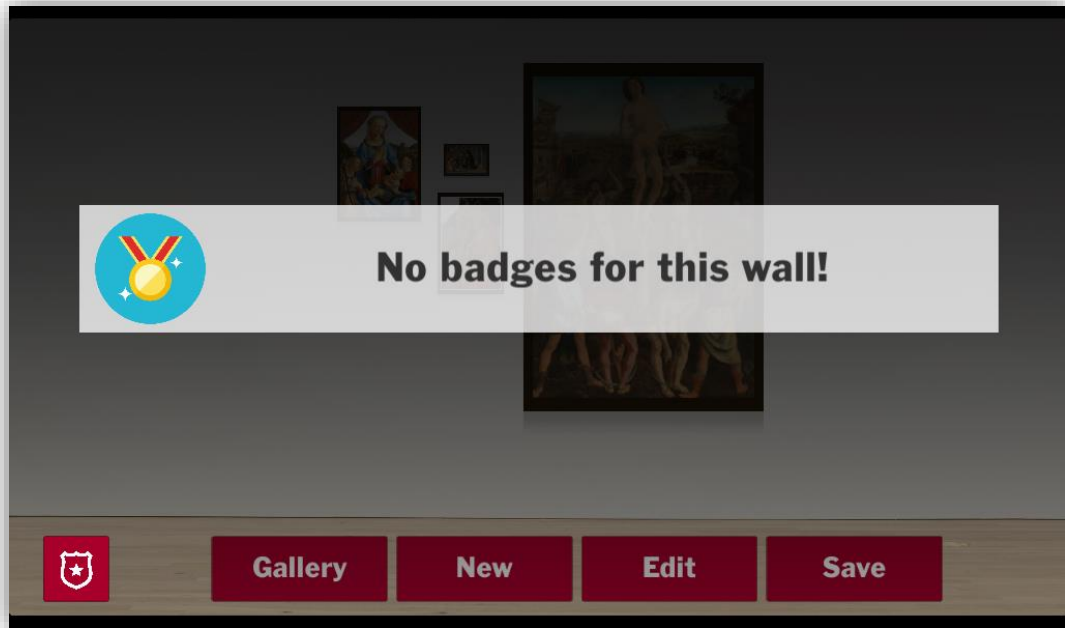


Figure 2-28. Tapping on the badges button pops up notifications of any badges the user collected by creating this wall. No other button except the badge button can be tapped at this point.

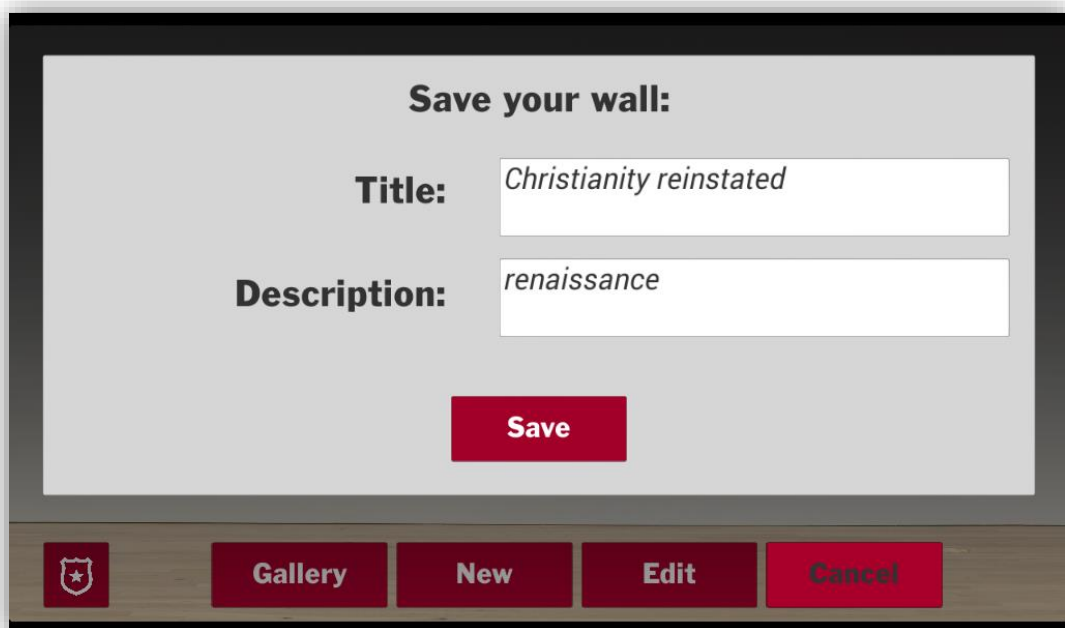


Figure 2-29. When the user taps on the Save button, they are moved to the save popup which allows them to save their wall with a title and description. This gives the opportunity to the player to reflect and verbalize what associations they used to connect the pain

#### 2.2.2.4. Gallery screen

The Gallery screen shows a list of the walls created by the user of this device. The gallery contains rows of two columns, showing the screenshot of the full wall for each creation. Tapping on the screenshot takes the player to a variant of the vanity screen above, which allows them to see the

badges rewarded by this wall, return to Gallery, delete the wall, or edit the wall. The user can only save the wall again (similar to the other variant of the vanity screen) after they have edited it.

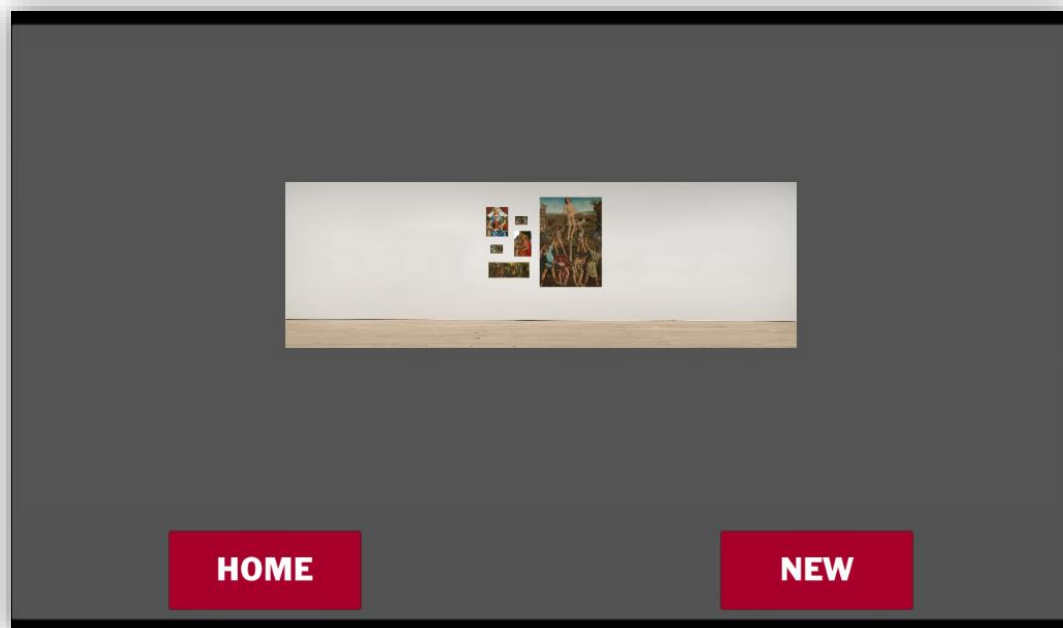


Figure 2-30. The wall has been saved to the Gallery, as the first entry created on this user's device. Tapping on the wall shown allows the user to move to a variant Vanity screen.

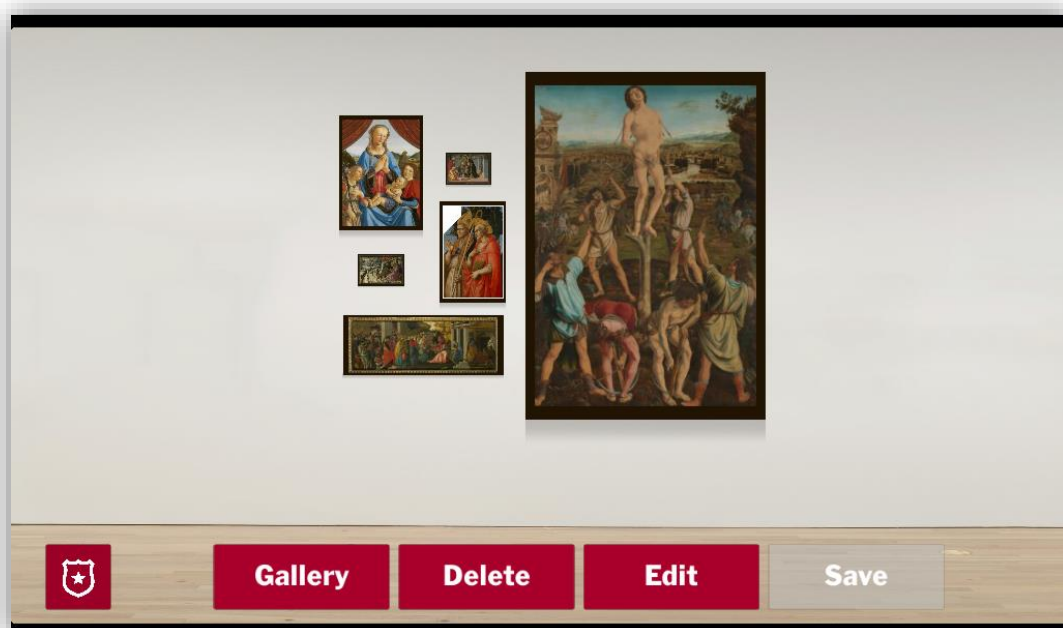


Figure 2-31. The gallery entry is shown on the Vanity screen. The user here has the opportunity to delete this wall. The save button is disabled as the user has not performed any changes to the wall already existing in the gallery.

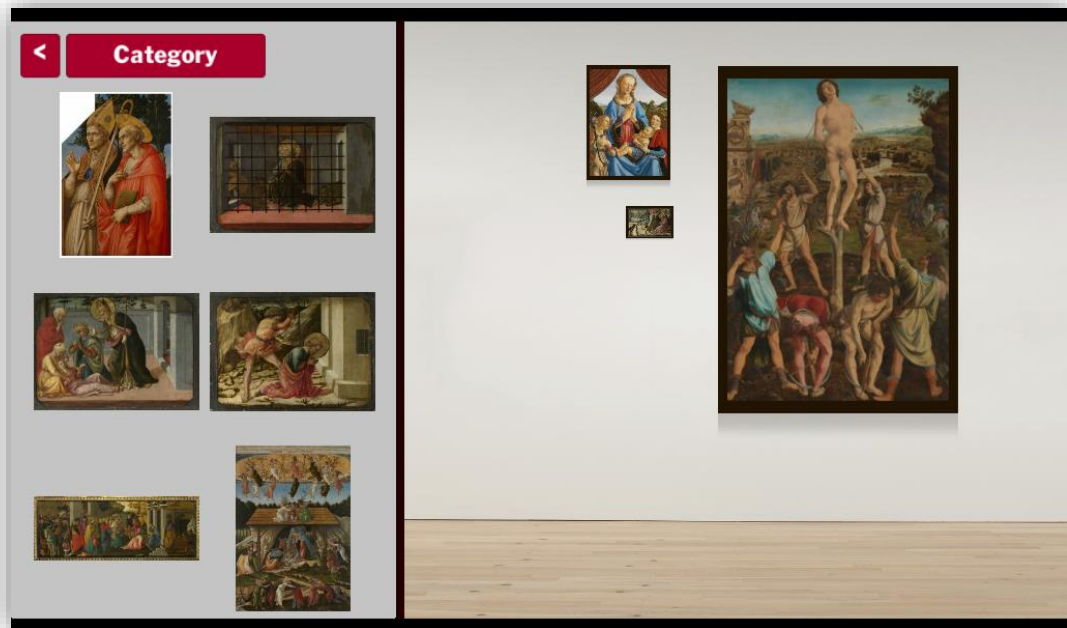


Figure 2-32. Tapping 'Edit' allows the user to add, remove or move paintings to the saved wall.

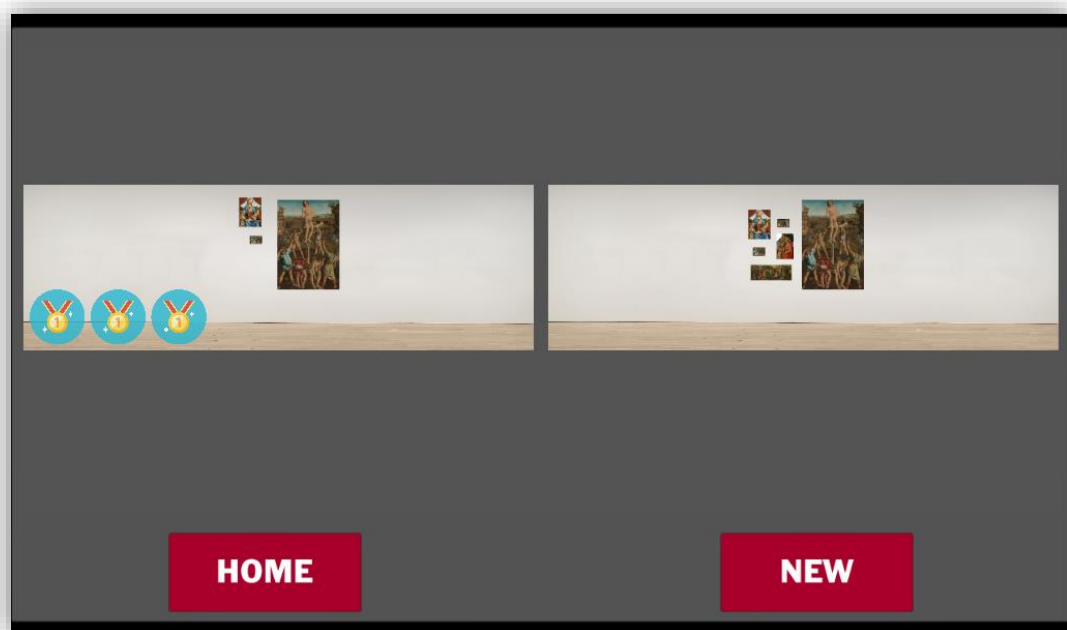


Figure 2-33. The user edited the original wall to remove some paintings while adding others, and has chosen to save it with a new title. Now both walls are showed in the gallery screen. Note that the most recent wall (left) has been rewarded with three badges.

### 3. Pilot 2: Many small venues

---

Pilot 2 connects four small venues, namely the Roman healing spa of Lugo (Spain), the Roman healing spa of Chaves (Portugal), the archaeological site of Montegrotto Terme (Italy) and the ancient theatre of Epidaurus (Greece). It aims to highlight the connections among the respective bodies of history and culture, as well as many traits of human behaviour, captured in the archaeology of the sites, that are still recognisable in our current society. This is achieved by engaging visitors in a mobile game based on the exploration and completion of graphs of relevant concepts and interconnections, extracted from the CrossCult knowledge base. Some concepts in the graph appear blank, and the players will have to fill them in by selecting the correct answer from a set of choices. The sets of choices will be adapted to the (individual or collective) profiles of the players, based on levels of knowledge. The game consists of several rounds, each focusing on the connections related to broad topics –in the prototype experience, these are titled “*When and where*”, “*Human settlements and water*”, “*Health and cult*”, “*Pilgrimage and communication routes*” and “*Material culture*”. The game may be played individually or in groups, with or without live competition against other teams (from the same venue or different venues).

#### 3.1. The app in relation to Deliverable 2.1

The app released with D5.1 implements most of the features announced in D2.1, including the following:

- Login and automatic venue identification by geolocation.
- Management of experiences, both for individual players and groups.
- Presentation of venues with interactive maps and galleries of images and descriptions.
- User profiling via questionnaires.
- Formation of groups (via invitations) and team recommendations.
- Live chat among team members.
- Interactive graphs of connections with various navigation aids.
- Galleries of images and descriptions linked to nodes of the graphs.
- Multiple-choice questions linked to nodes of the graphs, with mechanisms to communicate choices within the teams in order to ensure coherent views.
- Interfaces to display user and team scores, and to crowdsource comments that can be rewarded as additional points.

During beta tests and final content preparation efforts, the following features were added:

- Interfaces to get quick feedback about reflection points after each round of the game. These are intended to avoid all the reflection to happen at the end of the game, which might require much longer than the time the users were expected to remain in the app.
- Displaying stories linked to the rounds of the game. Each round can have a short story delivered before and/or after the users have played with the graphs of associations. These are intended to increase cohesion of the experience contents, providing a thread that takes the user smoothly through the successive reflective topics.

As an important aspect of implementation, it must be noted that the app has been written in a way that all the content of the experiences is defined externally, in JSON files that can be created with



an existing frontend tool (see D4.2, “*CrossCult frontend toolset – First version*”). That tool can be used by experts to browse associations captured in the CrossCult knowledge base, to add new links, to define the reflective topics and the corresponding stories and reflection points, etc.

Finally, the following features announced in D2.1 have been discarded or postponed:

- The use of micro-augmentations has been postponed, pending further analysis of when and where they can be displayed. The asynchronous character of these notifications sometimes interfered with the synchronicity of the team games (e.g. by revealing the right answers to some questions in times they should remain secret).
- The support for map-based and timeline-based questions has not been implemented yet, because the preparation of the contents for the prototype experience did not identify any opportunity to use them.
- The features to meet experts after the experiences have been postponed to the stage of uncontrolled experiments. Likewise, playing in open, public rooms that require venue staff to control the sequencing of the app screens will be realised in a later stage, since it demands a dedicated frontend tool for those staff –no changes to the app will be needed, though.
- The personalization features aimed at selecting contents to display according to the results of individual/team profiling require further testing, to work properly in combination with the adaptation to the context feature of which venue the player is visiting.
- Support for internationalization (app and contents offered in multiple languages) will be fully implemented as controlled experiments are conducted in the different countries involved. By the time of releasing D5.1 there is some support in place, but the actual translations of the pilot experience into Spanish, Portuguese, Italian and Greek have not been produced.

### 3.2. Sample scenario

The following scenario shows an execution of the Pilot 2 app that is very close to the activity diagram included in D2.1, involving small groups of users. The only significant differences are the following:

- The team formation process has been streamlined to be clearer from the users’ point of view, involving fewer steps and taking shorter time.
- The presentation of stories and reflection points along with each round of the game as not foreseen in D2.1.
- Interactions with social media (apart from logging in via Facebook) have been postponed as explained above.

It is worth noting that, in addition to the scenario of several users playing in a private room, the app already supports individual gameplay, as well as playing in open rooms managed by venue staff.

#### 3.2.1. Log in

The first screen of the app asks the user to log into the CrossCult platform, for which he/she can create/use a CrossCult account or proceed via an existing Facebook account (Figure 3-1).





Figure 3-1. When first using the Pilot 2 app, the user is faced with the log in screen.

### 3.2.2. Listing available experiences

Once the user has logged in, the app greets him/her, finds his/her location by the geolocation mechanisms of the mobile device and displays a list of the experiences offered in the venue he/she is visiting (Figure 3-2). Different experiences can develop different topics, in relation to different sets of venues around Europe.

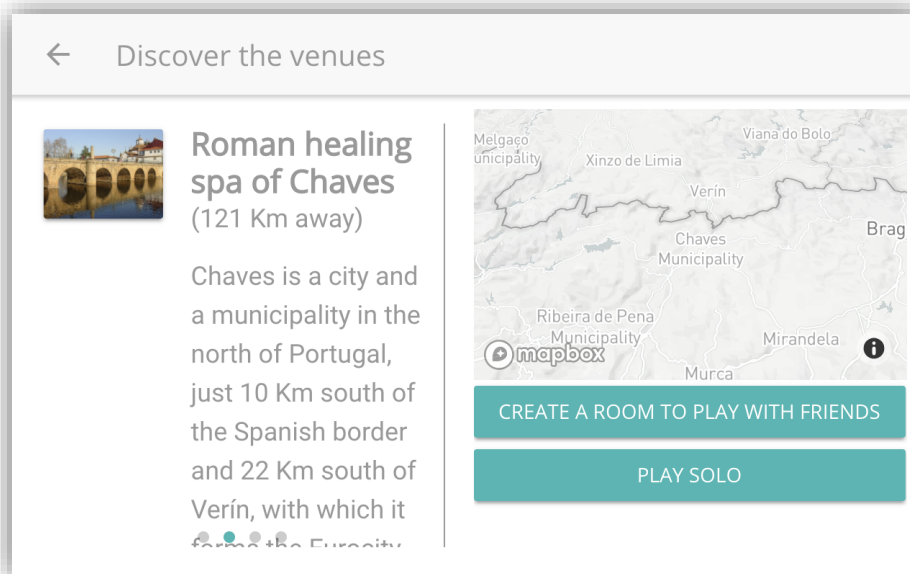


Figure 3-2. The list of experiences available in the venue is offered as the entry point to the app.

Clicking on the button of an experience takes the user to the next screen. The buttons are disabled in the meantime that the app establishes all necessary connections with the CrossCult platform.

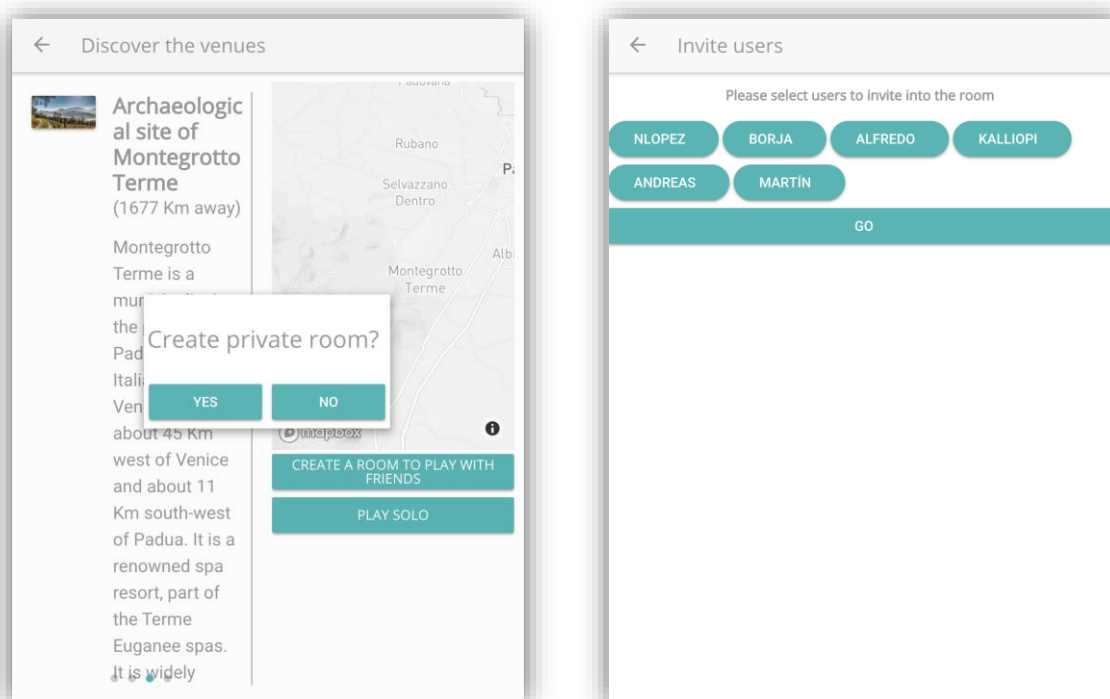
### 3.2.3. Introducing the venues and preparing individual/group games

When the user has chosen one experience, a screen appears that displays some information about the venues involved (including their distance to the user in Km), along with an interactive map that shows their locations (Figure 3-3). On this screen, there are buttons for the user to choose whether he/she wants to play the game with a group of people, or alone.



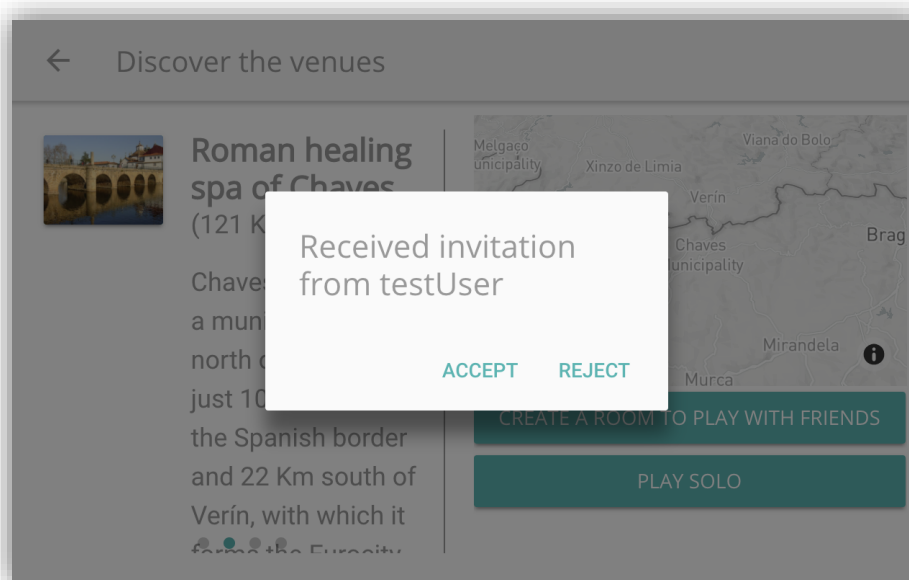
**Figure 3-3. The venues are presented by textual descriptions and galleries of images; they are placed on an interactive map and the user can select whether to play alone or in a group. The user's distance to the venue is calculated and displayed, too.**

If the user wants to play in a group, he/she is first asked to confirm the decision to create a private room. Then, a new screen appears in which the user can see a list of the people who have entered the same experience, but not yet started an individual or group game (see Figure 3-4 next page).



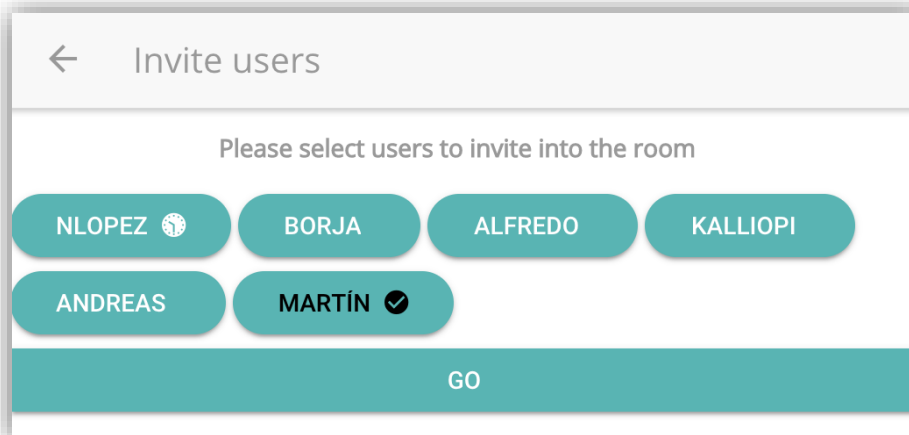
**Figure 3-4.** If the user chooses to create a room to play in a group, she gets a list of the people who can be invited to join.

Clicking on the buttons labelled with the names of other people interested in the experience, the creator of the private room can choose who to invite into it. The invited users will see a pop-up displayed on their screens, offering the option to accept or reject the invitation (Figure 3-5).



**Figure 3-5.** An invitation popping up on the screen.

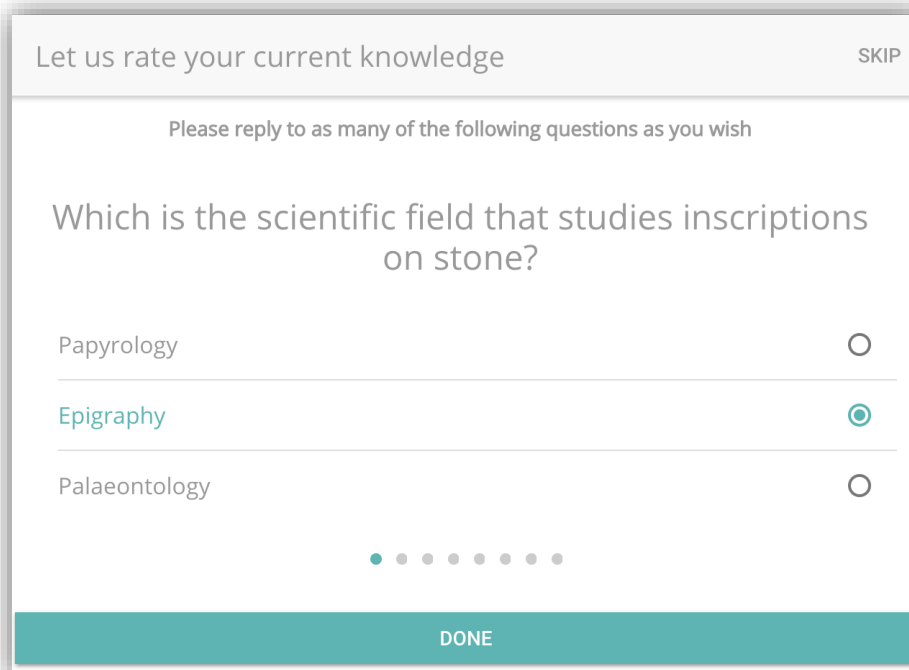
The inviting user can see a live update of whether the invitations are still pending, or whether they have been accepted or rejected (Figure 3-6). The user can proceed when at least one invitation has been accepted and there are no pending ones.



**Figure 3-6.** The status of the invitations is updated live: a clock denotes the pending invitations (those users can be uninvited by clicking the corresponding buttons), and a check mark denotes the confirmed users (these cannot be uninvited). If the user who created the room wants to.

### 3.2.4. Profiling via questionnaires

When the users are going to participate in a game have been decided (either one player only in solo mode, or a group of players not yet arranged into teams), a questionnaire appears on screen to assess their current knowledge. The outcomes will drive the recommendations to form teams and the presentation of contents in the game. If the user clicks the “Done” button, his/her replies are submitted to the profiling component of the CrossCult platform; otherwise, if he/she presses “Skip”, then the questionnaire is skipped and a default user category will be assigned.

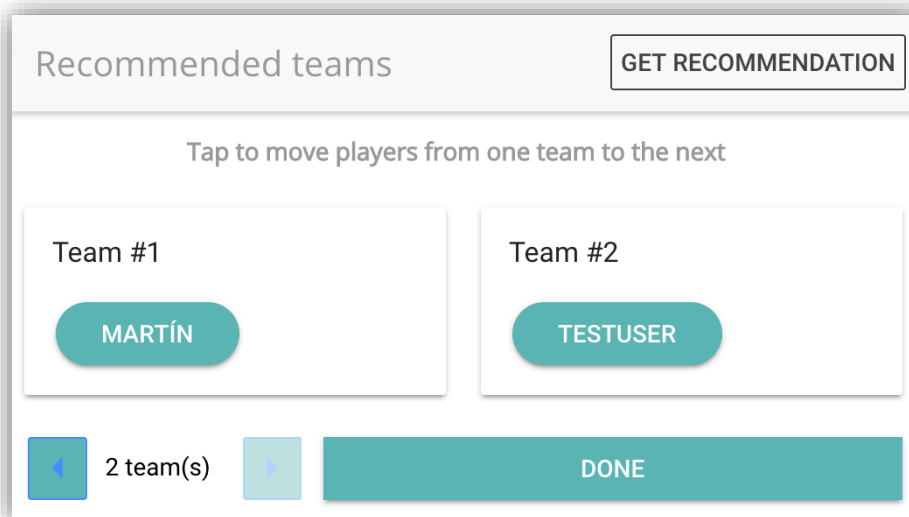


**Figure 3-7.** A quick multiple-choice questionnaire is used to rate the users’/teams’ level of knowledge about the topics of the experience.

### 3.2.5. Organisation of teams

When all users are done with the profiling questionnaire, the room leader gets a recommendation to form balanced teams, which he/she can modify at will (Figure 3-8). First, he/she can fix the number of teams, between 1 (minimum) and as many teams as players (maximum). Second, by clicking on the names of the users, he/she can move them from one team to another. At any time, the user can ask the CrossCult platform for a recommendation to form teams according to the criteria indicated in the JSON file that describes the experience.

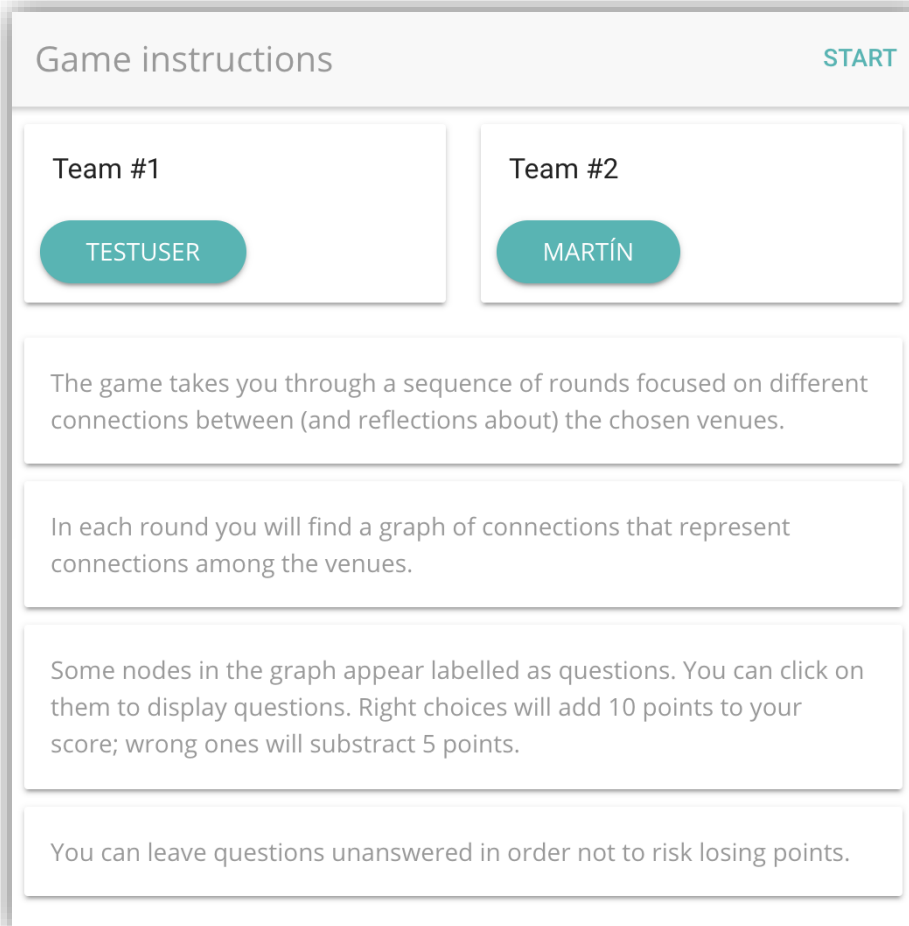
The user who created the room can move on to the next stage when the team compositions have been decided, and the app only makes sure no team is left empty.



**Figure 3-8.** The user who created the room can ask the CrossCult platform for a balanced distribution of users into teams. He/she can also change the number of teams.

### 3.2.6. Game instructions

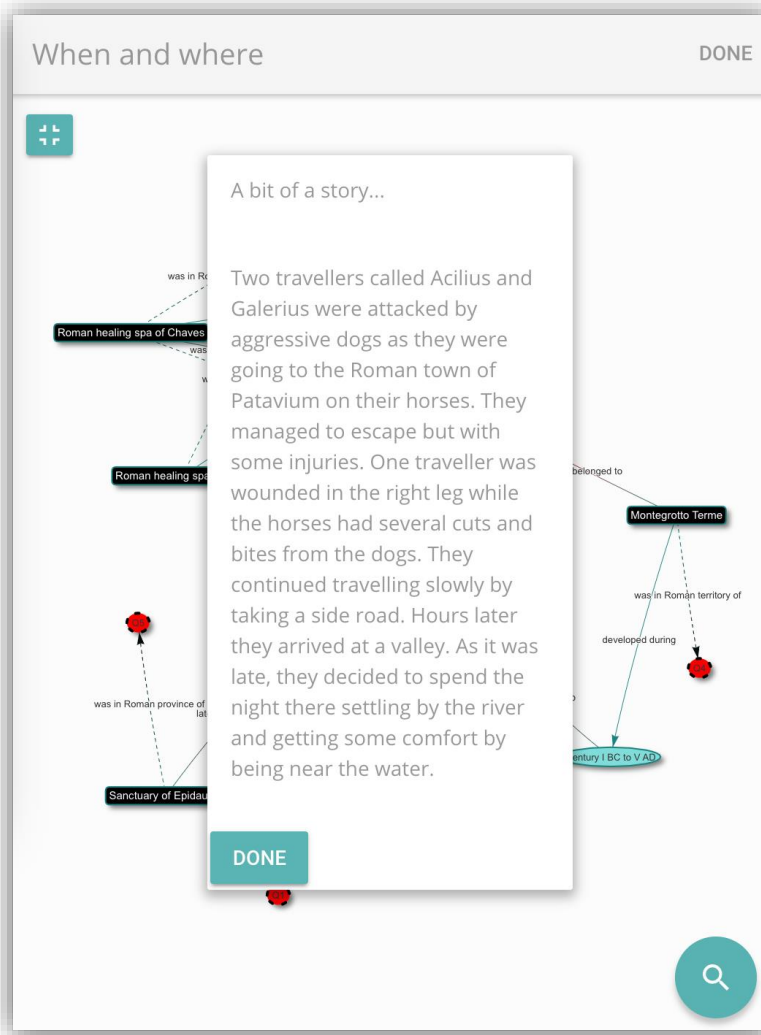
The next screen simply provides some instructions before starting the rounds of the game (Figure 3-9). In case of group play, this is where the final composition of the teams is presented to everyone.



**Figure 3-9. Presenting the composition of teams (only in group experiences) and simple game instructions.**

### 3.2.7. Gameplay

As explained at the beginning of Section 3, the game is organised in several rounds, focused on different reflective topics –in the prototype experience, these are titled “*When and where*”, “*Human settlements and water*”, “*Health and cult*”, “*Pilgrimage and communication routes*” and “*Material culture*”. Each round starts with a bit of a story that provides a connecting thread for the whole experience (Figure 3-10).



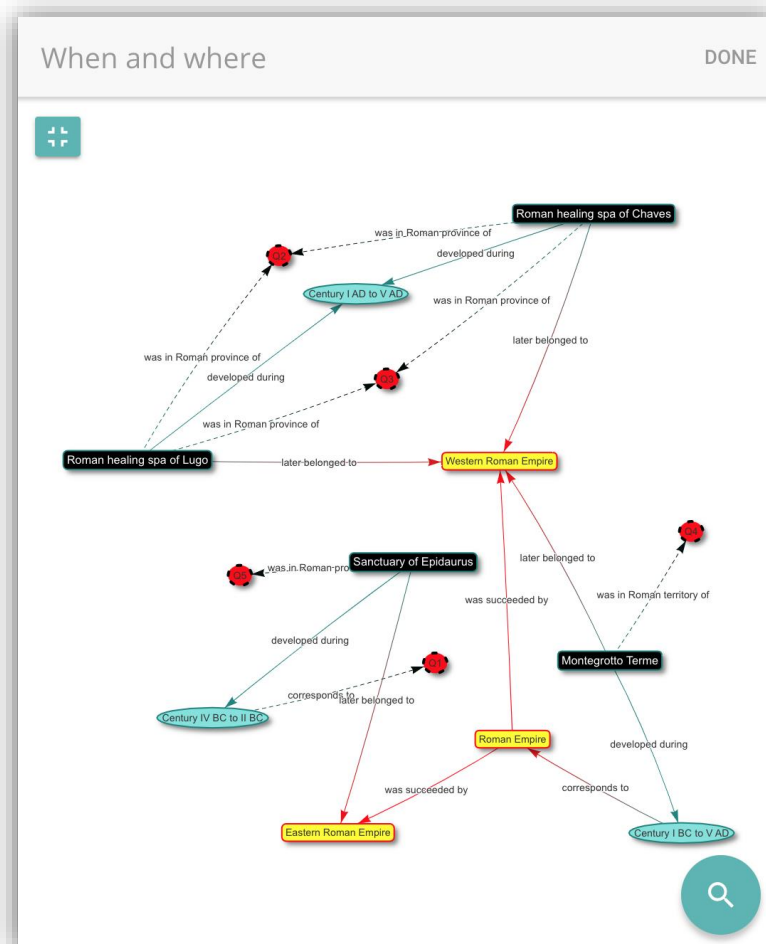
**Figure 3-10.** Short stories connecting the rounds of the game can be displayed at the beginning or end of each, as decided by the experts who designed the experience.

When the users have read the bit of story, they can proceed to explore the associations among the venues (represented as nodes with black background and white text; see Figure 3-12) through the concepts decided by the experts. Some questions appear as small red circles labelled with ‘Q’ plus a number, meaning that they contain a question. The goal of the game is to provide the right responses to those questions, either individually (in “solo” mode”) or collaboratively as a team.

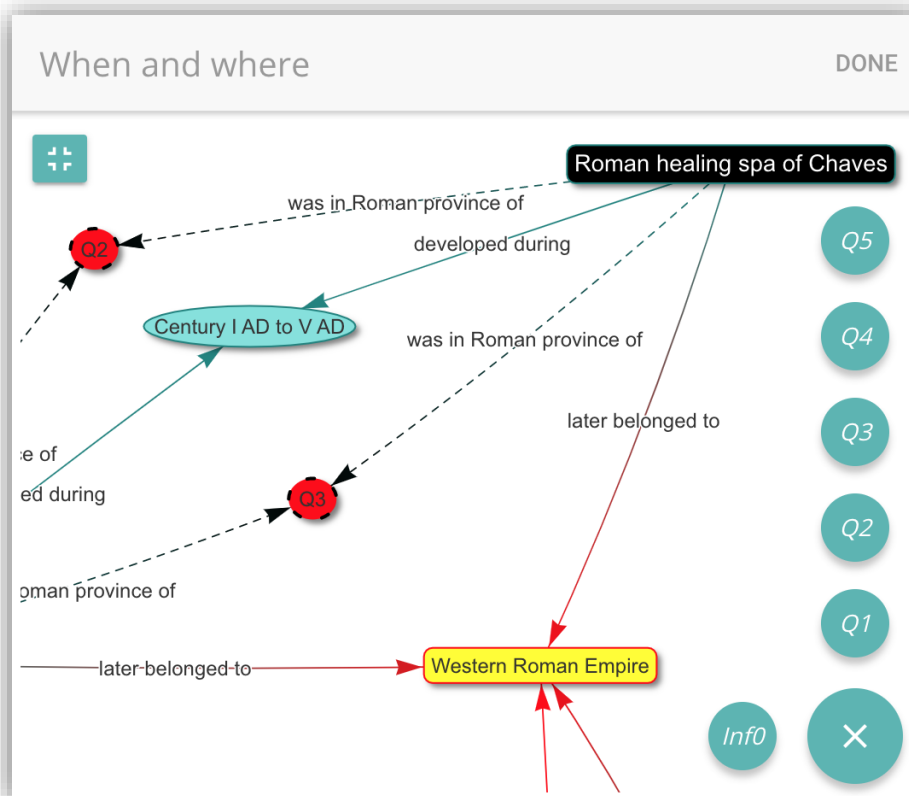


The graph can be zoomed in/out with simple gestures, and the screen displays three icons with the following functionality:

- The magnifying lens provides shortcuts to focus directly on the different questions. (see Figure 3-12)
- The cross-like icon zooms out so that the whole graph fits on screen.
- The speech bubbles show the chat screen, to allow the user to type comments to be sent to the other team members, and to read the list of messages exchanged hitherto.

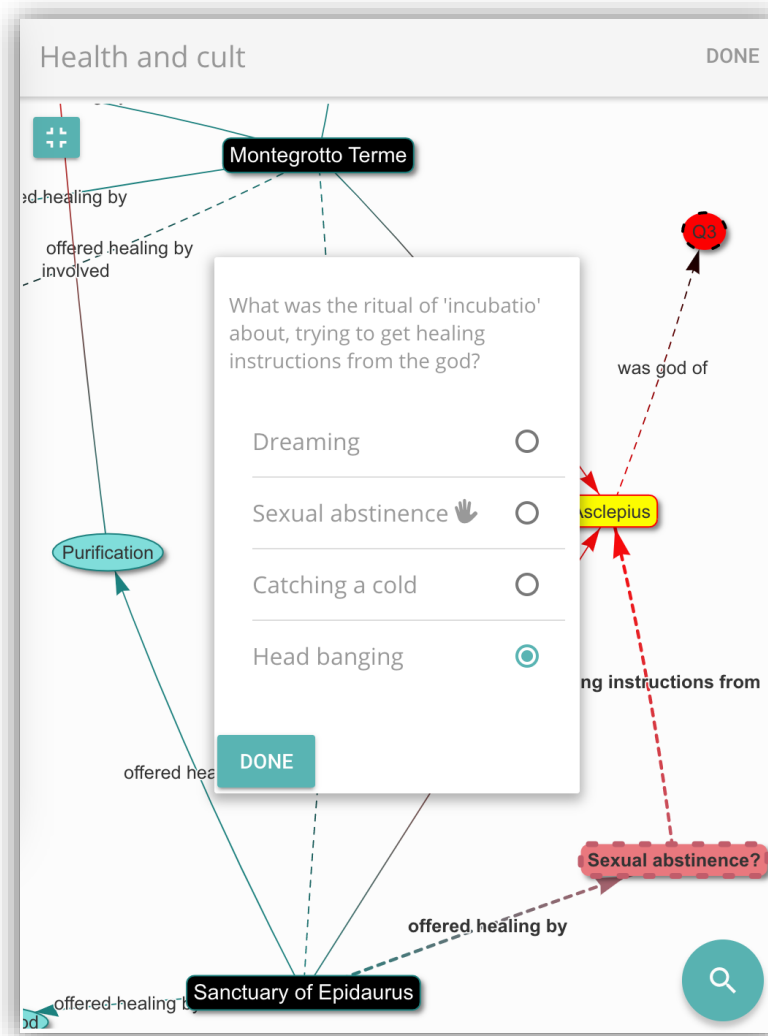


**Figure 3-11.** A graph of concepts and associations is displayed connecting the venues involved in the experience (black nodes). Questions appear as round nodes connected to the others with dashed lines. The most important concepts appear in yellow nodes.



**Figure 3-12.** The graph of concepts and associations can be zoomed in/out at will, and there are navigational aids to take the users directly to the nodes holding questions or any snippets of information related to the different concepts.

Whenever the user clicks on a 'Q' button, a pop-up is displayed showing a question title and the choices indicated in the JSON file that defines the experience (see Figure 3-13 next page). The choices previously made by the user and/or his/her teammates appear indicated with a hand.



**Figure 3-13. Displaying questions and answers provided by the user herself and (if applicable) by other members of the team.**

When all the members of a team (or the solo player) have decided to finish a round (by clicking on the “Done” button on the top right corner of the screens), they are shown the right choices to the questions they were displaying and responding to (see Figure 3-14). The score of the round is displayed, too.

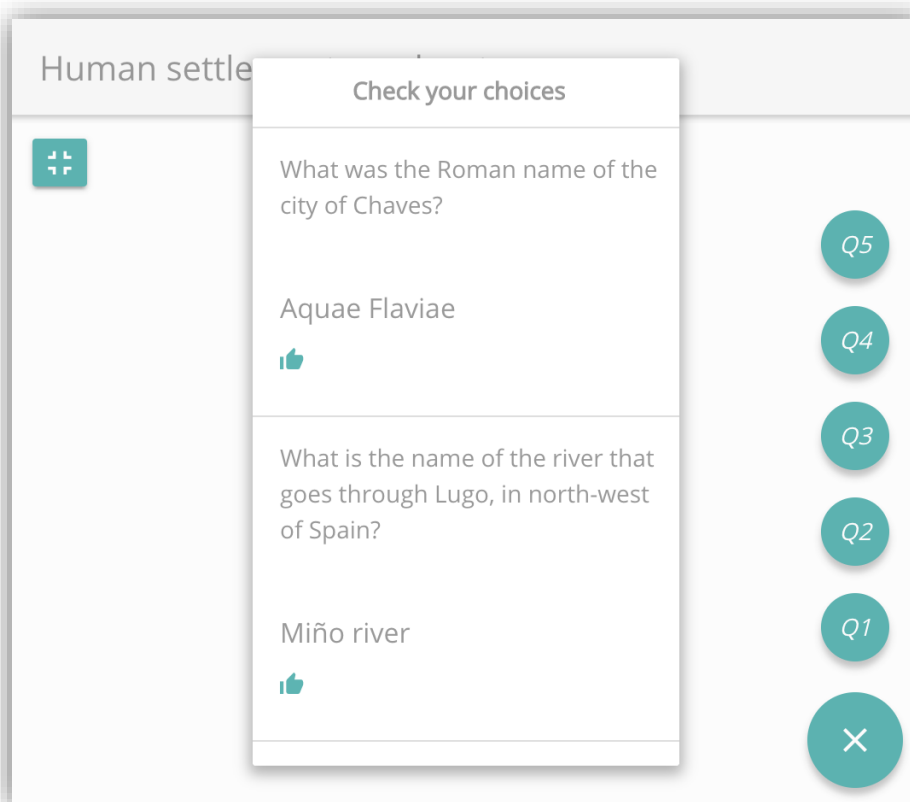


Figure 3-14. Displaying questions and answers provided by the user and (if applicable) by other members of the team.

### 3.2.8. Rounds of reflections

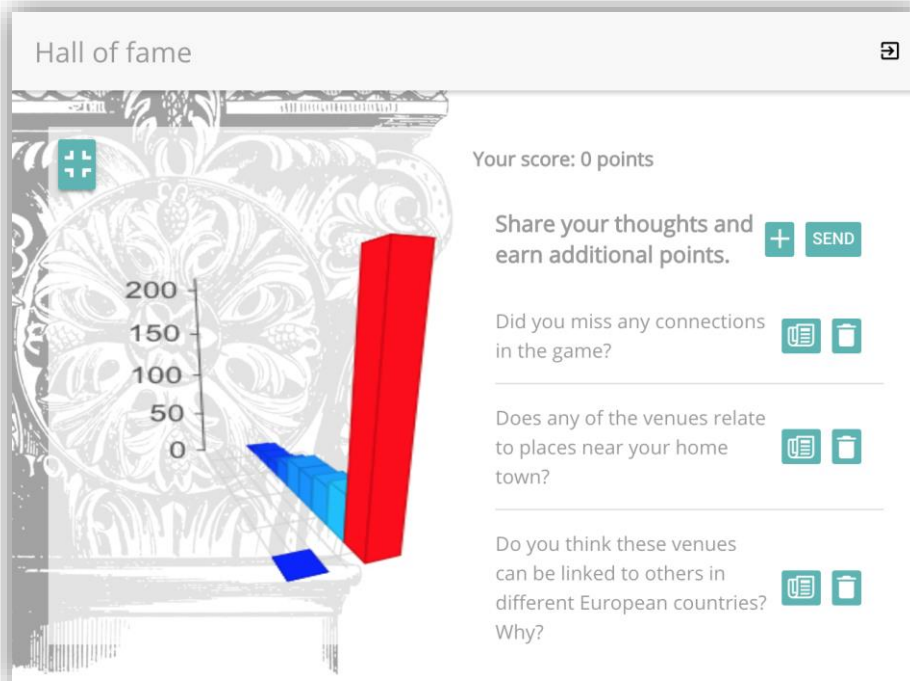
Following each round of the game, the players can provide quick feedback about brief textual facts chosen by the experts who designed the experience, aiming to deliver clear messages related to the concepts included in the graphs of associations (Figure 3-15). The players can click on five emoticons to convey one of the following messages: “*That’s good to know*”, “*That makes me think*”, “*That’s surprising*”, “*I knew it already*” and “*Who cares!*”. When they all have clicked the “Done” button, they can proceed to a new round of the game, or to the last screen if they have been through all the rounds already.

The screenshot shows a mobile application interface for a feedback round. At the top, a header bar contains the text "Some ideas to think about" on the left and a "DONE" button on the right. Below the header, a prompt reads "Please let us know what you think about the following reflection points". There are two reflection points, each consisting of a text box and a row of five emoticons. The first reflection point text is "The presence of nearby water resources has determined the existence of human settlements throughout History." and the second is "Some cities, like Lugo (and probably Chaves, too) were founded in their specific locations because of the hot springs. They were used to heal the wounds of the soldiers." The emoticons are: a smiley face, a thinking face, a surprised face, a winking face, and a face with wide eyes.

**Figure 3-15.** Asking the user for some quick feedback about selected historical facts. The experts who design the experience can include a gallery of visuals to be displayed along with each fact, e.g. involving archaeological items from any of the venues involved.

### 3.2.9. Hall of Fame and final comments

In the end, the users are shown how their individual/group scores qualify in the Hall of Fame computed globally (i.e. including the players from all the venues) for the experience (Figure 3-16). On the same screen, they can provide comments about new connections to win additional points, which are automatically updated, in a way that the Hall of Fame acts as an incentive to crowdsource knowledge. The comments will be fed to the crowdsourcing components of the CrossCult platform for proper validation, to ensure that foul language is filtered and only constructive comments are rewarded with points.



**Figure 3-16. While visualizing the score attained by the user/team in the game, they can post comments about additional connections and get additional points in reward.**



## 4. Pilot 3: One venue, non-typical transversal connections

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Pilot 3 is implemented at the Archaeological Museum of Tripolis, Greece. This is a small museum with low visitor numbers although there are some very interesting items housed here. Pilot 3 aims to present Greek ancient history from a different angle than that of other archaeological museums. It aims to engage visitors in exploring and understanding the unexpected connections between objects in the museum. Relevant additional information is provided to encourage further exploration. The pilot focuses on the topic of women in ancient Greece, which functions as a cross-cutting topic that links many of the artefacts in the museum.

This topic differs from the usual approach to history, which focuses on major events and great characters (most often male). The topic of women reveals stories about different aspects of ancient societies. The history of women in general is a subject that has only begun to be researched recently but the conclusions remain in the hands of experts. The aim of Pilot 3 is to increase awareness and understanding among the public of the important aspects of women's role in society. Starting with women in ancient Greece, the goal is not only to increase visitor knowledge but also to stimulate reflection and interpretation using a unique combination of physical objects and digital resources.

### 4.1. The app in relation to Deliverable 2.1

#### 4.1.1. Pilot 3 app ecosystem

The current version of the pilot 3 app package, released with D5.1 features a main application and a set of companion mini games. In addition, it features also an AR application which is still ongoing work. The games are not yet connected to the app, but will be in a next release.

During beta tests and final content preparation efforts, the following features were added:

- Access for people with visual or hearing problems. For this reason, the pilot content is available in audio giving also the possibility for subtitles.
- When the user places her device looking down, the screen locks, because users might want to place devices in their pockets and only listen to the content without risking the accidental pressing of buttons. For the same reason, a lock button is also added if the person was to have it in her pocket. The screen unlocks with the button or when it is brought in the upright position indicating that the person wishes to actively interact with the device.

#### 4.1.2. Current state of the main application

The app released with D5.1 implements most of the features announced in D2.1, including the following:

- Login.
- Multilingualism: content available in Greek and English.
- Use of open historical resources linked together to facilitate comparisons with the situation of women across ancient and modern societies.
- Narratives to increase empathy have been created.
- 7 thematic tours related to women in antiquity have been created to provide personalised experiences (i.e. daily life, social status, education, religion and rituals, names-animals-myths, mortality-immortality, appearance).
- Visitor profiling before the cultural experience through games.

- Micro-blogging is implemented but not yet connected to the app (to be done before open experiments), in order to function as a visitor's book and to gather new, subjective interpretations of history. There is also the possibility to connect to social media such as Facebook and share, like and discuss content and reflections.
- Enhanced content is ready to enrich the physical exhibits of the museum with objects from museums and sites around the world, and other digital resources.
- Enhanced content follows a specially designed methodology (by educators, psychologists and historians) to increase reflection. Reflection prompts are used frequently during the experience (balanced use of prompts to avoid overload and possibly reverse results).
- Micro-augmentations of experience are already implemented. When the user device remains inactive for 5 minutes, a vibration draws the user attention to content that is tour-specific (and not exhibit-specific) designed to trigger motivation and increase interest and participation.

#### 4.1.3. Current state of companion games and applications

360° views of real locations are produced and museum objects can be projected on them, in an AR application. The content is ready, however due to poor lighting conditions in the museum and results from initial testing, we now investigate alternative ways to read the objects than only object recognition. By the time the pilot is available for public testing, the AR features will be in place.

Mini games for Pilot 3 are implemented. Out of what was planned, three are implemented (and minor changes still remain), whereas one is also tested with users to evaluate its profiling value.

### 4.2. Sample scenario

In the following, usage sample scenarios and details of the screens are given for the mini games and the main Pilot 3 app.

#### 4.2.1. Mini games

“Who is your guardian Goddess?”:<sup>1</sup> This is a game for profiling but will also work as an *advergame* in social media. The following screenshots show the starting screen, some game screens and some results screens of the quiz game (Figure 4-1, Figure 4-2, Figure 4-3).



Figure 4-1. The initial screen of the game “Who is your guardian Goddess?”.

<sup>1</sup> <https://ccdev.uop.gr/anthroponymy/Game1/>

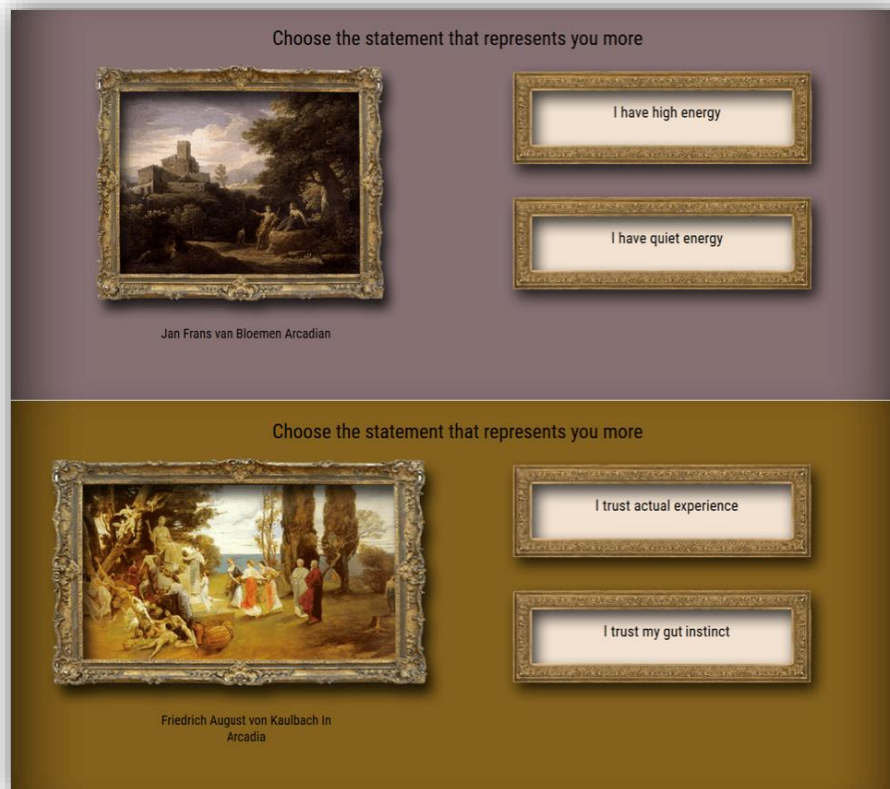


Figure 4-2. The user goes through a number of quick questions to build a profile and get to know her guardian Goddess.

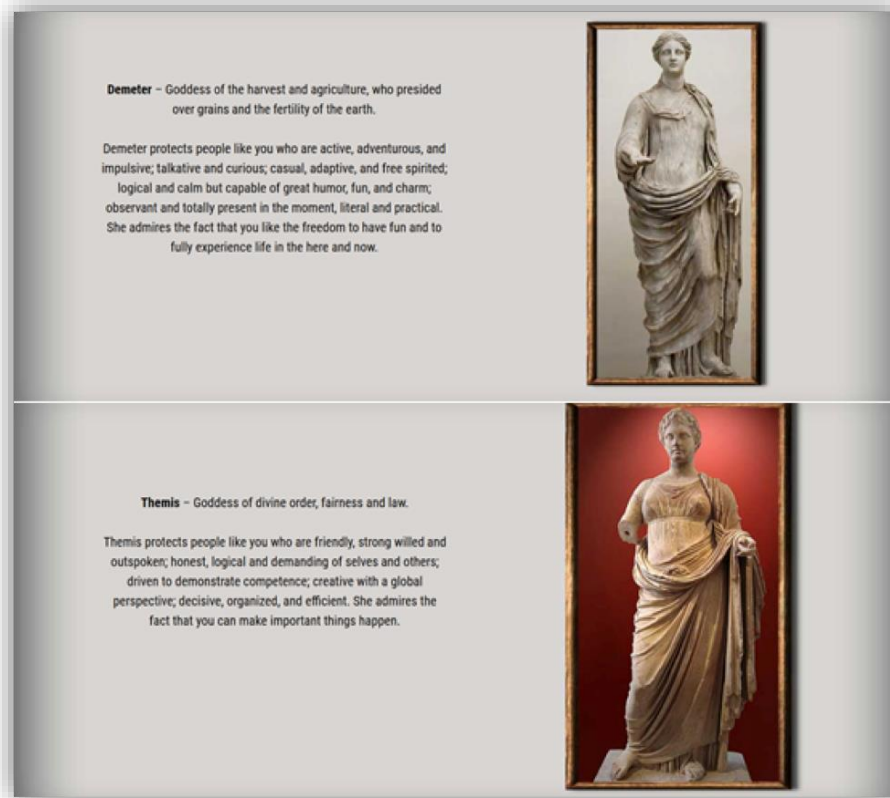


Figure 4-3. After replying to all the questions, the user discovers her guardian Goddess.

“Your face on a statue”:<sup>2</sup> This game works both as an *advergame* and as a reminder of the visit that visitors can use after their visit to show that they had this cultural experience and possibly use it as a profile photo in social media. The following screenshots are from the game (Figure 4-4, Figure 4-5, Figure 4-6).

<sup>2</sup> <https://ccdev.uop.gr/anthroponymy/Game3/>

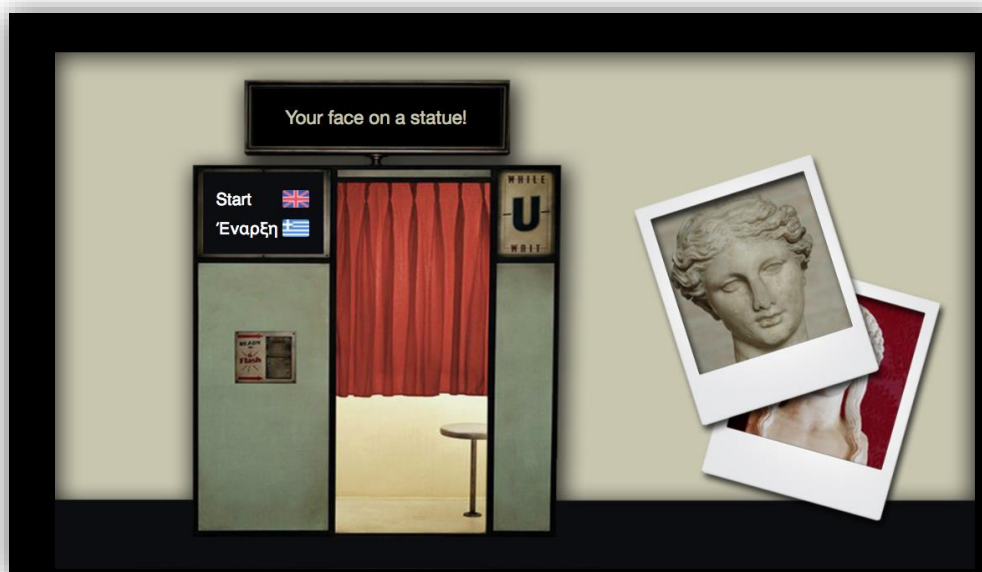


Figure 4-4. The initial screen of the game “Your face on a statue”.

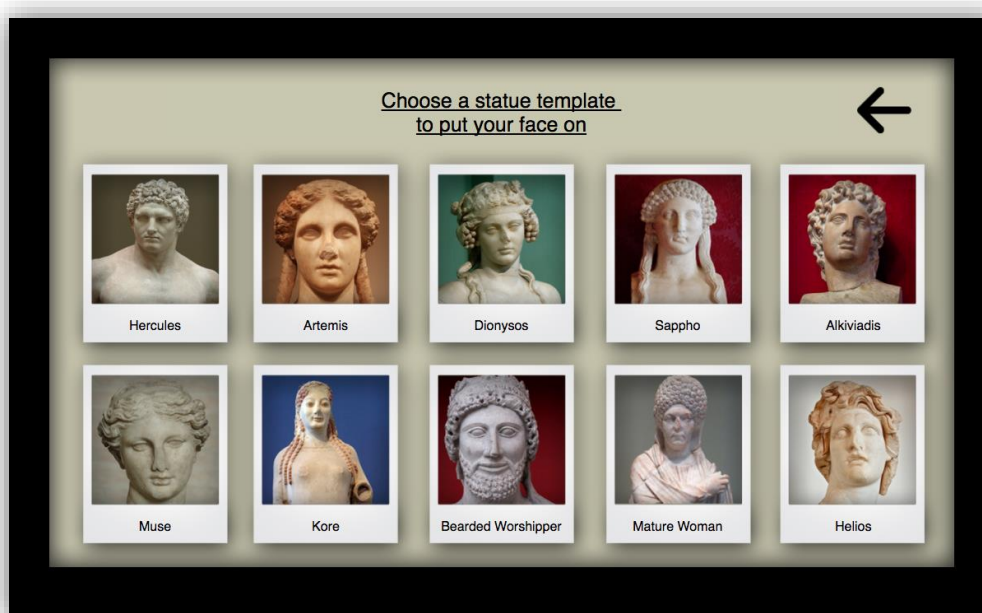


Figure 4-5. The gallery of statues available in the game.

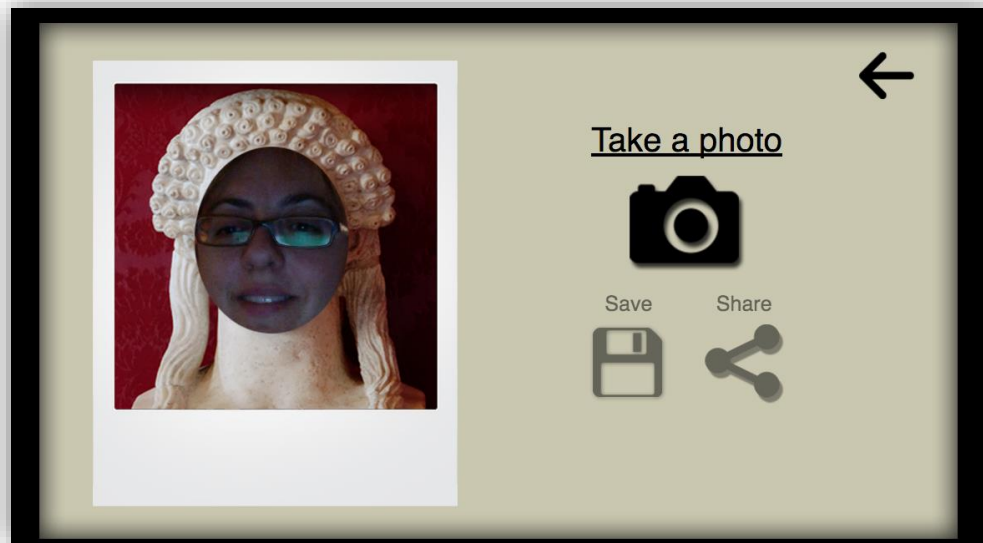


Figure 4-6. The resulting picture with the user's face on the statue of Sappho.

“Your status in ancient society”:<sup>3</sup> This is again a profiling game similar to “Who is your guardian goddess”. It was designed as an alternative title to “Who is your guardian goddess”, since we observed that men seem to avoid this title and preferred the title “Your status in ancient society”. The following screenshots are from the game (first screen -Figure 4-7, one quiz screen -Figure 4-8, and a results screen -Figure 4-9).

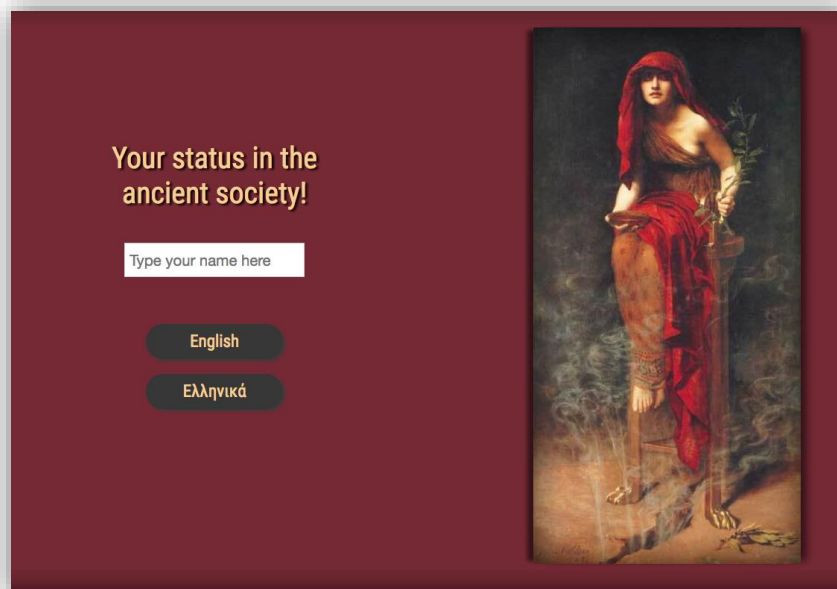


Figure 4-7. The initial page of the game “Your status in ancient society”.

<sup>3</sup> <https://ccdev.uop.gr/anthroponymy/Game4/>



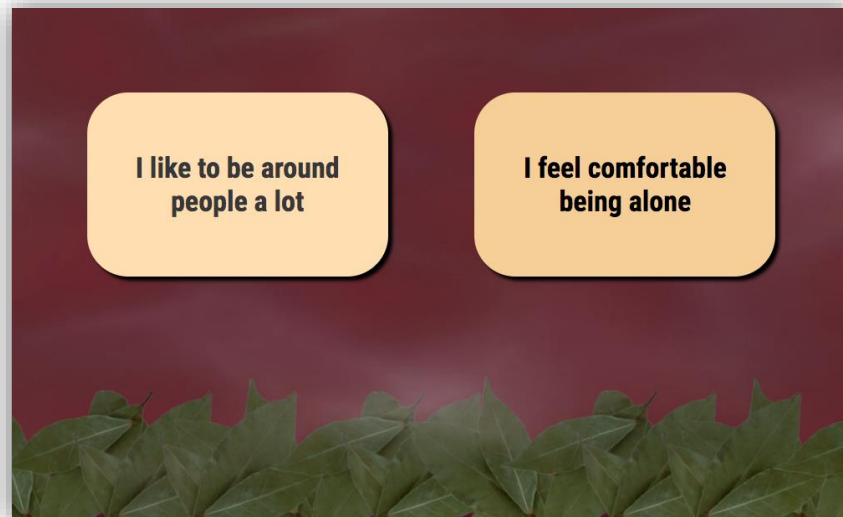


Figure 4-8. The user goes through a number of quick questions to build a profile and get the matching role in ancient society.

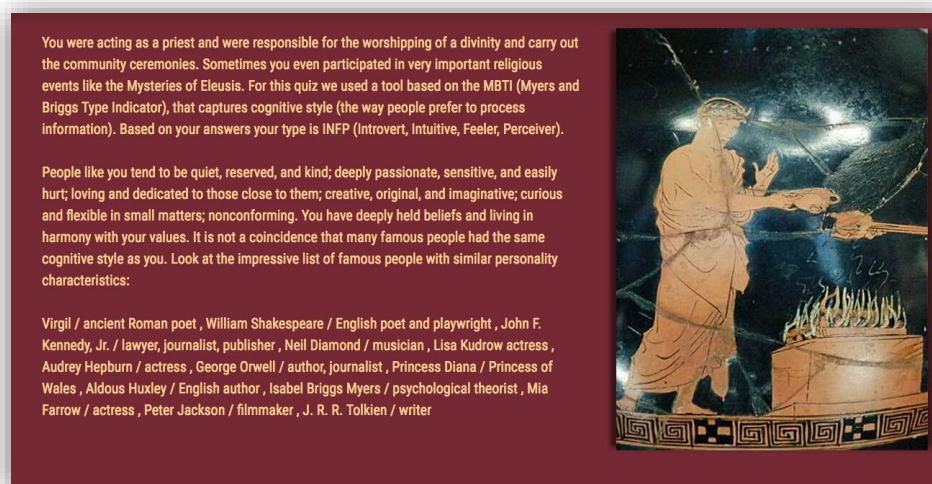


Figure 4-9. After replying to all the questions, the user gets to know the matching role in ancient society.

### 4.2.2. Pilot 3 Main app

The following scenario shows an execution of the Pilot 3 app. The app is designed for vertical/portrait view and not landscape, because previous testing showed that users prefer to hold devices with one hand and have the other free. A horizontal/landscape view would require the use of both hands which is not preferred by users.

#### 4.2.2.1. Starting screen/log in

The welcoming screen to the app is shown in Figure 4-10. The flag on top right can change the language from Greek to English and vice versa. In addition, the user can decide to connect as a guest or with her Facebook account.

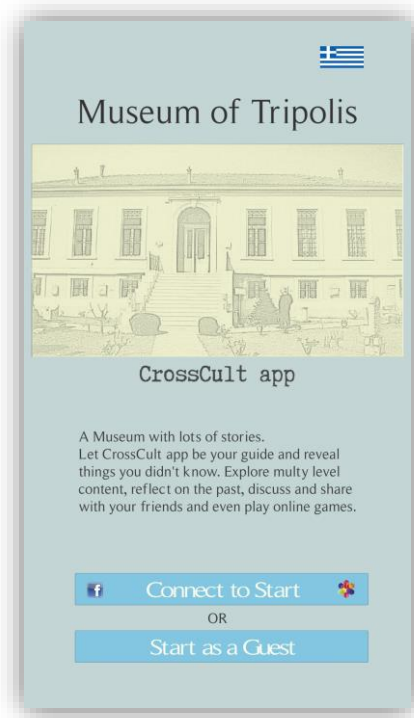


Figure 4-10. The login screen.

#### 4.2.2.2. Listing available experiences

Once the user connects, the available tours are presented (Figure 4-11). The user can select one of 7 tours, all to be seen with a scroll down. However, if the person decides to connect with her Facebook account and previously had played the mini profiling games, the tour most relevant to her interests will be presented first. This functionality is not yet implemented, since the games are not yet connected to the app. Before the public experimentation phase, the functionality will be available. In addition, the correlational study to connect museum tours and personality characteristics has been completed and the connections between profiles and thematic tours are established. Based on the significant correlations found in the study, the following guidelines will be used:

- Women have a clear preference for “social status” and “daily life”. Since the correlation is very strong, once the app knows that the visitor is female will suggest the two reflective topics first.
- If the age of the visitor is known, and because the correlation is very strong, then the reflective topic of “mortality/ immortality” will be recommended for ages 24-44.

- Introverts will not be presented with the topics of “religion and rituals” and “mortality/immortality” at the top of their menu. These will be placed at the bottom.
- “Mortality/immortality” will be presented to Extraverts as a priority choice.
- Thinkers will be presented with the topic “appearance” as a top choice.
- Young people will not see “religion and rituals” as a first choice.
- The thematic tours “name-animals-myths” and “education” will be placed in the middle of the menu, since strong correlations were not found for any of the cognitive styles.

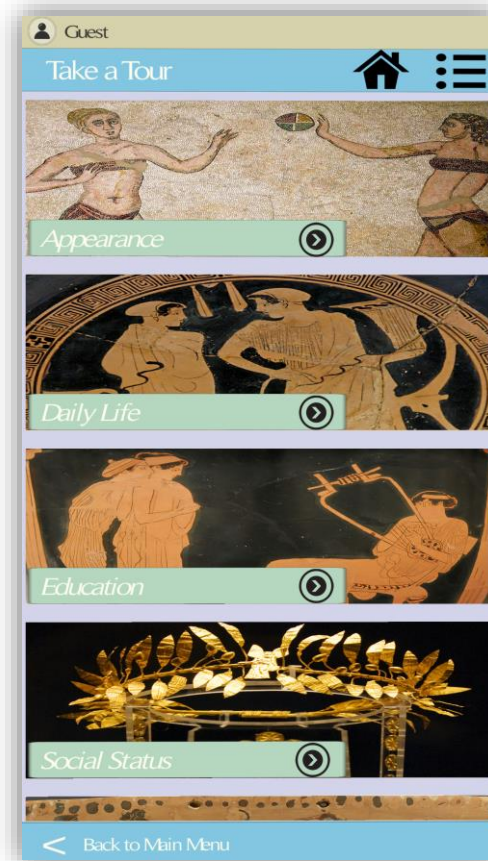


Figure 4-11. After logging in, the user is given the list of tours available.

#### 4.2.2.3. Drop-down menu

In a drop-down menu the following choices are always available to the user (see Figure 4-12 next page): The user's profile gives the user the opportunity to register with Facebook, email in case the user has used the app before, or to create a new account by using an email account. The language can be also changed and subtitles can be activated. In the settings button the user can find her profile, the audio/subtitles option, the language option, the privacy policy, terms of service and F.A.Q. Finally, through this menu the user can chose another tour to follow at any time.

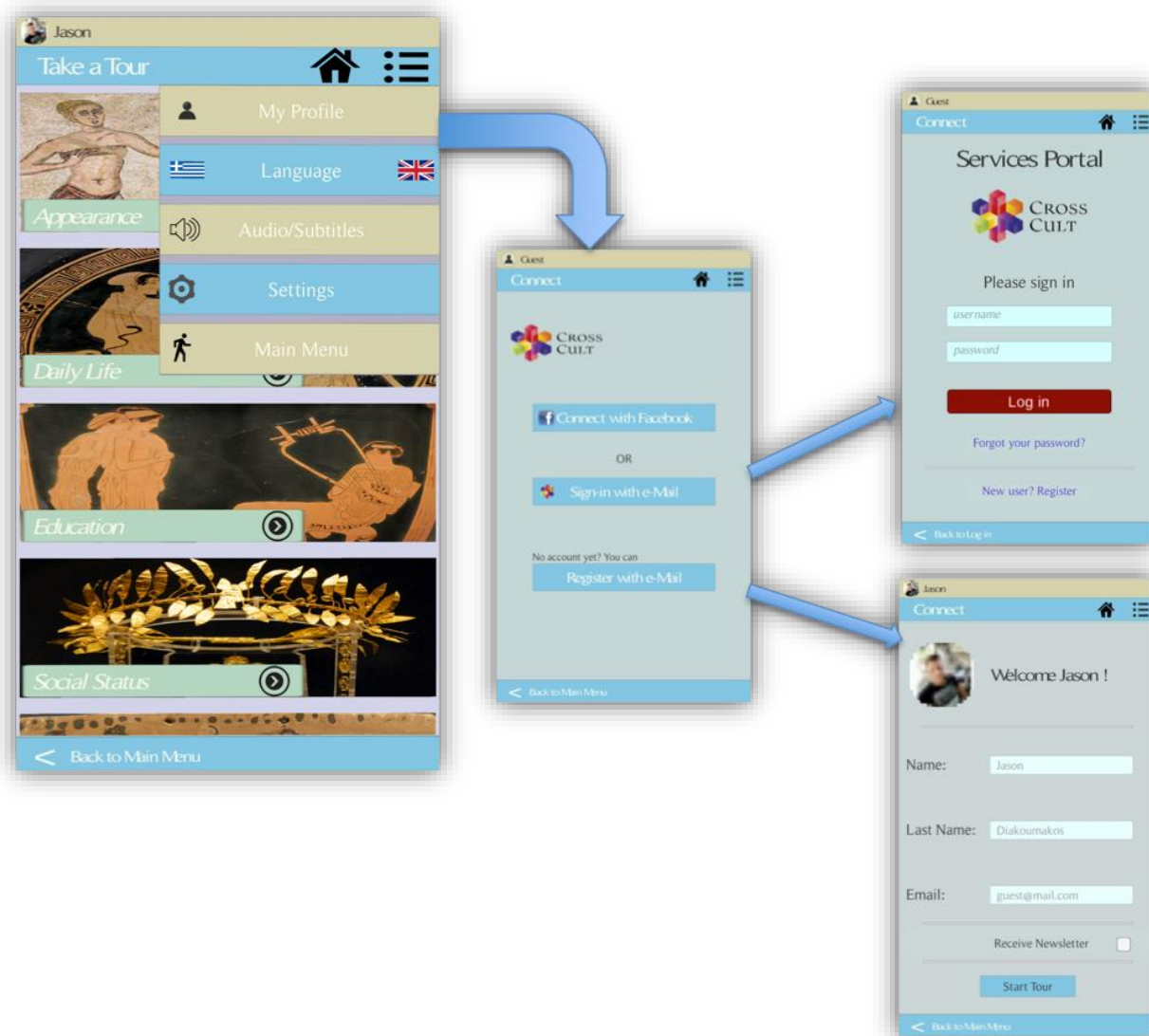


Figure 4-12. The choices and actions offered by the drop-down menu.

#### 4.2.2.4. Introduction of the experience

At the beginning of each thematic tour, a short introduction is available for the user to understand the topic of the tour (see Figure 4-13). As with all content the user can start or pause the content and control her experience. The audio file is also synchronised with the relevant subtitles for the hearing impaired.

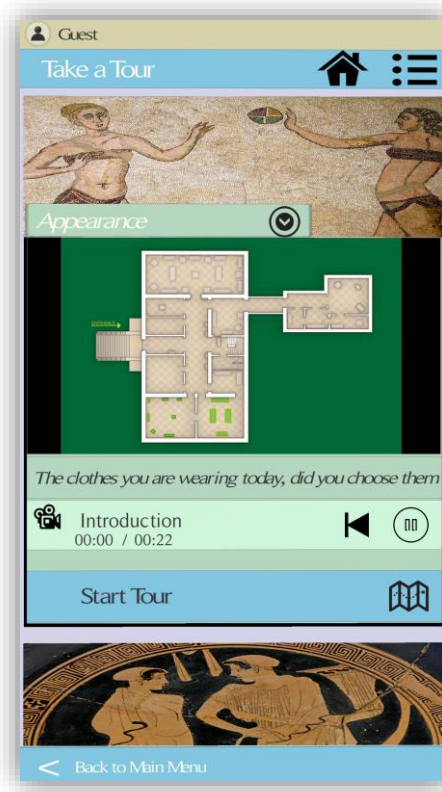
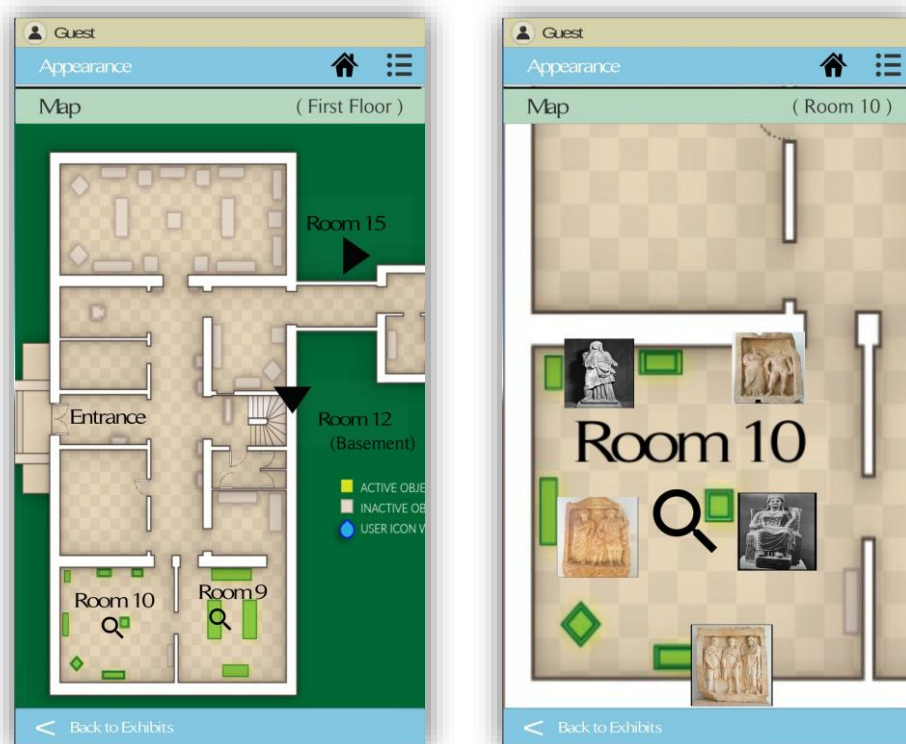


Figure 4-13. The introduction of an experience combines audio, pictures, maps and subtitles.

#### 4.2.2.5. Starting the tour and receiving content

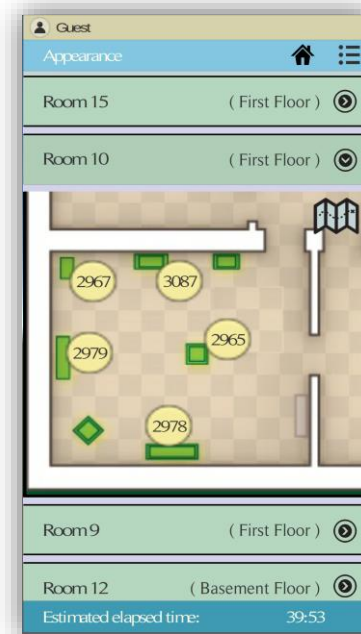
The user is presented with a museum map showing the location of rooms and objects, as well as the user icon to assist the user further into finding her own location (Figure 4-14).



**Figure 4-14.** The app allows browsing the map of the venue and locating the exhibits involved in the tour.

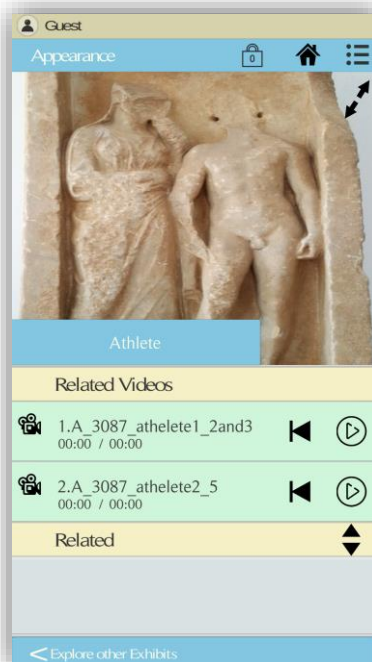
The user can then choose a room and see the exhibits there. The exhibit numbers shown below will be replaced with item images. The user always has the option to return to the map of the museum at the top right corner of the room she is in.





**Figure 4-15. The user can look into any room and get information about its exhibits.**

Then the user can choose an exhibit and listen to the related narrative. Again, she has the choice to start, pause or skip files. In addition, the user is often asked to check her screen in order to see relevant objects from other museum or other relevant digital content. The estimated time for each file is always presented in order to allow visitors to plan their visit. The narratives for each exhibit can stand alone and a linear viewing of items is not required. For each tour, the narratives are connected to the main topic and are designed for each exhibit.



**Figure 4-16. The narratives for each exhibit can stand alone, not requiring viewing in any particular sequence.**

### 4.2.3. Pilot 3 reflection

For each thematic tour a careful selection of reflection prompts has been done as well as a strategy for the use of reflection prompts in order to maximise their effect. The narratives themselves are designed in a way to increase empathy and help users understand different perspectives. These reflective prompts are included in the narratives and they are either indirect (e.g. by pointing at specific connections) or give the opportunity for active engagement. In many cases, the reflective prompts ask directly the user to provide her opinion and share her experiences and feelings. In addition, a series of Facebook activities intend to increase reflection since they can engage people actively in discussions and they aim at allowing the continuation of the cultural experience and reflection after the visit. For example, Pilot 3 can release a set of images on Facebook for comparison and discussion, or ask a user to share a similar experience she might have relevant to the one she heard. In general, the narratives follow a specific methodology where the experience starts from the museum items. The argumentations are built using digital content from different sources, like images from other museums, videos (documentaries, classic cinema), music tracks, as well as quotes from ancient sources. Then the narratives connect the past with issues relevant to visitors, like parenthood, human rights, access to education, etc. showing how humans across times deal with very similar situations. Finally, reflection points are introduced. The methodology used for the building of reflective narratives, has been approved by venue experts. The narratives themselves have been also evaluated for the reflective power through an initial qualitative study, showing that the approach can indeed trigger reflection.

## 5. Pilot 4: Multiple cities, “Past & Present” interplay

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Pilot 4 is a multicity scenario situated in Valletta, Malta, and Luxembourg City, Luxembourg. This pilot is also the only one that will take place outdoors, in the open air. It is akin to a personalised outdoor exhibition. Its purpose is to enable users to explore, reflect and reinterpret historic threads (topics) as they (re)discover the city; in doing so, they are able to uncover the variety of connections that coexist between both cities. The result is a richer and deeper understanding of how historical phenomena and European cultural heritage are manifested not just locally but also across borders. This will be achieved through the use of a personalised location-based game-playing app. The app will encourage users, through playful interactions, to evaluate both their surroundings and the historical objects (as well their descriptions) that they encounter hidden in the city.

The resulting app developed in Pilot 4 is designed to foster new, in-place experiences for its users. Its purpose is to lead players to discover meaningful coexistent connections within their city and between the two cities that may not be immediately obvious. In doing so, users will be able to explore enriched perspectives and interpretations associated with topics in European history while reflecting on their own narrative understanding of these thread topics and, by corollary, unravelling the perspectives, learning and experience that have helped shape them. Their user-generated reflections and interpretation will contribute to a shared collective memory.

### 5.1. The app in relation to Deliverable 2.1

The app released with D5.1 implements most of the features announced in D2.1, including the following:

- GPS tracking of the players.
- Automatic recognition of the players' location on first use.
- Customisable interactive map that enables players to navigate the city. The map can be styled according to different needs (day vs night, etc.).
- Delivery of geo-located historic content for non-linear storytelling.
- Three modes of gathering player reflection on content, which is activated when a player selects to discover content and can be editable when not in the city. These modes are:
  - Tags that integrate standardised terminology derived from WP2.
  - 5-star rating of places where content is located.
  - Commenting system that enables players to add their responses to reflective questions.
- Personalisation of app settings –ability to activate phone notifications (vibrations).
- Development of game framework integrating, points, level and achievements.
- Preferences: ability to turn sounds, vibration or story notifications on or off.
- Threads: ability to filter content based on its type –formal CrossCult stories or player-provided ones. This functionality will be extended in the next phase.
- My Journey: ability to review all the CrossCult/personal stories that you choose to discover. This enables users to review the reflections they have made add new reflections or tags. They can access this without being in the location.

- My Stories: this provides the use the ability to review unpublished stories or their published stories.
- Achievements: Ability to review the achievements you have been awarded or ones that are still left to get.

Beta testing and final content preparation for the Pilot 4 app took place in multiple rounds, starting from early paper prototyping (to identify preliminary requirements for the app and the content) until iterative weekly or bi-weekly testing of the mobile app prototype. This process has been found highly beneficial as it allowed the project team to tailor the app and content to real-user needs, and will be followed for future stages of the app development, adapting the testing frequency as the app matures. During the beta tests and final content preparation efforts, the following features were added:

- Ability to add geo-located player stories if a player reaches the correct level in the game.
- Ability to edit activation radius for story discovery to account for uncertainty and errors in GPS which meant limits the irritation of the players as they try to activate stories.
- Refinement and redesign of process to activate geo-located content so that there is now more playful navigation that provides feedback on distance to content and reduces user frustration.
- Text to speech to enable users to listen to stories and to appeal to different learning types.
- Splash screens that provide instructions on how to play the game.
- Terms and conditions to state the experiment protocol including data protection and experimental consent as well as conditions of use.
- First version of iPhone app.
- Two companion applications:
  - Moderator app: an app that allows crowdsourced or expert moderation of user-generated content (comments, reflections and stories) to avoid the presence of hate speech and/or potentially offensive language.
  - Web interface: a user-friendly interface that enables non-technically savvy users to create Points of Interest and attach stories to them. The POIs and stories added and activated through this web interface appear directly to the mobile app of pilot 4.

Finally, the following features announced in D2.1 have been discarded or postponed:

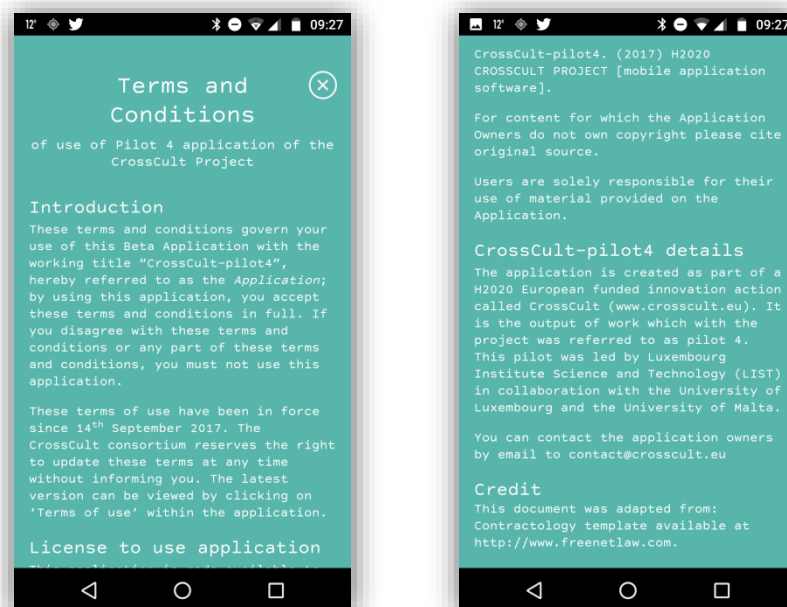
- Login and profiling of users was not considered a priority at this stage, as in initial user testing the players gave feedback that login screens would inhibit their desire to play.
- Recommending a POI and content, as this pilot is primarily meant to allow a free-form exploration of the city rather than be a guided tour. Notwithstanding this, the app still allows players to customize the POIs they want to be able to access, by selecting the history threads that interest them in the Preferences part of the menu.
- Following a thread –whilst it is possible to filter information based on “collections of content”, this is in its primitive state at the moment of submitting this deliverable. This feature will be further developed in the coming months.

- The web interface for content management has been designed and developed for handling multi-lingual content but the interface for enabling curation of multi-lingual content is not yet implemented.
- Multicity linking: this was delayed until the next round of development whilst we focussed on the basic barebones of the pilot and integrated the feedback from the first rounds of beta testing.
- Read-write access to the knowledge base will be fully developed in the next phase.

## 5.2. Sample scenario

### 5.2.1. Main Pilot 4 mobile App

When the user first installs the APK they will be asked to accept the terms and conditions, as shown in Figure 5-1.



**Figure 5-1.** When first using the pilot 4 app, the user must read and agree with the terms and conditions.

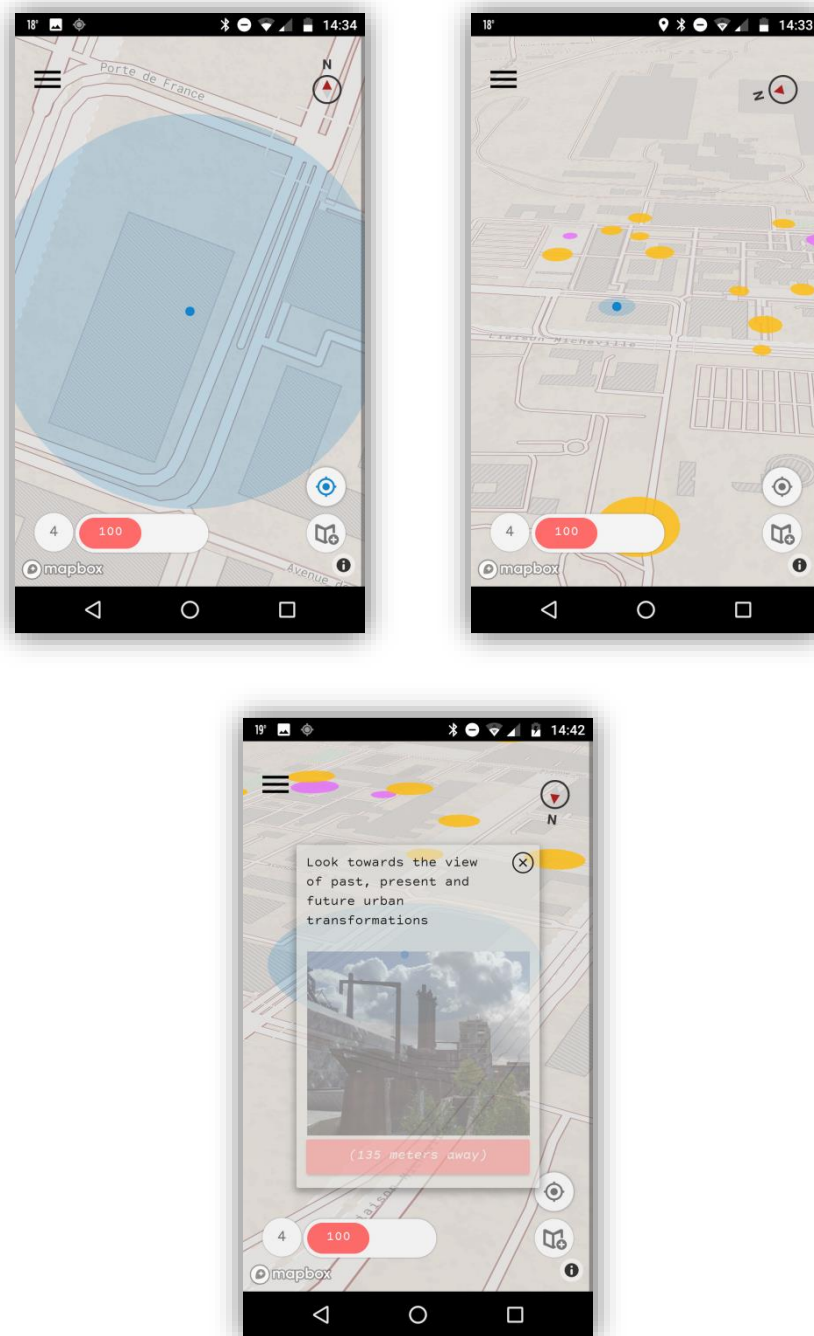
Following acceptance of the terms and conditions users are then shown a few help screens to familiarize them with what the app is about and how it can be used (Figure 5-2 next page). These screens are also always accessible from the app menu, under the Help tab.



**Figure 5-2. The Help screens assist the user in understanding how to use the app.**

As illustrated by Figure 5-3, after they click “Play” users see a map interface that automatically zooms to their location, using GPS localisation. Users can use the location button (marked as a blue dot at the lower left of the screen) to orientate their view. They can pinch the map to zoom in and out to find their nearest Points of Interest where stories are located. They can click on a POI and view a navigational clue (appearing as a popup in-screen window) that shows users a picture of the where they have to go (for example the picture of a building) and how far this POI is away.

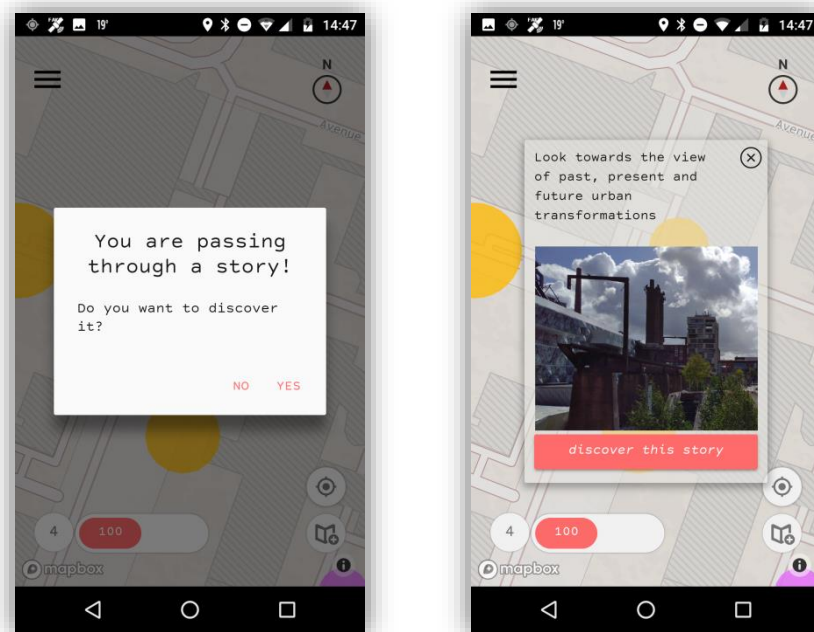




**Figure 5-3.** The map screens allow the user to identify their current position with respect to their surroundings and the city map (1st screen), view nearby Points of Interest (yellow and purple circles, 2nd screen) and walk towards them following a navigational clue (3<sup>rd</sup> screen).

POIs are marked on the map as yellow or purple circles, yellow for official CrossCult POI stories and purple for player-added POI stories. The size of each POI (size of the circle) indicates its activation radius. As soon as the user's physical location (blue dot) is located within the yellow or pink circle, the distance indication on the navigational clue changes to a "Discover this story" indication, and the user can read the story that accompanies the POI. If the user has activated the option to receive POI notifications (from the app menu/Preferences), but does not yet opened

the POI clue while being in the POI's radius, they will receive a notification that they are passing through a clue (Figure 5-4).



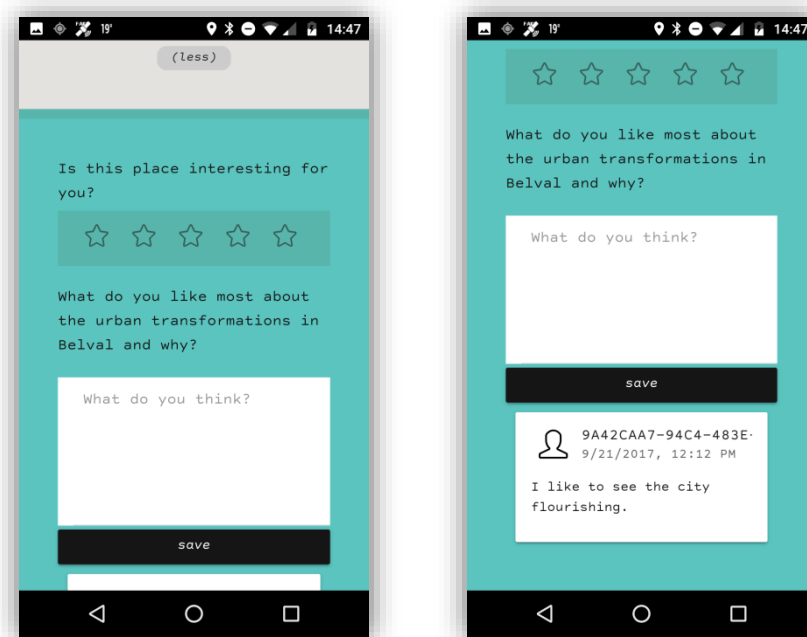
**Figure 5-4.** When the user is close to a Point of Interest they receive a notification (1st screen) and are invited to open the navigational clue to discover the historic/reflective content (2nd screen).

As soon as the user clicks on “Discover this story”, the screen changes and the map is replaced by the POIs story (Figure 5-5 next page). The POI’s story relates the physical location where the player is currently (in the city) with a history thread (for example on migration). For this reason, the image included in this screen is usually related to the history of the place where the player actually stands. Scrolling down this screen the user can read the story’s main text, which further helps make the mental connection between the POIs physical location and the historic thread that is being referenced. The text of the story is meant to trigger the process of reflection. From a usability point-of-view the text is by default minimized and can be expanded, and it has been styled to help on-screen readability. Finally, for players that do not wish or do not want to read the text, the story is also accompanied by a text-to-speech capability.



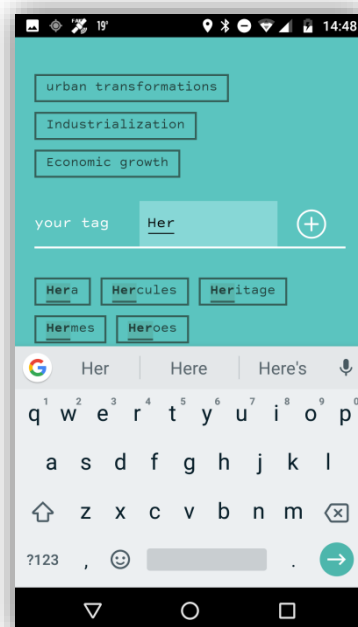
**Figure 5-5.** When opening a navigational clue, the user discovers the story related to it, including its title and tags (1st screen), historic image and main text (2nd screen). The main text is meant to trigger reflection between the POIs physical location and the historic thread that is being referenced (3<sup>rd</sup> screen).

As the player scrolls further down this screen, they can rate their perception of the place and also answer a reflective question (Figure 5-6). The reflective questions aim to also trigger reflection, based on the story the user has just read and on the mental connections they have made with their physical surroundings. Comments to reflective questions are marked as pending until they have been through the moderation process (using the moderator companion app mentioned above and described in more detail shortly after in this section).



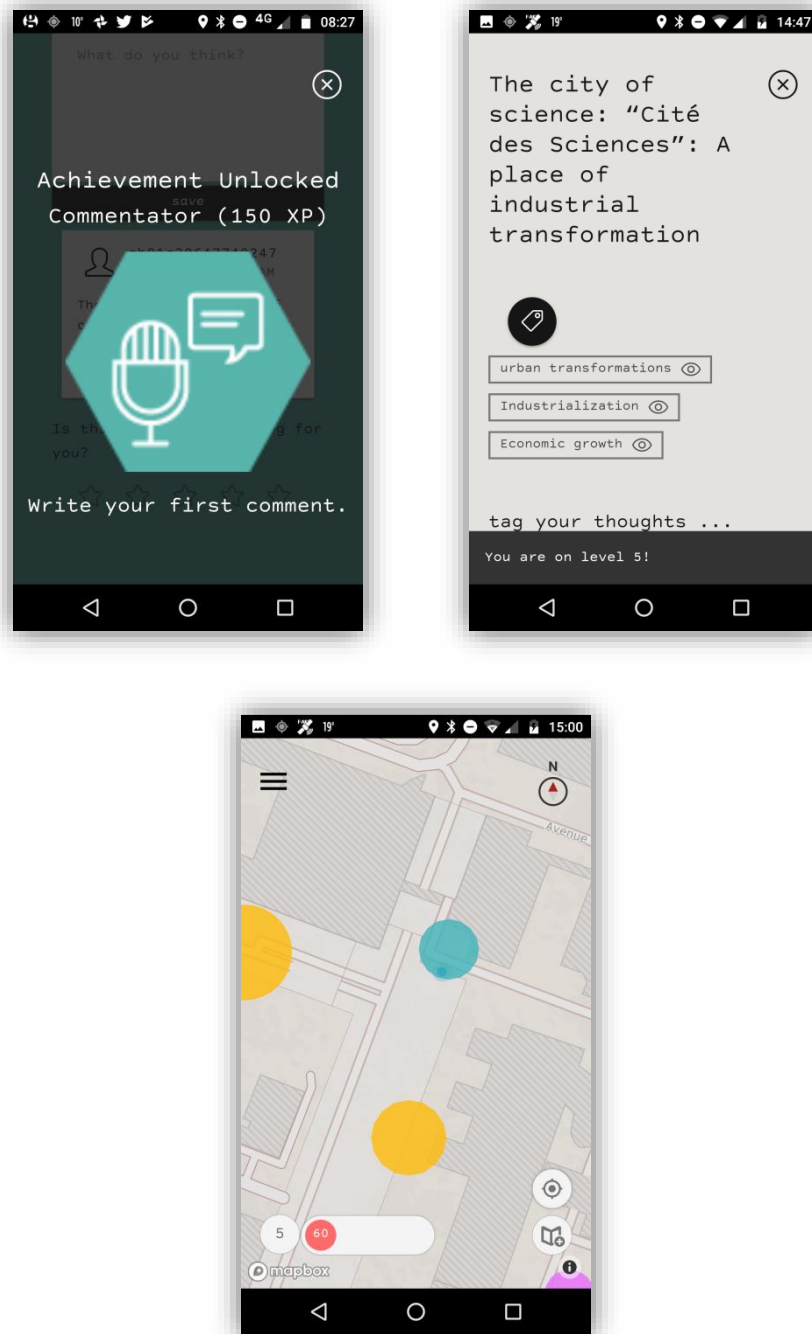
**Figure 5-6.** The user also has the ability to rate their perception of the place and answer a reflective question about the history topic referenced by the POI's story (1st screen). The user answers appear as comments underneath the reflective question (2nd screen).

The last option in the POI story screen allows users to tag their thoughts. To add a tag, the players click on the tag symbol found right below the story's title. A new screen opens, where the user can type any tag they wish, while they also receive tag suggestions based on what they have so far typed (Figure 5-7). These tag suggestions are retrieved from the knowledge based created for Pilot 4 in Work Package 2.



**Figure 5-7.** The user can also add a tag to the story of the POI.

Back to the main screen, and as they walk the city and interact with POIs and stories, players can earn points and go through different game levels. These points and levels are marked by achievement badges that denote the completion of different tasks (missions), as illustrated in Figure 5-8.



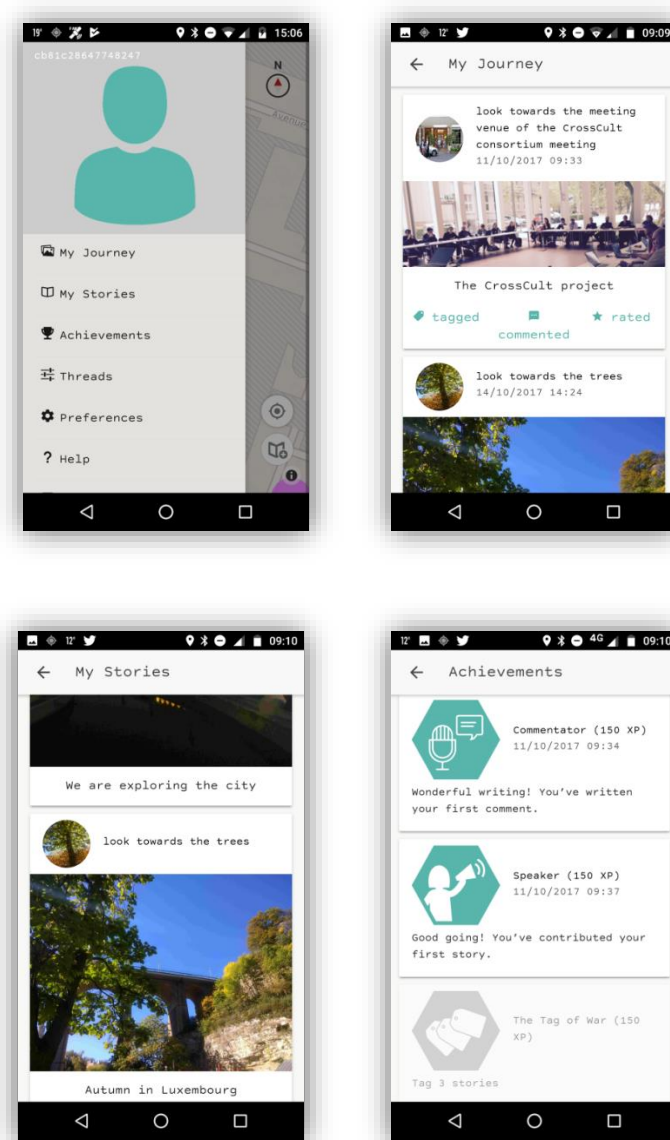
**Figure 5-8.** The users are rewarded with badges and experience points as they perform various activities in the app including writing a comment (1st screen) or adding a tag (2nd screen). They can view the points they have gathered at all times from the main app screen as they walk (3<sup>rd</sup> screen, bottom left).

Examples of missions (and their respective badges) include:

- Walker: Walk 1km on the map with the app open.
- Persistent: Play for 1 hour.

- Commentator: Writing your first comment.
- Speaker: Contribute a story and have it accepted.
- Storyteller: Contribute 10 stories and have them accepted.
- Single-track Mind: Find 3 POIs of the same historic thread.
- Multi-colored: Find 1 POI of historic thread.
- Reader: Find 3 user-created stories in the city.
- Curious Mind: Tag 3 (different, accepted) stories.
- Avant-Garde: Find the least visited POI.

All interactions undertaken as part of the game in the city can be reviewed through the menu at a later date – i.e from home, through the menu tabs: My journey, My Stories, My Achievements.

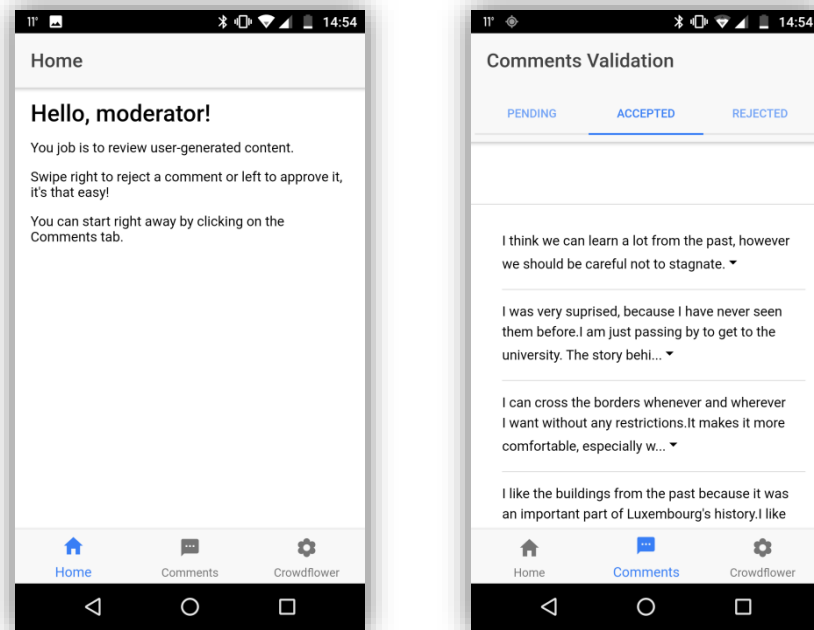


**Figure 5-9.** The user can use the menu (1st screen) to access the places they have visited (2nd screen), the stories they have contributed (3rd screen) and the achievements/badges they have unlocked (4th screen).



### 5.2.2. Moderator companion app

The moderator app retrieves comments in response to the selective questions. Either the expert or the crowd are asked to evaluate the comment for racist or offensive speech. If a comment is accepted it is published under the question with a date and time.



**Figure 5-10.** The moderator app is used to filter the user comments of the main pilot 4 app for hate speech or inappropriate language. The app can be used to either accept/reject comments manually (expert mode), through crowdsourcing (crowd mode) or both (the expert views what the crowd has not yet filtered and can make changes to what the crowd has filtered).

### 5.2.3. Web interface

The web interface of Pilot 4 is a visually-friendly tool to facilitate the easy addition, curation, previewing and publication of POIs and stories. Users can navigate on the map and click to add POIs and stories (right side of the screen). They can activate or deactivate these POIs (left side of the screen). The POIs that are activated appear on the mobile Pilot 4 app.

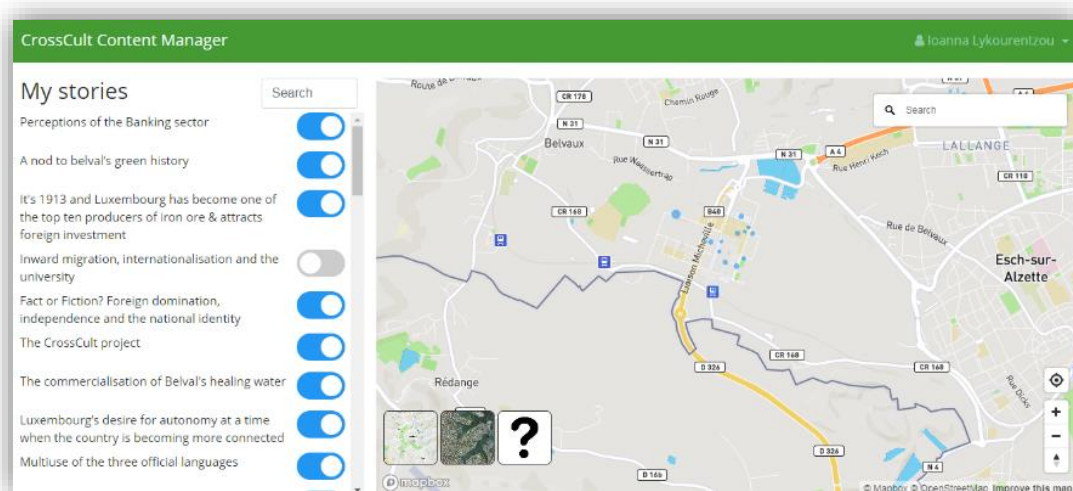


Figure 5-11. The web interface accompanying pilot 4 app is a visually-friendly tool to add POIs and stories.

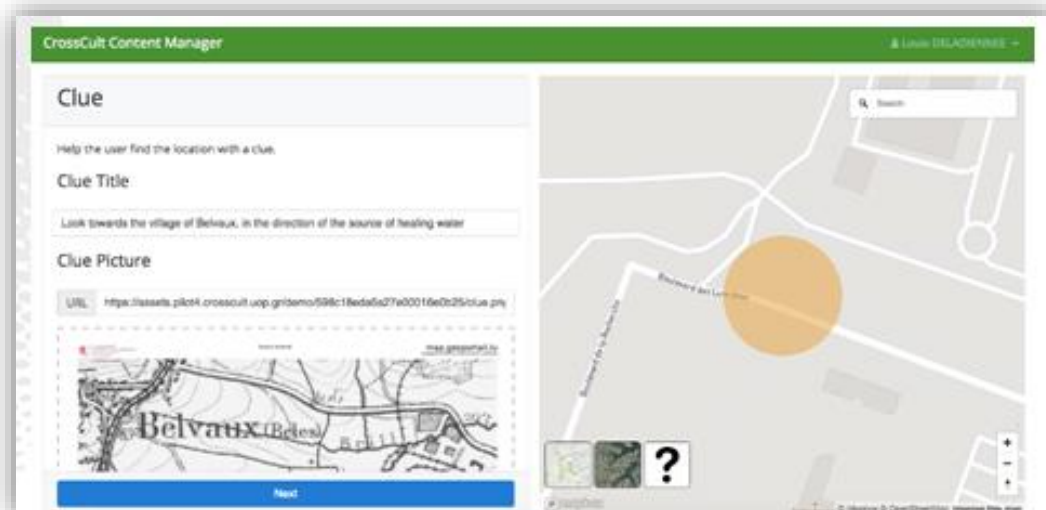
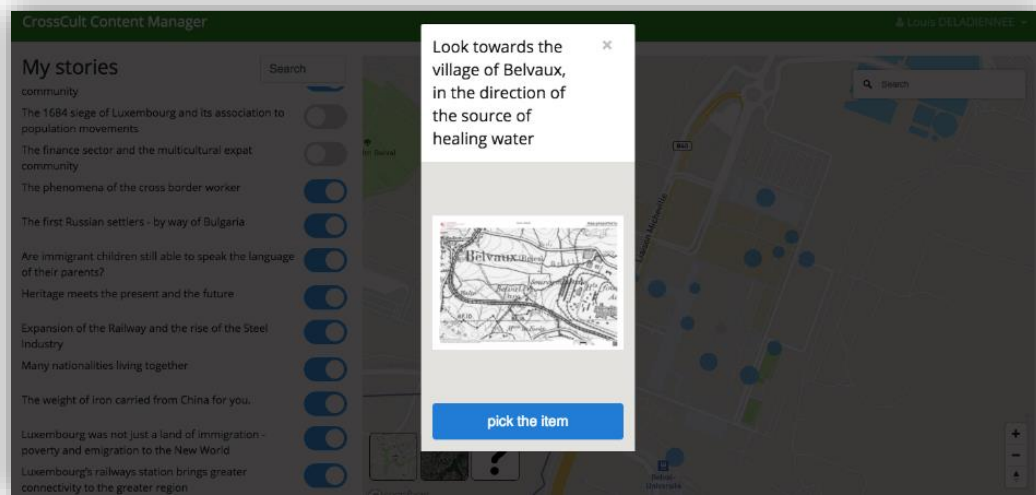


Figure 5-12. Adding the visual clue of the POI, including title and image.



**Figure 5-13.** As soon as the POI content (here its navigational clue) has been added, the web interface user can visualise it similarly to how it will appear on the mobile screen of the main pilot 4 app.

#### 5.2.4. Specific instructions for app testing

The Pilot 4 app provides its fullest user experience when there are actual POIs and content in nearby proximity to the user's physical proximity. Otherwise, the user can only see the starting screens and the menu, but without POIs to follow. In order to test the current version of the app to its fullest extent, it is therefore advised to either:

- Download and install a “Fake GPS location” app, available by third-party providers, and set its location to the city of Luxembourg or Valletta. This option is the best to ensure user anonymity.
- Use the web interface (section 5.2.3) of the app to add a POI in the desirable testing location. This option necessitates the creation of user credentials with the CrossCult backend framework. This option offers less user anonymity.
- Consult the CrossCult project team ([contact@crosscult.eu](mailto:contact@crosscult.eu)) to create POIs in the desirable testing location. This option offers less user anonymity.

## 6. Instructions to download and test the apps

Since the project is just entering the “controlled experiments” phase, the apps are not available on the different platform stores yet. The procedure to download and test them is documented below.

### 6.1. Connecting to the app hosting server

To support their distribution, the apps are uploaded and available in a central server hosted under hosted at <https://pilotapps.crosscult.uop.gr/>. The table below provides direct links to each pilot folder:

Pilot	Direct Link
Pilot 1	<a href="https://pilotapps.crosscult.uop.gr/minio/pilot1/">https://pilotapps.crosscult.uop.gr/minio/pilot1/</a>
Pilot 2	<a href="https://pilotapps.crosscult.uop.gr/minio/pilot2/">https://pilotapps.crosscult.uop.gr/minio/pilot2/</a>
Pilot 3	<a href="https://pilotapps.crosscult.uop.gr/minio/pilot3/">https://pilotapps.crosscult.uop.gr/minio/pilot3/</a>
Pilot 4	<a href="https://pilotapps.crosscult.uop.gr/minio/pilot4/">https://pilotapps.crosscult.uop.gr/minio/pilot4/</a>

Access to this server is password protected.

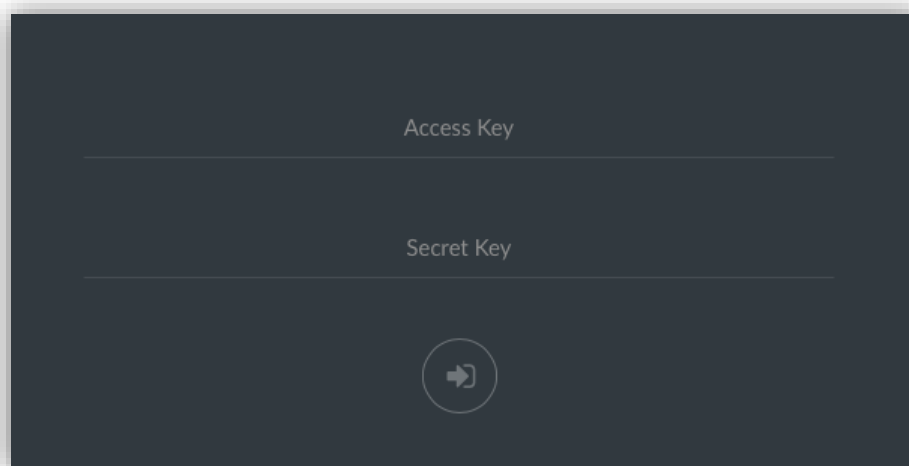


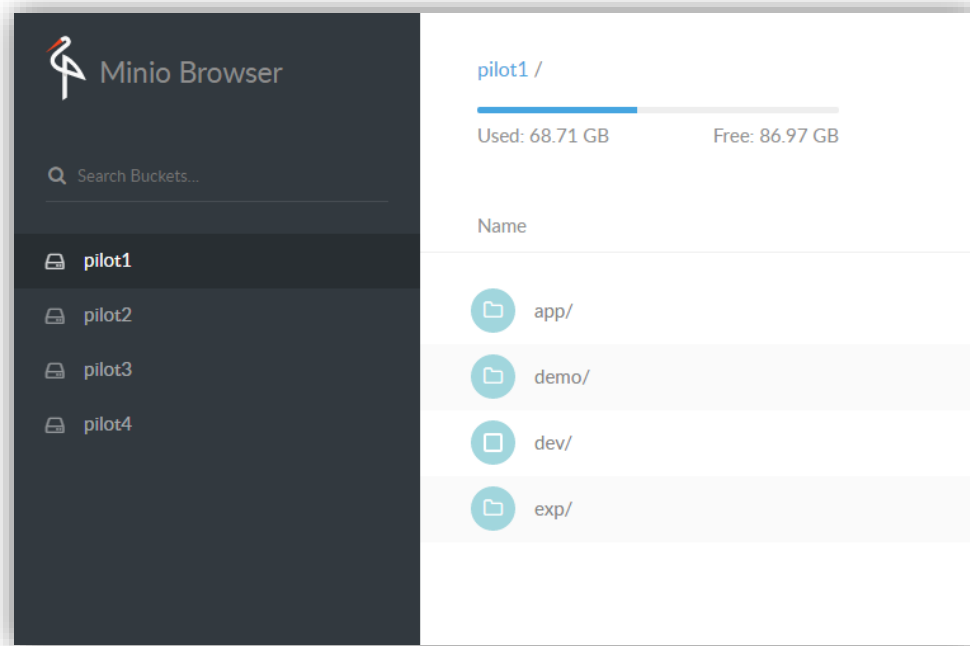
Figure 6-1. Logging to the app distribution server.

The credentials are:

<b><i>Access Key</i></b>	<b>pilot-access</b>
<b><i>Secret Key</i></b>	<b>pilot-apps@CC</b>

### 6.2. Finding the app

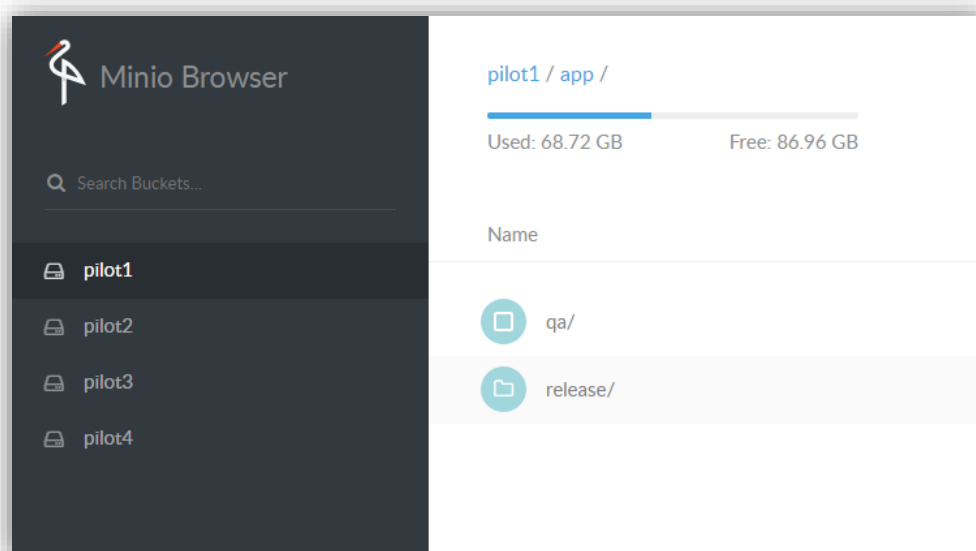
Once connected, the page of Figure 6-2 is displayed. The left side lists all the pilots. If a direct link was used, the correct pilot appears pre-selected already.



**Figure 6-2. The list of pilots.**

For each pilot, the folder structure is the same. The relevant one here is the “*app*” folder. For each pilot, the *app* folder contains two sub-folders:

- *qa* (standing for ‘quality assessment’): contains the latest changes that needs to be tested and validated by the pilot experiment team. The app in this folder can be unstable as it is the bleeding edge of the development.
- *release*: contains the latest version of the app that can be used for experiments.



**Figure 6-3. Structure of folders for each pilot.**

### 6.3. Downloading the app

Upon entering the *release* folder, the Android version of the app can be found:




Name	Size	Last Modified	
 pilot1.apk	14.18 MB	Oct 10, 2017 1	  ...

Figure 6-4. Inside the release folder.

It is not possible to download the file directly; rather, it is necessary to generate a download link first. To do so, click on the three dots on the right, and the “files” icon. This will open a configuration window. The link is valid only for a fixed duration which you can configure. Clicking on the “Copy Link” button will provide the actual download link that can be used to download the app on a smartphone.

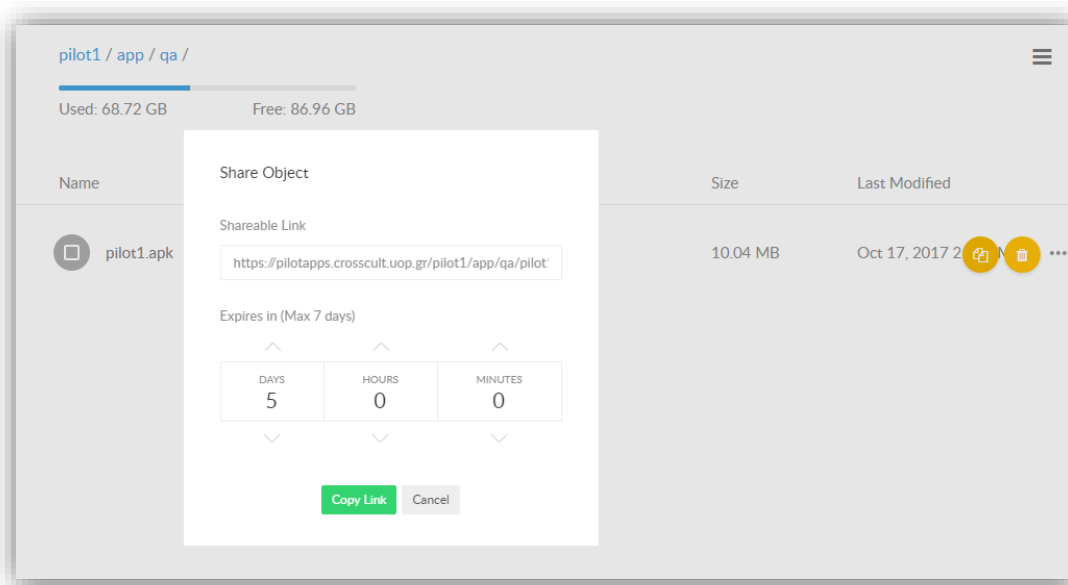


Figure 6-5. Generating a download link.

### 6.4. Installation process FAQ

- **What are the requirements for the test phone?**

All CrossCult apps have been built for Android phones, version 6.0.0 or higher only. iOS versions for some of the apps will come later in the project. Since the apps are not on the android Play Store, they are not signed and thus your phone might warn you about a possible security risk. You need to allow the installation from “unknown sources” on your phone to install our apps<sup>4</sup>.

<sup>4</sup> See instructions [here](#).



Also, not that all apps require internet connection, either by Wi-Fi or network data. Please make sure you have Internet when testing the apps.

- **Why the app install fails?**

Make sure your phone matches the abovementioned requirements, and that you used a generated link as explained in this procedure and that you didn't download the app directly from the web interface.

- **The app I'm testing requires to be in a specific location to access content. What do I do?**

In case the app requires you to be at a precise location to see content and you cannot go there, as suggested in Section 5.2.4, you can use a workaround of a fake GPS app to trick the system into thinking you are anywhere on the planet.

## 7. Conclusion

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The four pilot apps and the accompanying tools have been developed, at least, to a point that enables the start of the experiments in controlled environments that will be documented in Deliverable 5.2 by the end of M26 (Milestone 2, April 2018). Those experiments will consist of on-site beta tests, with participation and supervision of technical and humanities research staff, plus invited users who make take some time to analyse the features offered and provide feedback. Actually, these efforts have been initiated already during September and October 2017, since the members of the CROSSCULT consortium have internally cross-checked the implementations of the different pilots. This has led to some usability improvements during the preparation of this deliverable, and to the identification of opportunities to share/adapt features between different pilots in order to increase the cohesion of the works conducted in WP2, WP3, WP4 and WP5 itself.