ARCHES

H2020 – 693229

Deliverable D3.2 "Report on system integration and testing – 1st version"

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Abstract

The present deliverable contains the definition, analysis and design between subsystems of the ARCHES platform, a first approach to the data model, the use case analysis from the web system requirements defined in the deliverable D3.1 "Report on system architecture definition" [1] and a first definition of the graphical user interface (GUI).

The partners have worked together to reach the best initial possible design meeting the stakeholders' needs. The design will be iterative and will allow the technical developers to implement modifications, adaptations or improvements based on the feedback from the people with differences and difficulties associated with perception, memory, cognition and communication, leading to more appropriate and effective results.

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Table of Contents

List of figures

List of tables

Abbreviations

API: Application Programming Interface

ICT: Information and Communication Technologies

ARCHES: Accessible Resources for Cultural Heritage EcoSystems

EU: European Union

FK: Foreign Key

GUI: Graphical User Interface

PK: Primary Key

UI: User Interface

URI: Uniform Resource Identifier

UML: Unified Modelling Language

TTS: Text-To-Speech

WP: Work Package

1 Introduction

This deliverable presents the advances in the analysis and design of the software platform of the ARCHES project before the exploration groups in Spain and Austria are built and the second round of pilot exercises – task T6.2 "Pilot Stage II – validation of initial developments" – starts in month 13 (October 2017).

The first phase consisted in defining the interaction between the different subsystems – i.e. the avatar component and the games – of the ARCHES platform that were already described in deliverable D3.1 "Report on system architecture definition" [1]. Once the interaction and communication mechanisms were detailed, and based on both technical and end-user requirements, a catalogue of use cases was developed. Use cases can be defined as a type of textual requirements that reflect how a user will interact with a solution to achieve a specific goal. In essence, they capture all the possible ways through which the user and the software system can interact. To this end, the full process was thoroughly described step by step.

Next phase addressed the collection of data from the different museums involved in the project, i.e., Museo de Bellas Artes de Asturias, KunstHistorisches Museum Wien, The Wallace Collection, Museo Thyssen-Bornemisza, Museo Lázaro Galdiano and the Victoria & Albert Museum. After an initial analysis, a common data model was created. This included the selection and generation of the main entities that will be used to store information about the works of art and the corresponding data attributes. Likewise, we established the relationships or associations among those entities as well as (often implicit) relationships among those attributes.

Finally, a set of mock-ups were designed for the implementation of the graphical user interface (GUI). To this end, the requirements, needs and capabilities of the target audiences were taken into account. However, this is a first version intended to be updated and enhanced all along the iterative development process thanks to the experiences and recommendations reported by the exploration groups.

2   Subsystems integration

The software architecture of the ARCHES platform is described in deliverable D3.1 [1]. The description already referred to two different subsystems that should be integrated into the overall system: the avatar component and the serious games. This is briefly addressed in the following sub-sections.

2.1   Avatar

The avatar subsystem is planned as shown in the Figure 1. However, there are still challenges to face, which can only be discovered by evaluating the progress made all along the execution of the project. The close cooperation with the exploration groups will allow the developers to identify which are the characteristics and functionalities that need improvement, e.g. it is important not only to translate content word by word, but also put it together into a grammatical correct, well understandable sentence. Also understandability in sign language is tightly linked with quality of the output, which has to be tested during development with the target audiences.
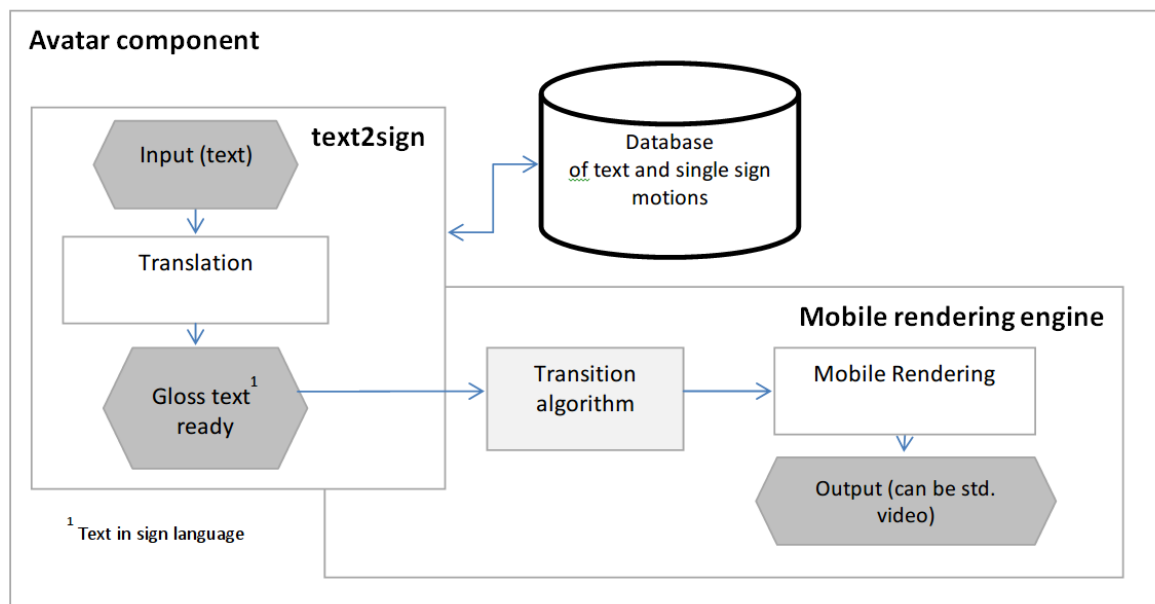
Figure 1: Avatar component.

To integrate the avatar into the overall platform as defined in D3.1, the avatar system will generate data Uniform Resource Identifiers (URIs) or local file references to the avatar. The link to pre-rendered videos will allow the user to watch the content on an accessible HTML5 video player provided by the browser and adapted to the needs of the platform.

With the objective of achieving the best results, our approach establishes that, in an initial phase, the signed texts will be provided to the system in advance. This will facilitate the analysis of the impact produced on the individuals that are participating in the exploration groups to draw conclusions on key aspects such as the appearance, colours and other physical features of the avatar. In parallel, SignTime will continue working on making automatic the signing process, so that, in a second phase, the texts can be provided through an application programming interface (API) and the content of the data URI is replaced with a live rendered avatar of the provided text. While this is desirable, the achievable quality of such an approach has still to be assessed and verified in the process.

2.2 Games

The challenge of the serious games developed in ARCHES relies on trying to mimic the overall experience of exploring a museum (art pieces, people, layouts, collections, etc.) from an Internet browser. Consequently, the context will be different for each of the six participating museums, meaning that there will be six different games (one for each).

The subsystem dealing with the serious games will be accessible through the ARCHES platform. In particular, an icon will be displayed on the top bar of the website to grant immediate access to this content (see Figure 16), allowing the user to choose the preferred game.

In general terms, games will consist of three "gameplays":

1. Exploring museum space;
2. Playing mini-games with people in the museum for collectables (e.g. a small replica of a painting) to obtain further information about them;
3. Collecting info, gossip and trivia in an album of sorts.

For the sake of simplicity, the games will take advantage of the ARCHES user systems, so the user who has logged in to the website will directly be linked to the game user from where the games will take user info (accessibility needs and overall user preferences).

Games will save the progress as often as possible so the user can stop playing and continue at any time since the we saw that this is an important factor for the target group as a result of the conversations with the UK exploration group.

A more detailed description of the games needs to be formed and will be available after detailed testing of the preliminary developments with the exploratory groups and both technical and museum reviews.

2.3 Games and avatar integration

While the avatar component is provided by SignTime, the serious games (WEB GL) are provided by Coprix. This means that the system has to guarantee that all the communications and any potential data exchange between the modules are successfully performed. Two options have been considered:

1. Avatar video / real-time rendering is implemented inside the game and accessed internally, rendering in game's WEB GL player/area. This enables the game to be full-screen and include sign language avatar.
2. Avatar stands outside the game dedicated area, and we issue playback commands via the Avatar Subsystem API. In this case, games cannot go full-screen. Besides this, we would also need the Avatar API to have video playback commands and feedback, so that it can be synchronised with the game (seek video, rewind it, set speed, get current time and loading status etc.).

One of these ways of working will be chosen after further testing and discussion with the participants.

3   Use case analysis

A use case is a methodology used in system analysis to identify, clarify, and organise system requirements. The use case is made up of a set of possible sequences of interactions between systems and users in a particular environment and related to a particular goal.

The overall view of the ARCHES uses cases is illustrated in the Figure 2. In the following sub-sections the involved actors will be identified and each use case will be defined in detail.
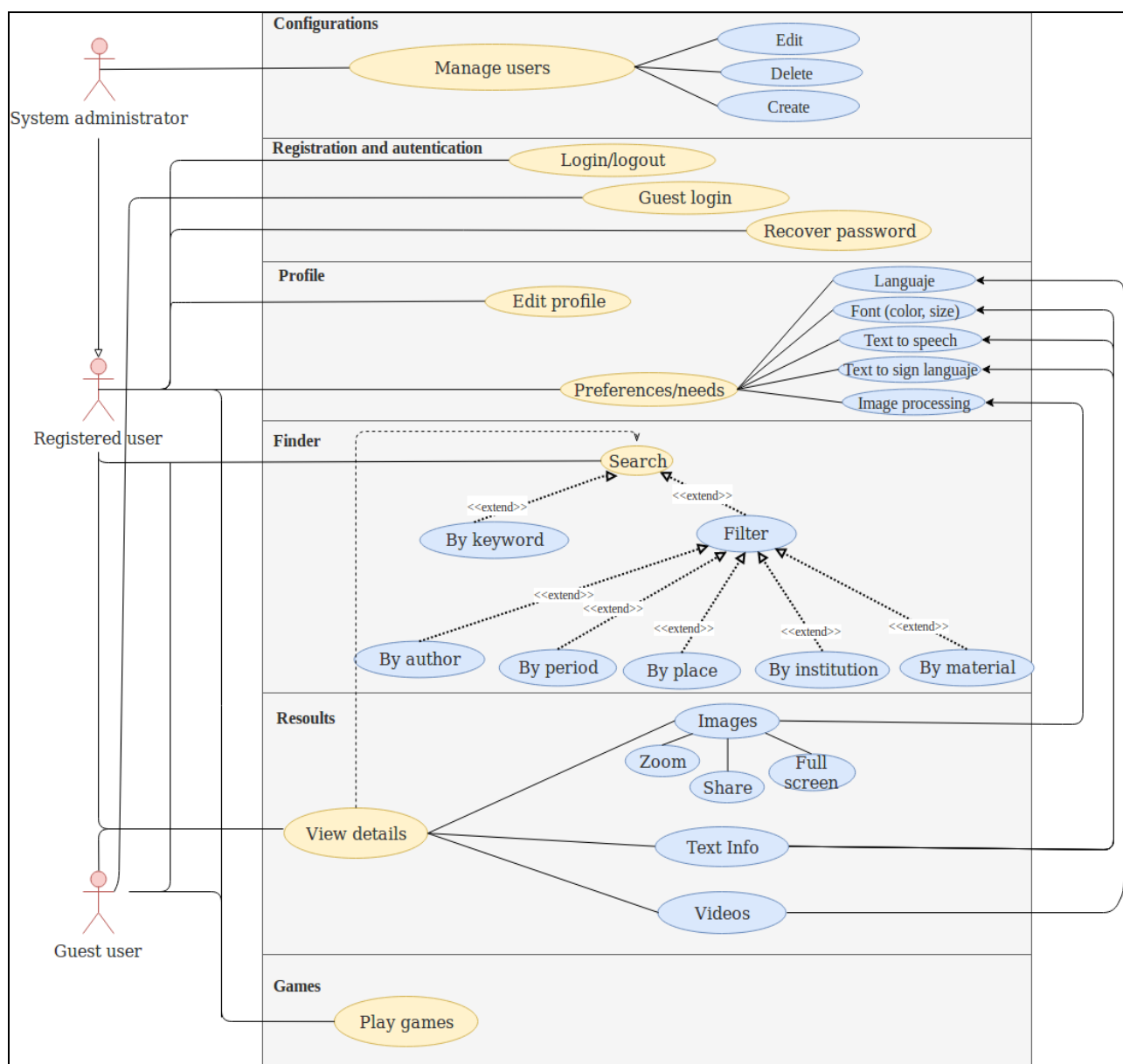
Figure 2: Use cases diagram.

3.1   Actors involved in the use cases

Use cases are executed by different actors. An actor specifies a role played by a user or any other system that interacts with a system. Three kinds of actors are differentiated:

- **System administrator:** The actor who is responsible for managing the platform users.

- **Registered user:** A user who has registered at the ARCHES platform (username and password) and has an associated profile.

- **Guest user:** Any person who wants to access the ARCHES platform but has not an associated profile.

3.2 Uses cases definition

This section describes the sequence of steps that compounds each use case. In order to facilitate the understanding, the definitions of use cases are grouped into different sections/subsystems:

- Configurations

- Registration and authorization

- Profile

- Finder and results

- Games

3.2.1 Configurations

The details of the "Configuration" process are presented in Table 1.

Table 1: Use case 'Manage users'.

Name	UC1.1	Name	Manage users	
Description	ARCHES Administrator manages the users of the platform.			
Pre-Condition	The Administrator has to be logged in the platform with administrator role.			
Sequence	Create	1. Administrator clicks on the section 'Configuration'. 2. Administrator selects the option 'Create New User'. 3. Administrator fills in the form with the new user data. 4. Administrator clicks on the button 'Save'. 5. ARCHES platform sends a sign in confirmation email to the new ARCHES user.		
	Edit	1. Administrator clicks on the section 'Configuration'. 2. The application displays a list of registered users. 3. Administrator clicks on the button 'Edit'. 4. The application displays a form with the user data. 5. Administrator modifies the user identification fields to be updated. 6. Administrator clicks on the button 'Save'.		
	Delete	1. Administrator clicks on the section 'Configuration'.		

		2. The application displays a list of registered users.
		3. Administrator clicks on the button 'Delete'.
		4. The application displays a new window to confirm.
		5. Administrator clicks on the button 'Save'.
Post-Condition	Create	A new ARCHES user is created.
	Edit	An existing ARCHEs user's profile is updated.
	Delete	An existing ARCHEs user's profile is deleted.

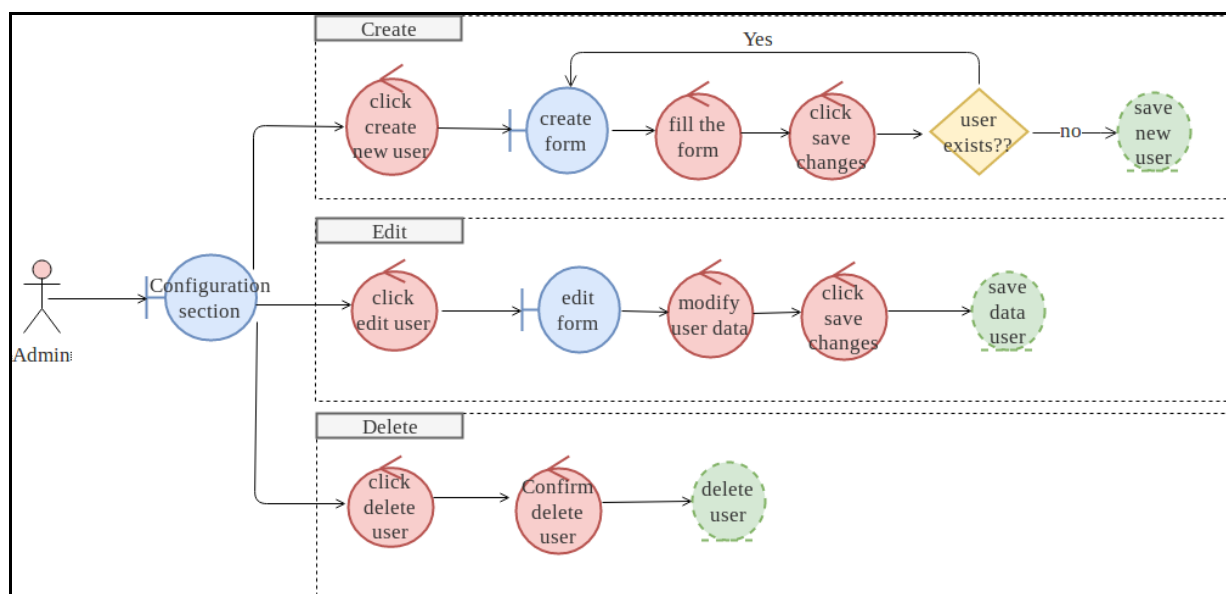The sequence described for the use case 'Manage users' is shown in Figure 3.

Figure 3: Process associated to the use case 'Manage users'.

3.2.2 Registration and authentication

The details of the "Registration and authentication" process are initially split into two use cases: 'Login' and 'Guest login'. See Table 2 and Table 3 respectively.

Table 2: Use case 'Login'.

Name	UC2.1	Name	Login
Description	The user logs in to the ARCHES platform through the ARCHES login portal.		
Pre-Condition	User must be registered in the platform.		
Sequence	1. The registered user accesses to the ARCHES platform login URL.		
	2. The registered user introduces her username and password (picture password or text password) on the login page.		
	3. The system checks the user credentials.		
	4. ARCHES allows the registered user to enter the platform.		

Post-Condition	The registered user is logged in the ARCHES platform.

Table 3: Use case 'Guest login'.

Name	UC2.2	Name	Guest login
Description	The guest user enters in the platform by clicking on the option 'Guest login'.		
Pre-Condition	The user is not registered in the platform.		
Sequence	1. The guest user accesses to the ARCHES platform login URL and clicks on the 'Guest login' option. 2. The system gives access to the user.		
Post-Condition	The guest user can access to the system.		

The sequence described for the use cases 'Login' and 'Guest login' is shown in Figure 4.
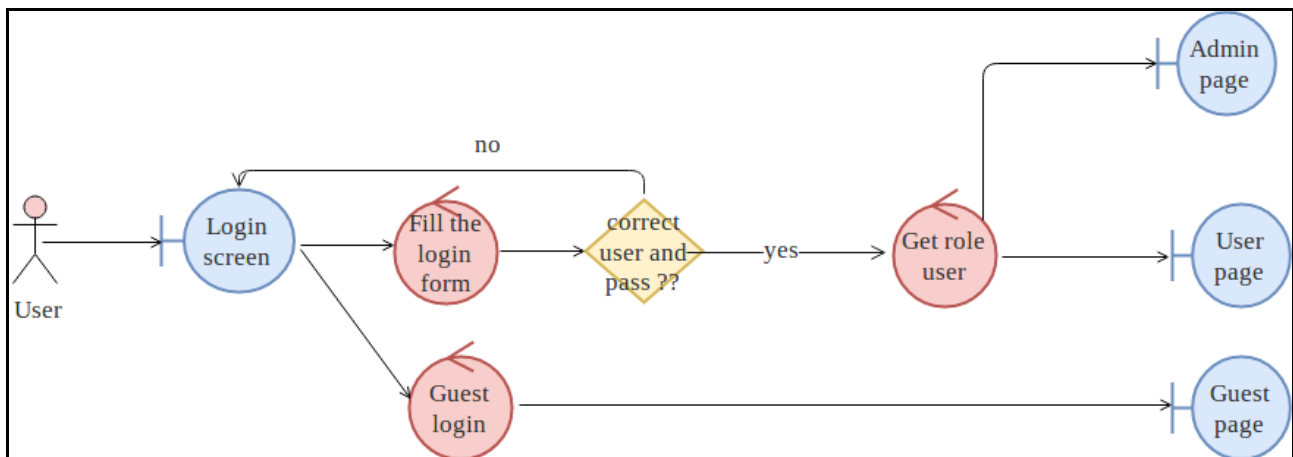
Figure 4: Process associated to the use cases 'Login' and 'Guest login'.

Following the 'Login' and 'Guest login' use cases, 'Logout' is summarised in Table 4. The sequence is represented in Figure 5.

Table 4: Use case 'Logout'.

Name	UC2.3	Name	Logout
Description	The registered user logs out from the ARCHES platform.		
Pre-Condition	User must be registered in the platform and logged.		
Sequence	1. The registered user clicks on the option 'Log out'. 2. The system logs out the user in the ARCHES portal.		

Post-Condition	The registered user is not logged in the ARCHES platform.
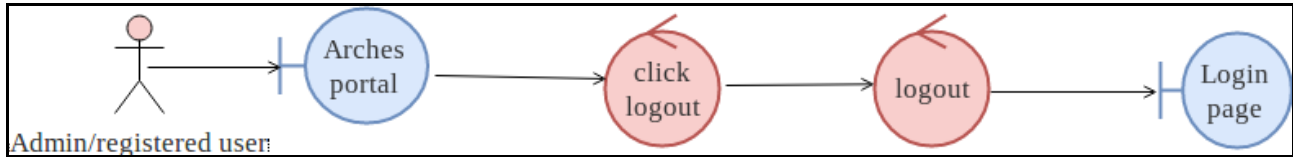
Figure 5: Process associated to the use cases 'Logout'.

In case the password is forgotten, the user should be able to recover it. This is addressed in Table 5.

Table 5: Use case 'Recover password'.

Name	UC2.4	Name	Recover password
Description	The user recovers her password by clicking on the option 'Recover password'.		
Pre-Condition	User must be registered in the platform.		
Sequence	1. The registered user accesses to the ARCHES platform login URL and clicks on the 'Recover password option'. 2. The system displays the recover password page. 3. The user introduces her username or email in the form and clicks on the option 'Continue'. 4. The system checks if the user/email exists and sends an email with a link to recover the password. 5. The registered user can access to the ARCHES platform through the link and is allowed to a new password.		
Post-Condition	The registered user gets a new password.		

The sequence described for the use case 'Recover password' is shown in Figure 6.
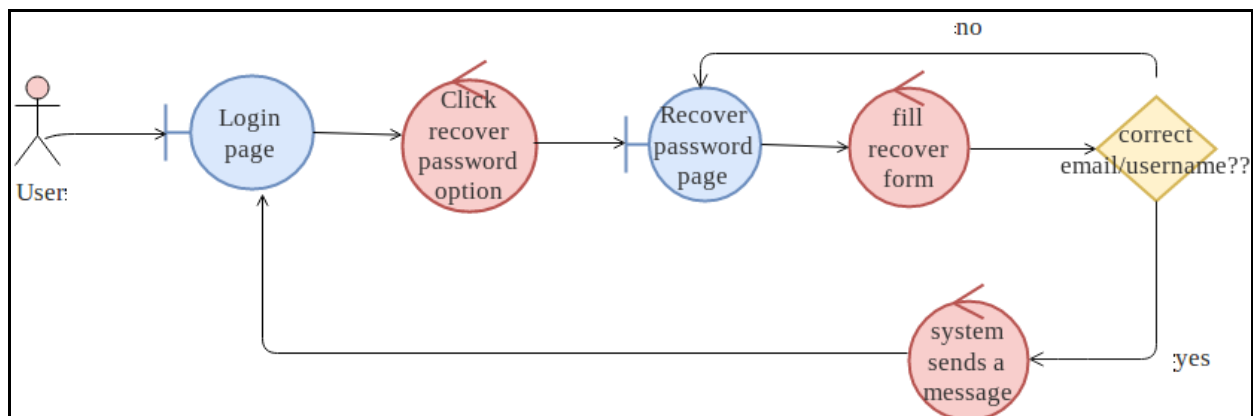

Figure 6: Process associated to the use cases 'Recover password'.

3.2.3 Profile

Two use cases are considered under this section (see Table 6 and Table 7).

Table 6: Use case 'Edit profile'.

Name	UC3.1	Name	Edit profile
Description	The registered user edits her data profile.		
Pre-Condition	User must be registered in the platform and logged in.		
Sequence	1. The registered user clicks on the option 'Profile'. 2. The system displays a form with her personal data. 3. The user modifies her personal data and clicks on the button 'Save'.		
Post-Condition	The user's profile is updated.		

Table 7: Use case 'Edit preferences'.

Name	UC3.2	Name	Edit preferences
Description	The registered user edits her preferences/needs.		
Pre-Condition	User must be registered in the platform and logged in.		

Sequence	1. The registered user clicks on the option 'Profile' and, then, selects the menu option 'Preferences".
	 2. The system displays a form with all the configuration options and assistive technologies in the system:
	   • **Language**: The system will have three language options (German, Spanish and English).
	   • **Font size:** The user can select the font size adapted to her needs.
	   • **Font colour**: The user can change the font colour for the content of the website.
	   • **Text to speech**: A type of speech synthesis functionality that is used to create a spoken sound version of the text into website.
	   • **Text to sign language**: Functionality that transforms some contents on the website into sign languages by means of an avatar.
	   • **Image processing**: Depending on the types of visual problems, different image filters will be defined to improve the image visualisation on the website.
	 3. The user selects her preferences and click on button 'Save'.		

Post-Condition	The system is adapted to the user preferences.

The sequence described for the use cases 'Edit preferences' and 'Edit profile' is shown in Figure 7.
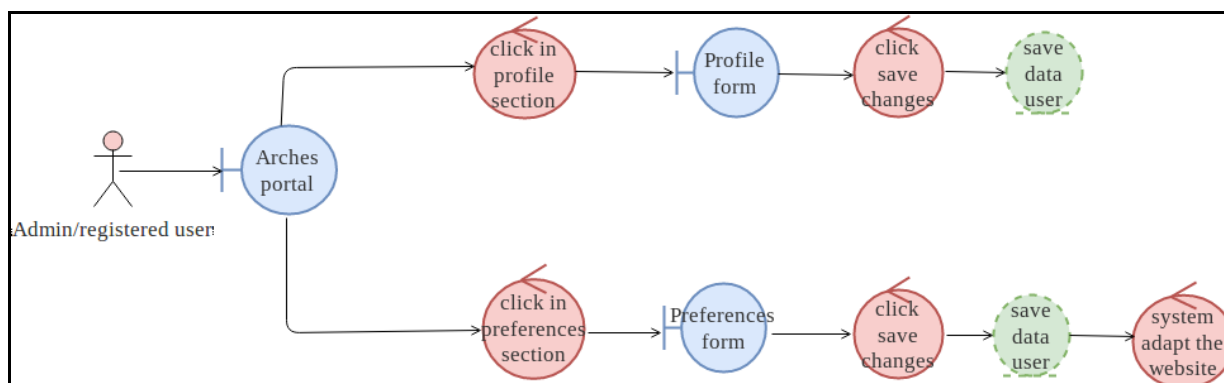

Figure 7: Process associated to the use cases 'Edit preferences' and 'Edit profile'.

3.2.4 Finder and results

There two uses cases linked to 'Finder and results'. These are 'Search' (see Table 8) and 'View results' (see Table 9).

Table 8: Use case 'Search'.

Name	UC4.1	Name	Search
Description	The user wants to search information in the finder of the website.		
Pre-Condition	The system must be connected to the external APIs and has to store data about the artworks that are searched.		

Sequence	1. The user clicks on the section 'Search'.
	 2. The system displays a finder with two search functions:
	    • **Quick search:** The user can search using one or more keywords.
	    • **Advanced search**: This allows the user to filter the information or to search by parameter. At the moment the parameters are:
	      ◦ Author
	      ◦ Work type
	      ◦ Period
	      ◦ Material
	      ◦ Place
	      ◦ Institution
	 3. The platform shows a list of results related to the words/expressions specified in the search-box and the filters.
	 4. The user can update the list of results in real-time according to the		

	selected filters.		
Post-Condition	User is able to visualise and filter information in real-time.		

Table 9: Use case 'View results'.

Name	**UC4.2**	**Name**	**View results**
Description	The user can view the results obtained in the search.		
Pre-Condition	The user has searched one or more artworks and the system has found some results.		

Sequence	1. The user clicks on one of the results of the search.
	2. The system gets the user profile configuration and preferences and adapts the content to the user needs.
	3. The system displays the details of the artwork. These can be:
	    • **Images**
	    • **Text info**
	    • **Videos**		

Post-Condition	User is able to access to the results of the search and can use/view the content adapted to her preferences.		

The process corresponding to the use cases 'Search' and 'View results' is depicted in Figure 8.
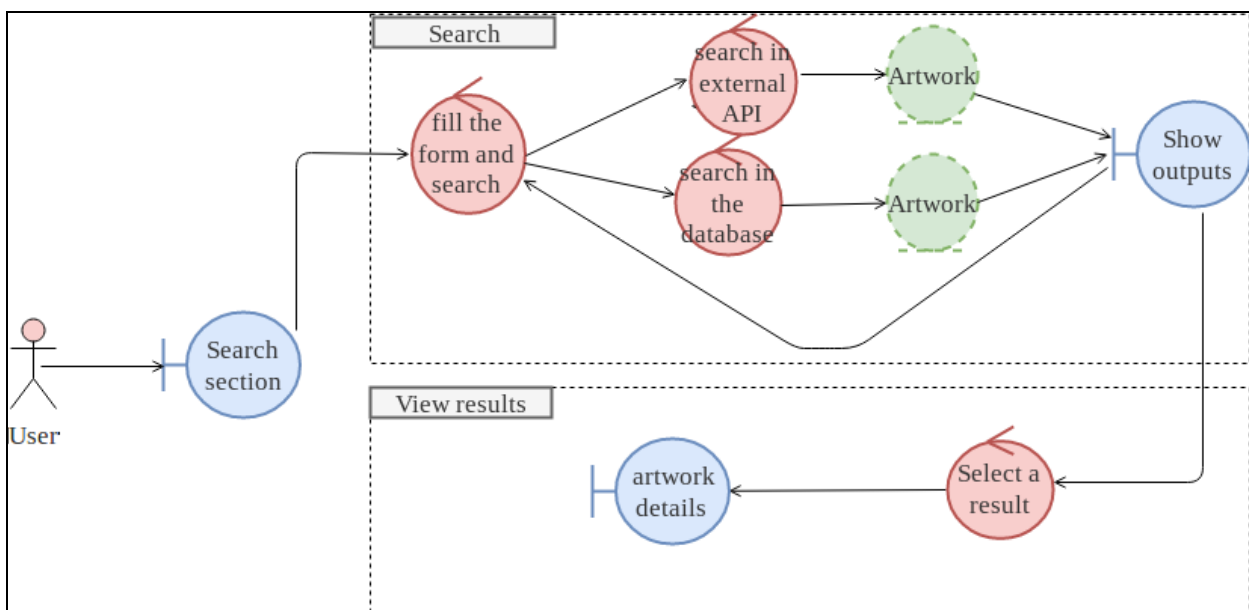

Figure 8: Process associated to the use cases 'Search' and 'View results'.

3.2.5   Games

One use case is considered under this category. More details are provided in Table 10.

Table 10: Use case 'Play games'.

Name	UC5.1	Name	Play games
Description	The user can play with the available games.		
Pre-Condition	The user has logged in to the website.		
Sequence	1. The user clicks on the section 'Games' 2. The system displays six games, each one with a description about the game and a preview image. 3. The user clicks on the game. 4. The system opens the game.		
Post-Condition	User is able to play the selected game.		

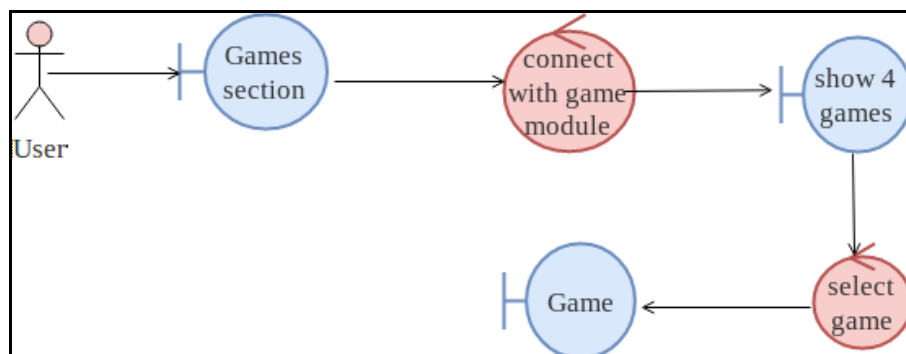The process to play a game is represented in Figure 9.

Figure 9: Process associated to the use cases 'Play games'.

4 Data model

The collection and organisation of data are an important and critical part in the creation of the system. The diversity of users with a different age range, languages and different difficulties associated with perception, memory, cognition and communication makes it necessary to have flexible and adaptable content. On the other hand, managing information provided by different sources and partners is a complicated task. Therefore, it is necessary to standardise data and create a common data model.

A data model is an abstract model that organises elements of data and standardises how they relate to one another and to properties of the real world entities.

The following diagram (Figure 10) presents an overall conceptual model of the system using the Unified Modelling Language (UML) notation. The class diagrams make use of Primary Key (PK) notation as well as Foreign Key (FK) notation, where a field is a reference to another table primary key. This allows us to define unique identifiers. The diagram represents all the entities (tables) and their attributes. It also shows the relationships between tables (1-to-1 or 1-to-many mapping).

Since this is a first version, the data model is still open to modifications, such as adding more entities and attributes if so needed according to the decisions adopted by the exploration groups and the participating museums regarding the inclusion of new data sources.

The diagram is divided in three areas or modules:

- Data provided by the museums

- Management of users

- External API

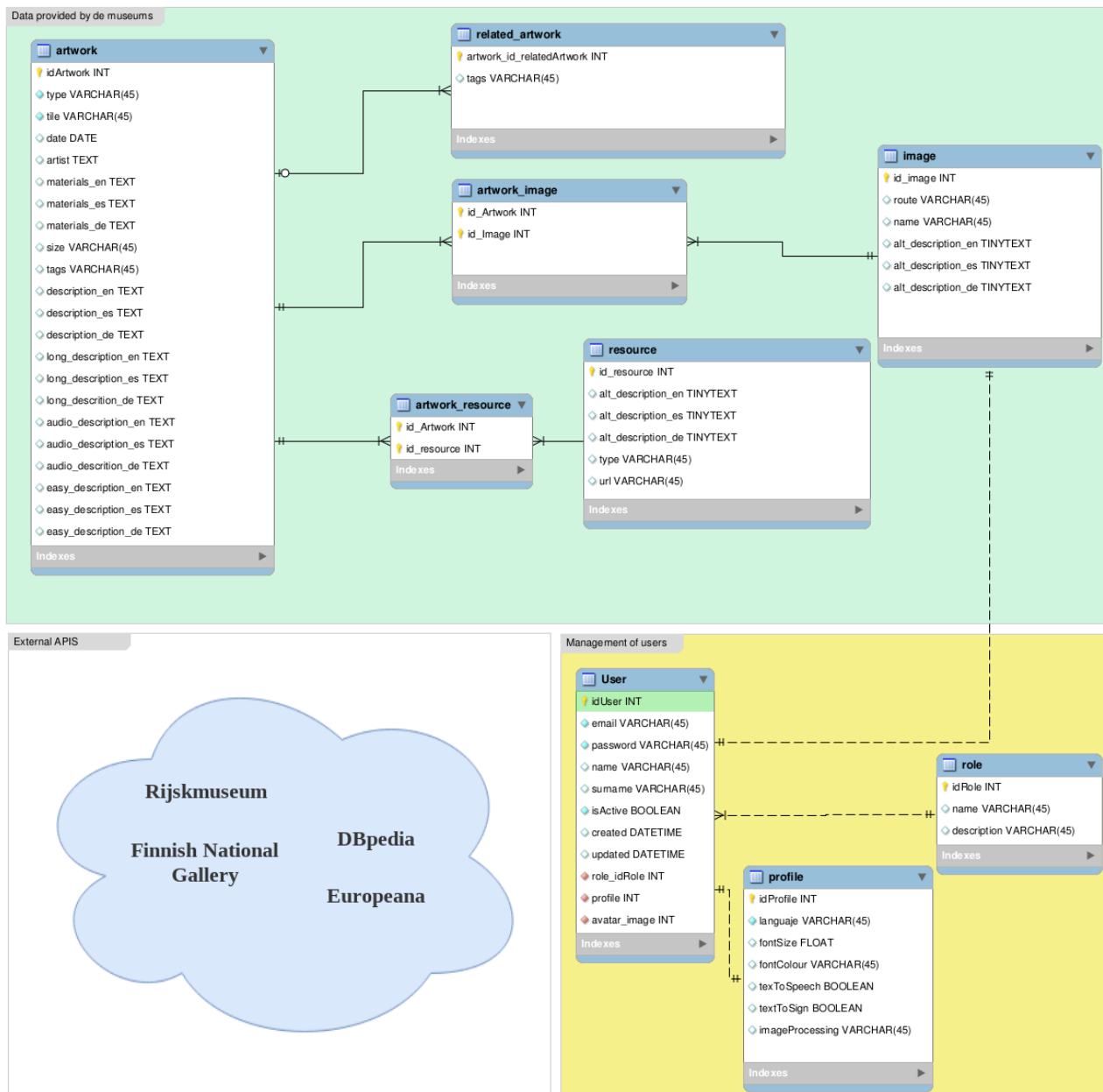In the following subsections more details about these modules are given.

Figure 10: Data model.

4.1 Data provided by the museums

In Figure 11 the principal entity '*artwork*' is presented. This entity has the following attributes:

- **Type**: Represent the type of artwork (e.g. painting, sculpture, etc.).

- **Date**: Date of creation.

- **Artist**: Author of the artwork.

- **Materials**: Materials used in the artwork in the different languages (English, Spanish and German).

- **Size**: Dimensions of the artwork.

- **Tags**: Keywords to represent the artwork.

- **Description**: General description, including main features, in the different languages (English, Spanish and German).

- **Easy description**: Description using simple concepts and ideas in the different languages (English, Spanish and German) – usually shorter than the other options.

- **Long description**: More detailed information about the artwork in the different languages (English, Spanish and German).

- **Audio description**: Audio track corresponding to the different versions of the available descriptions in the different languages (English, Spanish and German).
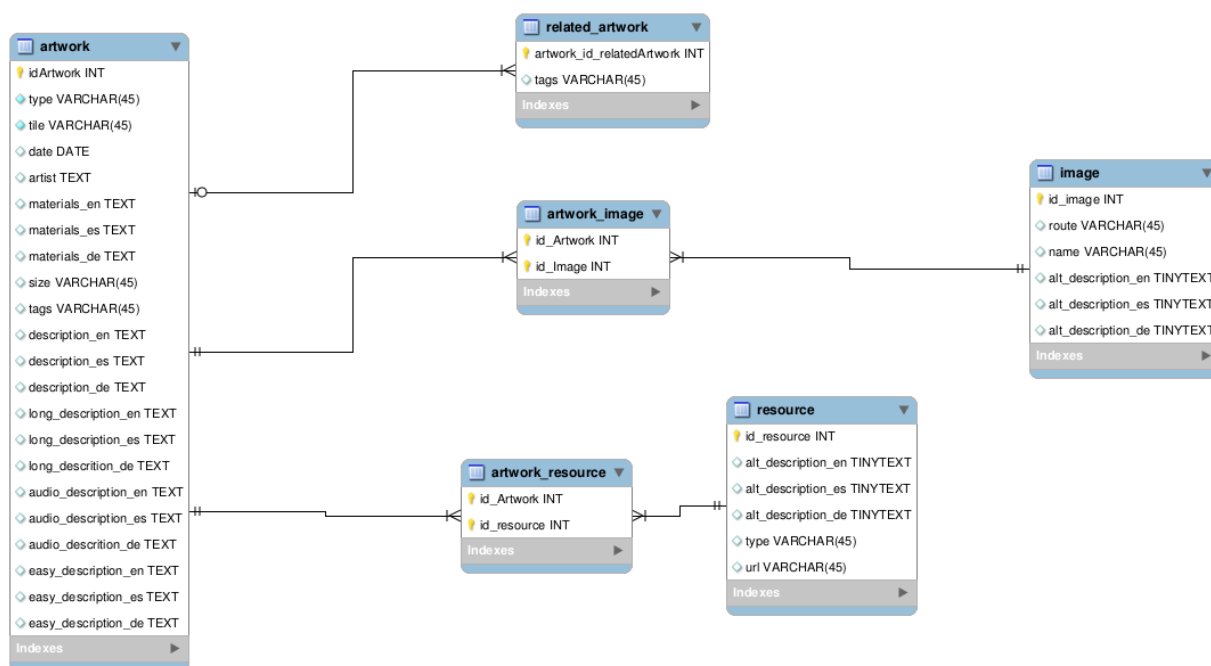

Figure 11: 'Data provided by the museums' module.

A specific artwork can be connected with other related artworks (e.g. same style, author, period, etc.). These connections are not restricted to other elements within the same collection, but establishing links with other museums will be possible too. This will allow the user to navigate through diverse institutions and contents. The table 'related_artworks' will be used to store the information (e.g. descriptions, images).

An example of how the multiple attributes and fields are filled in is shown in Table 11.

Table 11: Example of data provided for a specific artwork.

Artwork		
Museum	Kunsthistorisches Museum Wien	
Type	Painting	
Title	Water	
Photo		
Date	1566	
Artist	Giuseppe Arcimboldo (1527 - 1593 Milan / Mailand)	
Materials	English	Wood
	German	Holz
	Spanish	*Unavailable*
Size	66,5 cm x 50,5 cm	
Location	Wien, Kunsthistorisches Museum, Gemäldegalerie	
Tags	Arcimboldo, water, emperor	
Description	English	This painting belongs to a series of eight fantastic heads, which Arcimboldo created as a gift for the Emperor Maximilian II. They symbolize the four elements and seasons and thus express the emperor´s omnipotence.
	German	Dieses Gemälde gehört zu einer Serie von phantastischen Köpfen, die Arcimboldo als kaiserliches Geschenk geschaffen hatte. Sie stellen die vier Elemente und Jahreszeiten dar und sind damit zugleich eine Huldigung an die Allmacht des Kaisers.
	Spanish	*Unavailable*
Long	English	Giuseppe Arcimboldo is a very famous painter. He lived about 500 years ago. The painting depicts a head, which is facing to the left side.

Description		But the head is not a human head. Instead of the nose Arcimboldo painted a mural.
(for people with visual and cognitive impairments)		A mural is a snake-like fish living in the sea. He is very dangerous. The cheek and the cheekbone is a ray. A ray also lives in the sea. He has a flat body and a long tail fin .A seashell opens its cone as ear. Arcimboldo embellished it with a pearl.
		The round eye of an ocean sun fish is the pupil. A bunch of deep read corals rises on the front. Corals are sea animals that grow on the ocean bed. They can appear in many different colours.
		On top of the head blows a small whale water fountains out of its blowholes. The corals and the water fountains look like tufts of human hair.
		A pike and a crawling eel form the neck. Round the neck lies an elegant necklace of oyster pearls.
		For the bust Arcimboldo chose a sea tortoise, a frog and a crawfish. The breast is covered by a crab.On the shoulder lies an octopus.The long tentacles slide down the arm.
		This image is a fanciful human portrait.The different parts of the face are made of water animals. They live in fresh water and in the ocean. Arcimboldo painted them in a most naturalistic manner.
		Most of them Arcimboldo has probably never seen before.Why was he able to paint them so lively?
		Arcimboldo lived at the Imperial Court in Vienna.
		At that time several well-known scientists lived there too.Arcimboldo obviously took advantage of their knowledge.
		The artist chose some animals for special reasons. Probably he wanted to allude to imperial garments. The big crab on the breast is similar to a breast plate of an armour. The octopus on the shoulder looks like epaulettes of a uniform.
		This picture belongs to a series of eight paintings. These eight paintings symbolise the four elements and the four seasons. This head is the symbol for the element water.
		In the Kunsthistorisches Museum are also the paintings representing the element fire and the seasons winter and summer.
		One season and one element form a pair.
		The wet water forms a pair with the cold winter, the glowing fire with the hot summer.
		The other four pictures of the series are painted in the same imaginative manner. They represent spring, air, autumn and earth. But they are preserved in other international collections.
		The artist painted this series nearly 500 years ago. He gave it to the

		Emperor of the Holy Roman Empire. Thus the artist expressed his high appreciation for him.
		The four elements and the four seasons glorify the Emperor´s omnipotence. But they remind us also of eternity. Arcimboldo painted a lot of similar heads.
	German	Giuseppe Arcimboldo ist ein berühmter italienischer Maler. Er lebte vor mehr als 500 Jahren. Das Bild zeigt einen Kopf, der nach links blickt. Der Kopf ähnelt aber in keiner Weise einem Menschen.Anstelle der Nase ist eine Muräne zu erkennen. Eine Muräne ist ein schlangenartiger Fisch, der im Salzwasser lebt. Er ist sehr gefährlich.
		Die Wange des Gesichts und der Backenknochen werden von einem Rochen gebildet.Ein Rochen lebt ebenso im Salzwasser. Er hat einen ganz flachen Körper und eine lange dünne Schwanzflosse.
		Anstelle des Ohres öffnet sich der Trichter einer Muschel. Arcimboldo schmückte sie sogar mit einer tropfenförmigen Perle als Ohrring. Anstelle der Pupille sitzt das runde Auge eines Mondfisches. Auf der Stirn wächst ein rot leuchtender Korallenast. Korallen sind Meerestiere, die auf dem Meeresgrund wachen.Sie können in vielen unterschiedlichen Farben vorkommen.
		Auf dem höchsten Punkt des Kopfes spritzt ein kleiner Walfisch aus seinen beiden Blaslöchern Wasserfontänen. Die Korallenäste und die Wasserfontänen schauen wie abstehende Haarbüschel einer menschlichen Frisur aus.
		Ein Hecht und ein sich schlängelnder Aal formen den Hals. Elegant schmiegt sich eine Kette aus Austernperlen um den Hals.
		Für den Oberkörper wählte Arcimboldo eine Wasserschildkröte, einen Laubfrosch und einen Krebs.Die Brust bedeckt eine mächtige Krabbe. Auf der Schulter ruht ein Tintenfisch.Seine langen Tentakel gleiten am Oberarm der Figur entlang.
		Dieses Bildnis ist eine phantasievolle Darstellung eines menschlichen Porträts. Die einzelnen Gesichtspartien sind aus zahlreichen Wasserlebewesen gebildet.Sie leben sowohl im Salz- als auch im Süßwasser.Sie sind überaus lebendig widergegeben.
		Den Großteil der Tiere hatte Arcimboldo vermutlich noch nie in seinem Leben gesehen. Warum konnte er sie aber derartig naturgetreu widergeben? Arcimboldo arbeitete am Kaiserlichen Hof in Wien.
		In dieser Zeit lebten mehrere berühmte Naturwissenschaftler am kaiserlichen Hof.Deren Wissen ist in den Werken Arcimboldos wieder zu erkennen.
		Der Künstler wählte manche Tiere aus ganz bestimmten Gründen aus. Er wollte vermutlich Hinweise auf kaiserliche Kleidungsstücke

		geben.Der mächtige Krebs auf der Brust erinnert an einen Brustpanzer einer Rüstung.
		Der Tintenfisch auf der Schulter schaut wie Epauletten einer Uniform aus.
		Dieses Gemälde gehört zu einer achtteiligen Serie. Alle acht Bilder stellen die vier Elemente und die vier Jahreszeiten dar.Dabei ist dieser Kopf das Symbol für das Element Wasser.
		Im Kunsthistorischen Museum sind außerdem noch das Element Feuer und die beiden Jahreszeiten Winter und Sommer erhalten. Jeweils eine Jahreszeit und ein Element gehören paarweise zusammen. Das nasse, kalte Wasser bildet ein Paar mit dem Winter, das glühend heiße Feuer mit dem Sommer.
		Die anderen vier Bilder der Serie sind ebenso phantasievoll zusammengestellt.Sie stellen den Frühling, die Luft, den Herbst und die Erde dar.Aber sie befinden sich in unterschiedlichen internationalen Sammlungen.
		Der Künstler malte diese Bilderserie vor fast 500 Jahren. Er schenkte sie dem Kaiser des Heiligen Römischen Reiches. Damit drückte ihm der Künstler seine große Wertschätzung aus.
		Die vier Elemente und die Jahreszeiten verherrlichen die Allmacht des Kaisers.Sie erinnern aber auch an die Ewigkeit.Arcimboldo malte noch viele ähnliche Köpfe.
		Lassen Sie einmal Ihre Phantasie spielen und entwerfen Sie einen phantastischen Kopf nach Ihren Ideen!
	Spanish	*Unavailable*
Audio description	*Unavailable (to be prepared)*	
Easy Description	English	The painter depicts a head with a funny face. This head is composed of different fish. Altogether the painter created eight such pictures.
		Four of them are in the Kunsthistorisches Museum. Another is composed of fruit. Another is formed from the trunk of a tree. The fourth head is composed out of things which have to do with fire.
		The heads represent the two seasons: summer and winter, but they illustrate also two of the four elements, fire and water.
		The painter presented these paintings to the Emperor because he admired the Emperor as power over the four seasons and the four elements.
	German	Der Maler malt einen Kopf mit einem Gesicht.Der Kopf und das Gesicht sind aber aus lauter Fischen komponiert.Der Maler hat insgesamt acht solche Köpfe gemacht.

		Vier davon befinden sich im Kunsthistorischen Museum.Ein weiterer Kopf ist aus Früchten gemalt.Ein anderer ist aus einem Baumstrunk gemalt.
		Der vierte Kopf besteht aus lauter Dingen, die mit dem Feuer zu tun haben.Die Köpfe stellen die Jahreszeiten Sommer und Winter dar.
		Sie stellen aber auch zwei Elemente dar, das Element Feuer und Wasser.Der Maler schenkte diese Bilder dem Kaiser.
		Der Maler verehrte den Kaiser als Herrscher über die vier Elemente und die vier Jahreszeiten.
	Spanish	*Unavailable*
Multimedia resources	https://www.youtube.com/watch?v=Em3bzFV_WL4	
Related artworks	• Giuseppe Arcimboldo, Winter, Wien, KHM, Inv. Nr. GG 1590 • Giuseppe Arcimboldo, Feuer (Fire), Wien, KHM, Inv. Nr. GG 1585 • Giuseppe Arcimboldo, Sommer (Summer), Wien, KHM, Inv. Nr. GG 1589 • Giuseppe Arcimboldo, Luft (Air), Privat Collection, Switzerland • Giuseppe Arcimboldo, Frühling (Spring), Madrid, Real Academia de Bellas Artes de San Fernando • Giuseppe Arcimboldo, Erde (Earth), Privatsammlung, Österreich • Giuseppe Arcimboldo, Herbst (Autumn), Paris, Musée du Louvre (belongs to a second sereies; original version of the Autumn is lost, the Louvre version gives the impression of the lost original)	

4.2 Management of users

Following the same scheme presented in the previous section, describes the key entity relationships between the users and other entities. It shows that 'User' contains a series of attributes, being 'idUser' the primary identification method of the user by the system, while 'name' is the main identification displayed to users. The email and password are required upon registration, and these are requested every time the user proceeds to log in to the platform. This information is encrypted using secure algorithms to protect sensitive data. In addition, the user has the option to include additional profile data such as name, surname and are allowed to select an image as profile picture.

Each user has her own profile. In the profile the user can configure the language (mandatory), font size, font colour and assistive technologies like text to speech, text to sign language and image processing. This is aligned with the principle of asking the user about the functionalities that will be enabled in the platform instead of asking about disabilities.
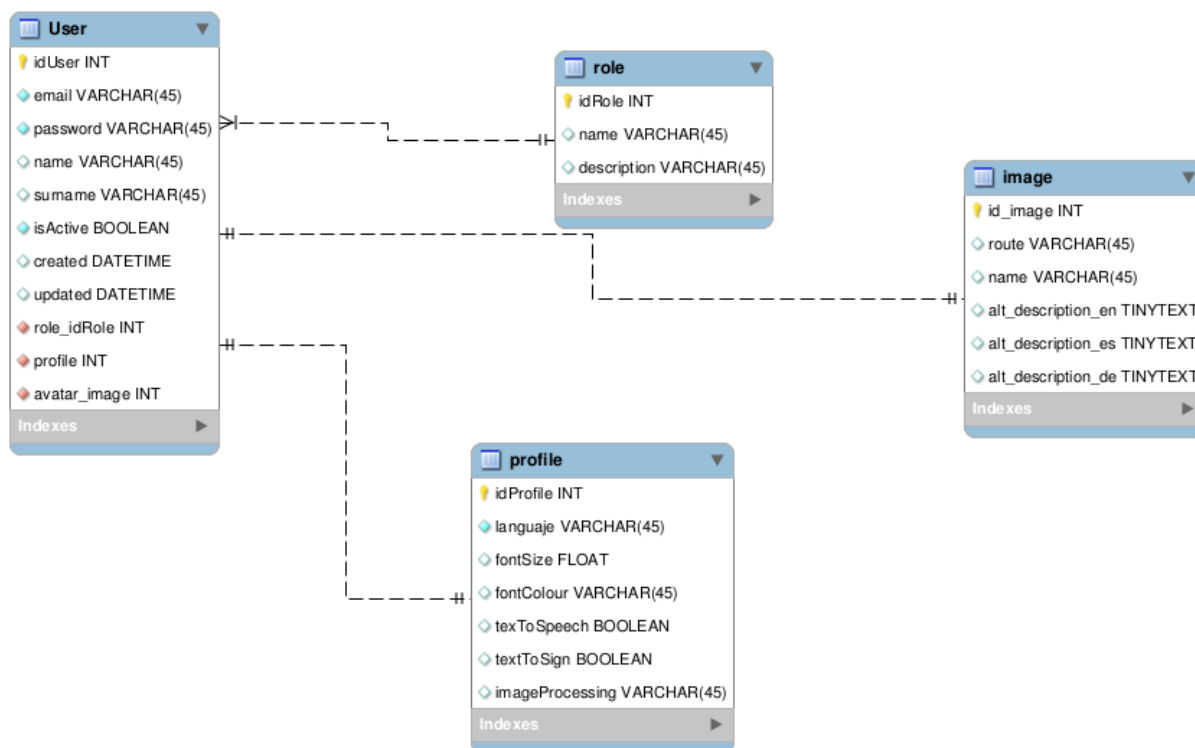
Figure 12: 'Management of users' module.

4.3 External APIs

This module extracts information from external APIs for its further consumption in ARCHES. At this stage four APIs have been identified to be integrated into the platform: Europeana [3], DBpedia [2], Rijskmuseum [5] and Finnish National Gallery [4]. The exploration groups are working with these and the identification of the different entities and attributes is still in progress.

5 Definition of graphical user interface

A Graphical User Interface (GUI) is a computer environment that simplifies the interaction of the user with the computer or electronic device by taking advantage of their graphic capabilities. The most common approach for this is based on the use of visual elements, such as icons, pull-down menus, buttons, scroll bars, windows and dialog boxes, which are easy to understand and extensively adopted by the IT community.

This section shows a first version of the design of the graphical interface corresponding to the web platform. The main objective of these screens is to validate the user interfaces with end-users in order to get a solution that fulfils their needs.

These interfaces have been designed with a web prototyping tool taking into account the web system requirements defined in deliverable D3.1 "Report on system architecture definition" [1], in particular, section 2 "Web System Requirements".

5.1 Website site map

Figure 13 shows the structure and navigation scheme of the website. This will allow the reader to know how the different screens are connected.
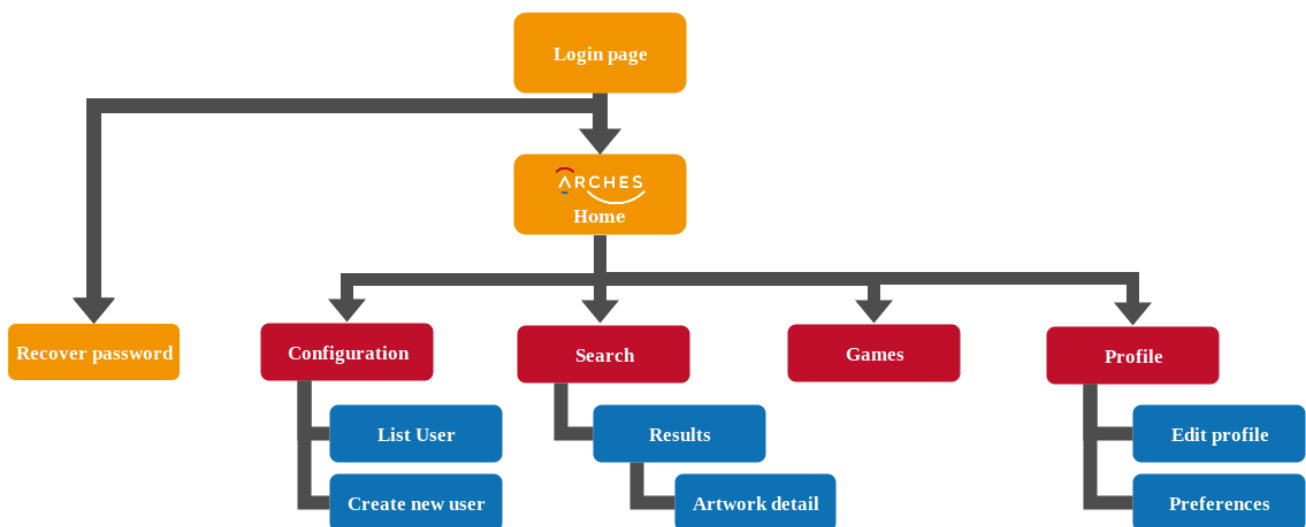

Figure 13: website site map.

5.2 Registration and authentication

Regarding the registration and authentication, all type of users will log in to the platform through the same URL (Internet address). In the login screen (see Figure 14), users are requested to provide their username and password before clicking on the 'Login' button. In order to facilitate people with differences and difficulties associated with perception, memory, cognition and communication to log in to the platform, a picture password – consisting of three or more icons the user is free to combine – is displayed by default. However, if the user prefers to opt for a word or a string of characters, she can enter the text password like in other websites.

Once the 'Login' button has been clicked, and assuming that the user's credentials are correct, the user is allowed to access to the website with her own profile. Otherwise, she will be asked to try again.

The option 'Guest login' is also implemented so visitors can access without credentials.
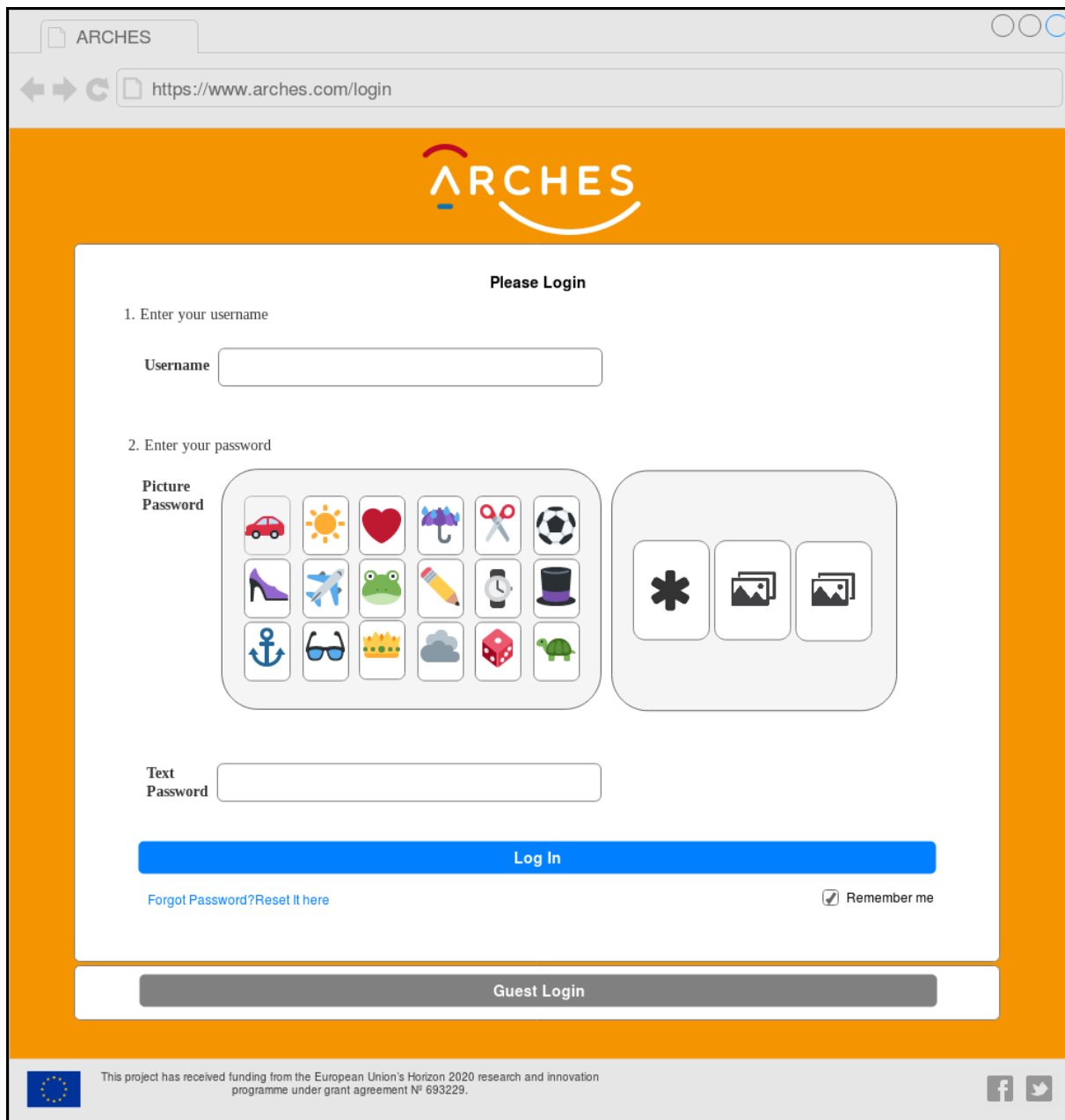

Figure 14 : 'Login' screen.

If the user forgets the password, this can be reset by clicking on the option 'Forgot password'. At this point, the email address or username will be requested (see Figure 15). Afterwards, the application will send an email with a link to reset the password.
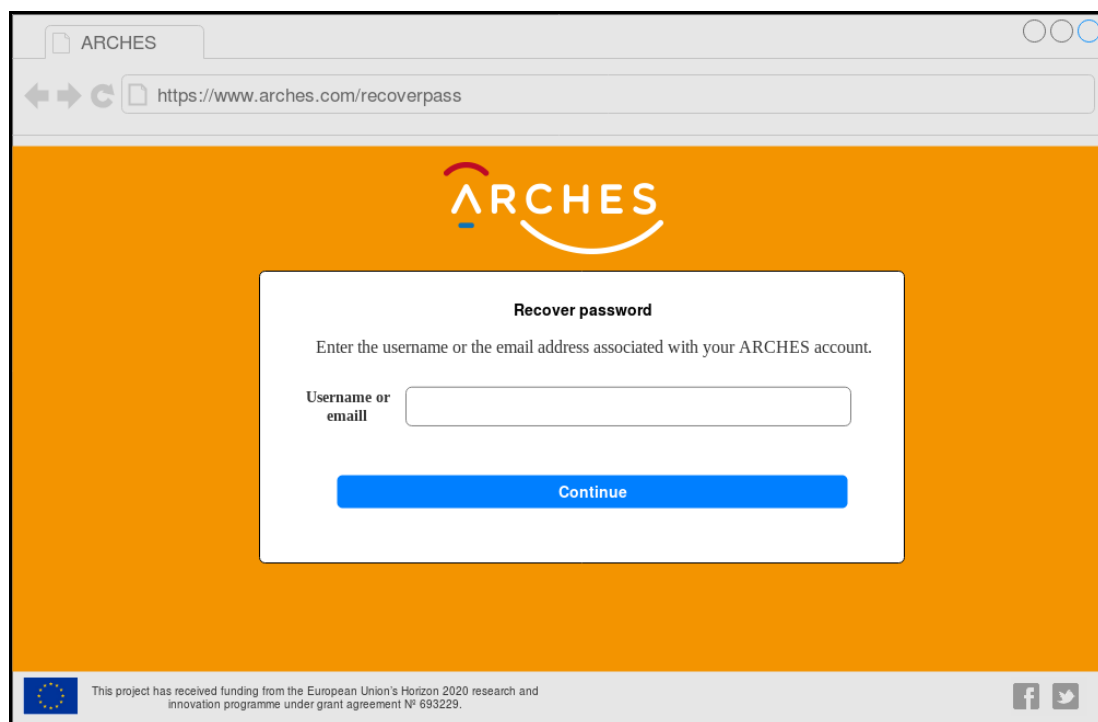
Figure 15: 'Recover password' screen.

5.3 Configurations

Once the user is logged in the platform, a top bar menu listing all the services offered by the system together with a 'Configuration' section will be displayed. The latter will only be available for System Administrators. If this section is selected, administrators will be allowed to create a 'New user' or get a full list of the existing users 'List existing users'.

5.3.1 List existing users

When the administrator clicks on the option 'Configuration' the application displays a list of registered users (see Figure 16). In this list the administrator can manage ARCHES users by clicking on the 'Edit'/'Delete' buttons for each of the available entries. In particular, when selecting the option 'Edit', the system will show the agent data ready to be modified and saved.
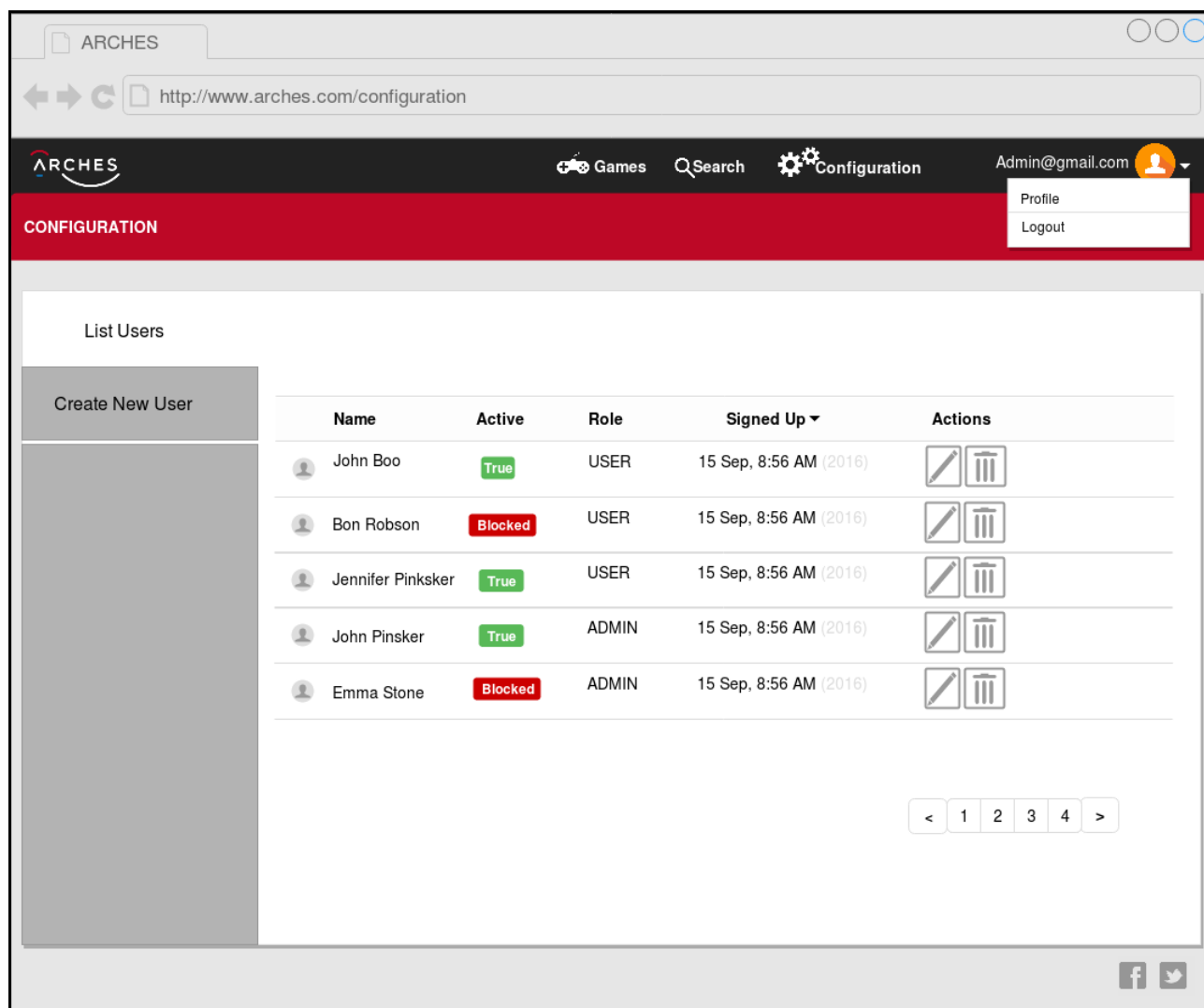
Figure 16: 'List users' screen.

5.3.2 Create new user

If the user administrator chooses 'Create new user', a form will be displayed to specify the email, username, role, default language and if the user is active/inactive (see Figure 17). The new registered user will receive the credentials to access to the website via email.
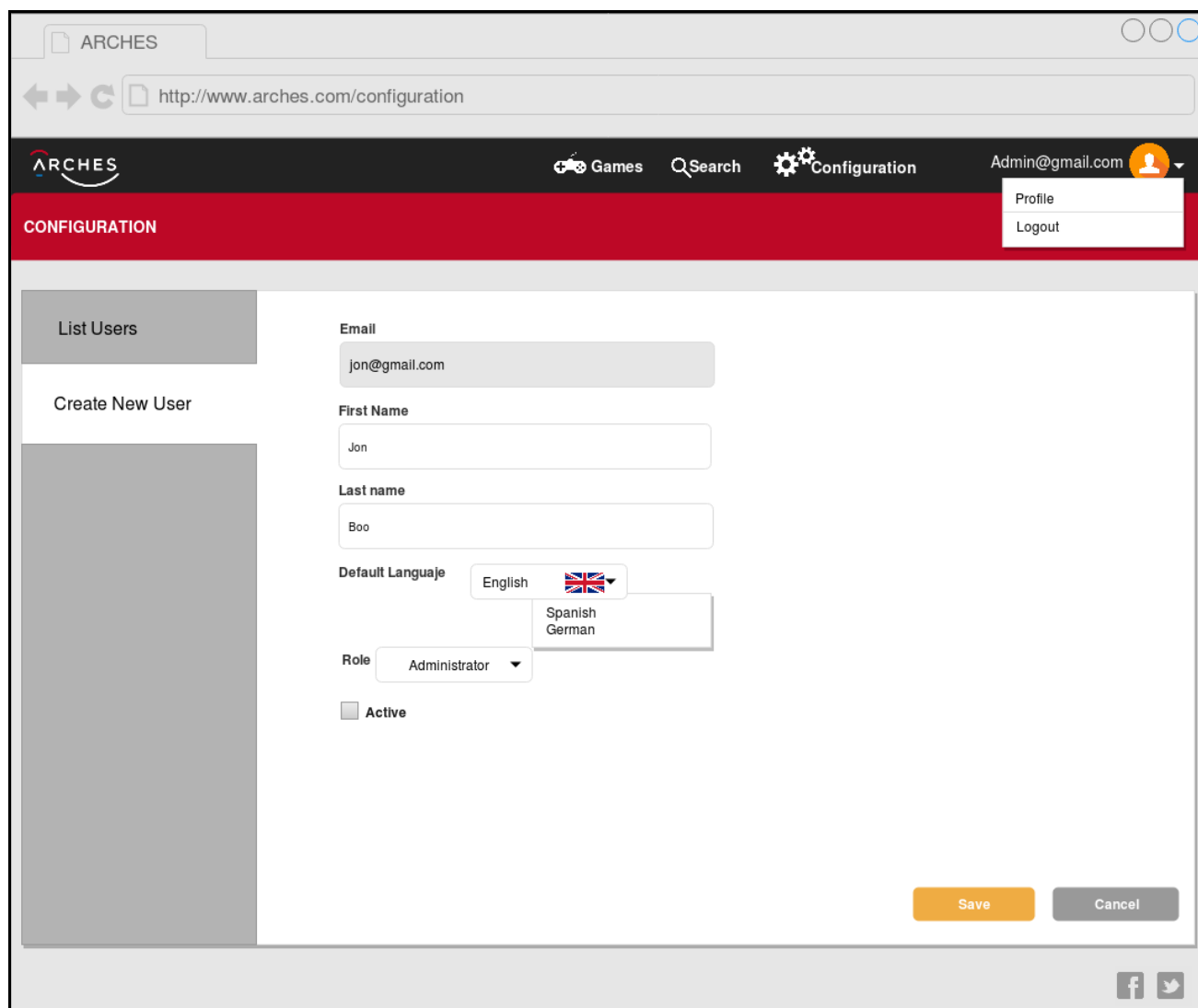
Figure 17: 'Create new user' screen.

5.4 Profile

A user profile is a collection of settings and information associated with a user. Each registered user has her own profile and can configure the corresponding personal data and preferences like language, font size, font colour, etc.

5.4.1 Edit your profile

To change or edit the profile the user will have to click on the email displayed in the top bar and a drop-down list will appear (see Figure 18). Then, the user will select one of the two options: 'Profile' and 'Logout'. When selecting the former option, the website displays the personal data, allowing her to modify several input fields (e.g. name, last name, password and upload an avatar image). The email address is the only parameter the user cannot edit.

To update the profile photo, just click on the image and select 'Upload an image'. The user and choose an image to upload.
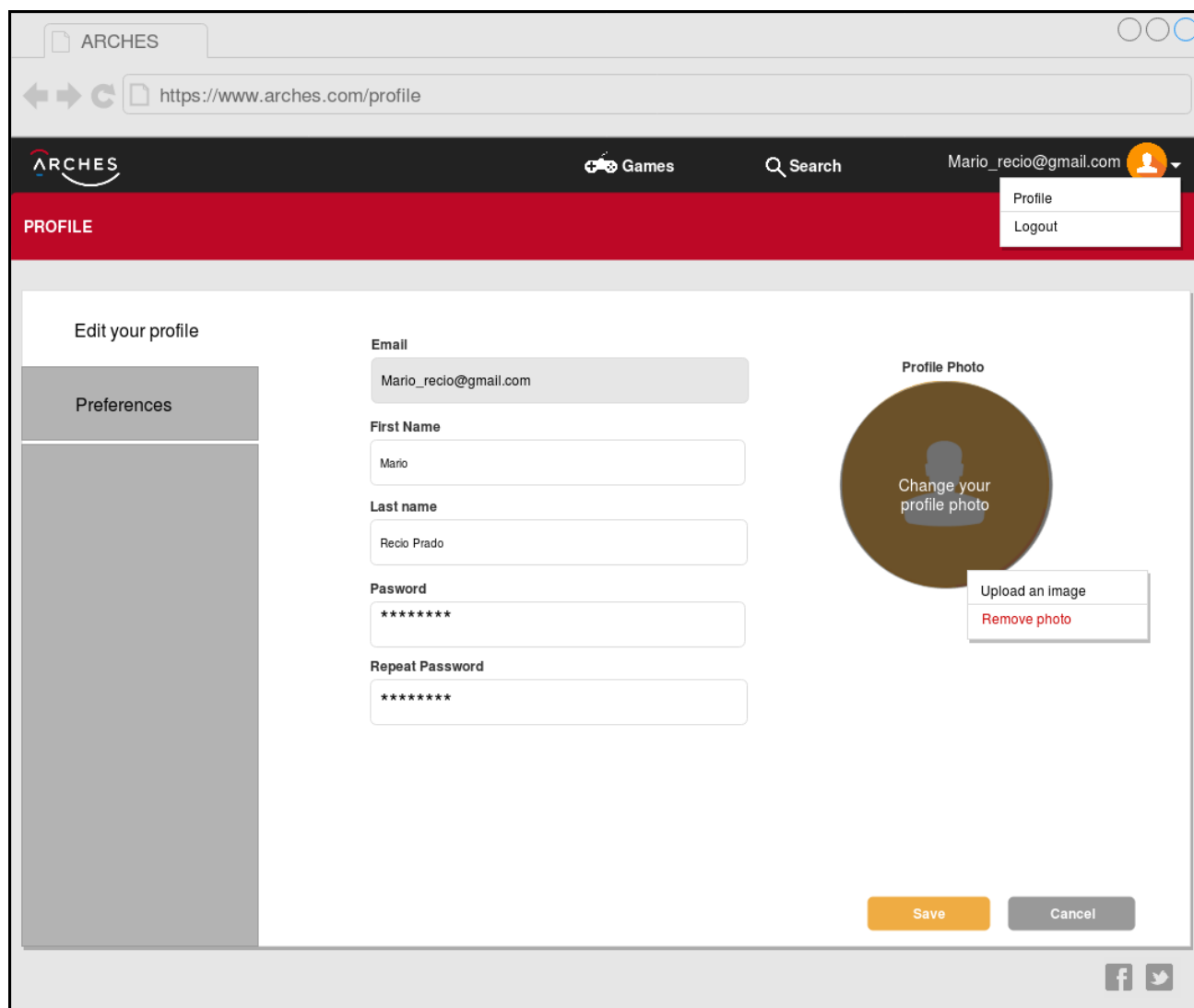
Figure 18: 'Edit profile' screen.

5.4.2 Preference

If the user selects the option 'Preferences' on the same page (see Figure 19), she will be allowed to configure the profile according to her particular access needs and preferences. For example, the user will be allowed to change the language, font size, font colour, or select assistive technologies like text to speech, text to sign language or image processing.
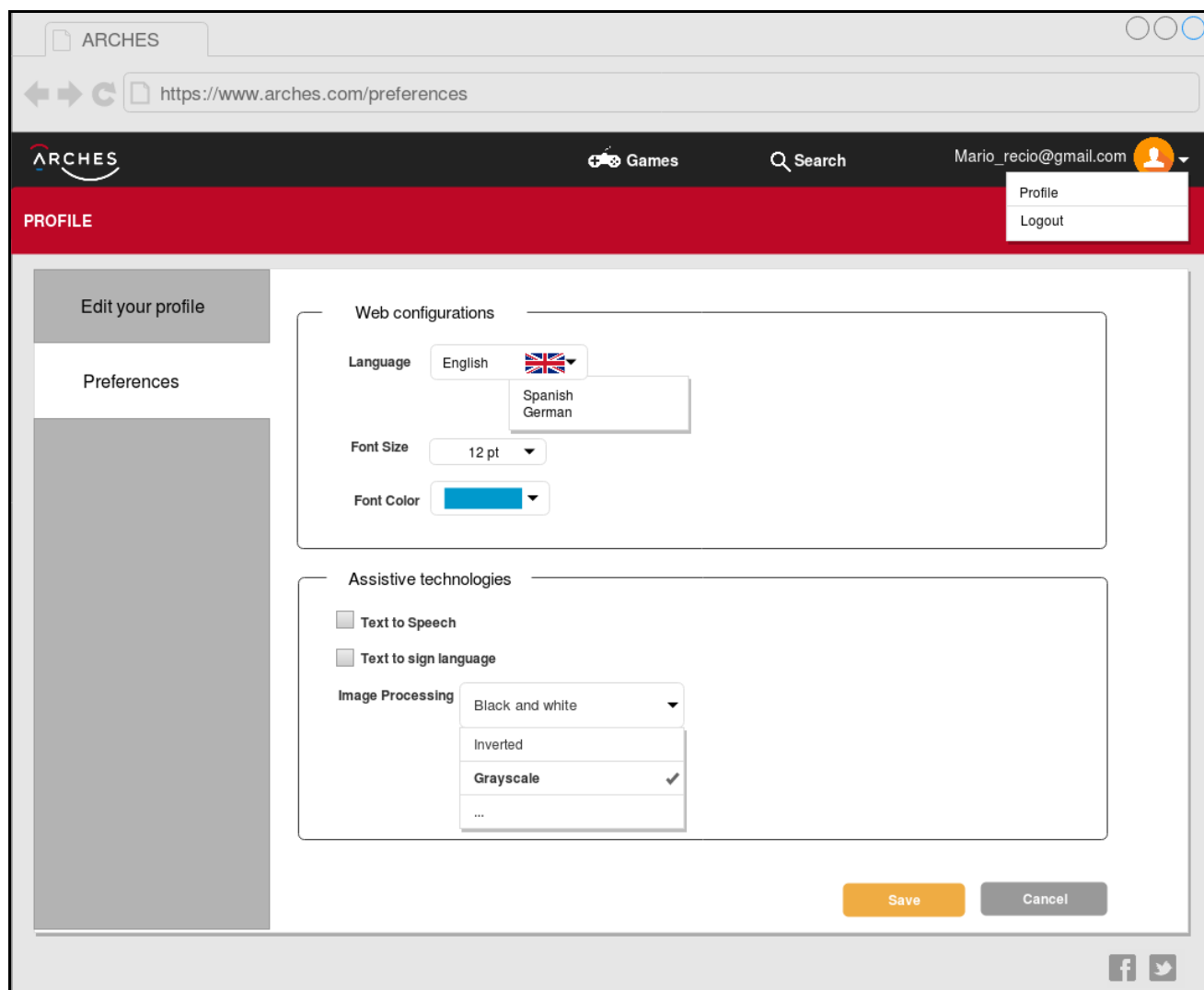
Figure 19: 'Preferences' screen.

5.5   Finder and results

The ARCHES website will implement two search functions: quick and advanced search.

- **Quick search** is a Google-like search using keywords that will retrieve results containing one or more of the keywords the user wrote in the search field.

- **Advanced Search** allows narrowing the focus of the search by defining some parameters or filters such as author, work type, period, material, place etc.

Once the keywords have been introduced in the search bar, the user should click on the button 'Go!' to see the results.
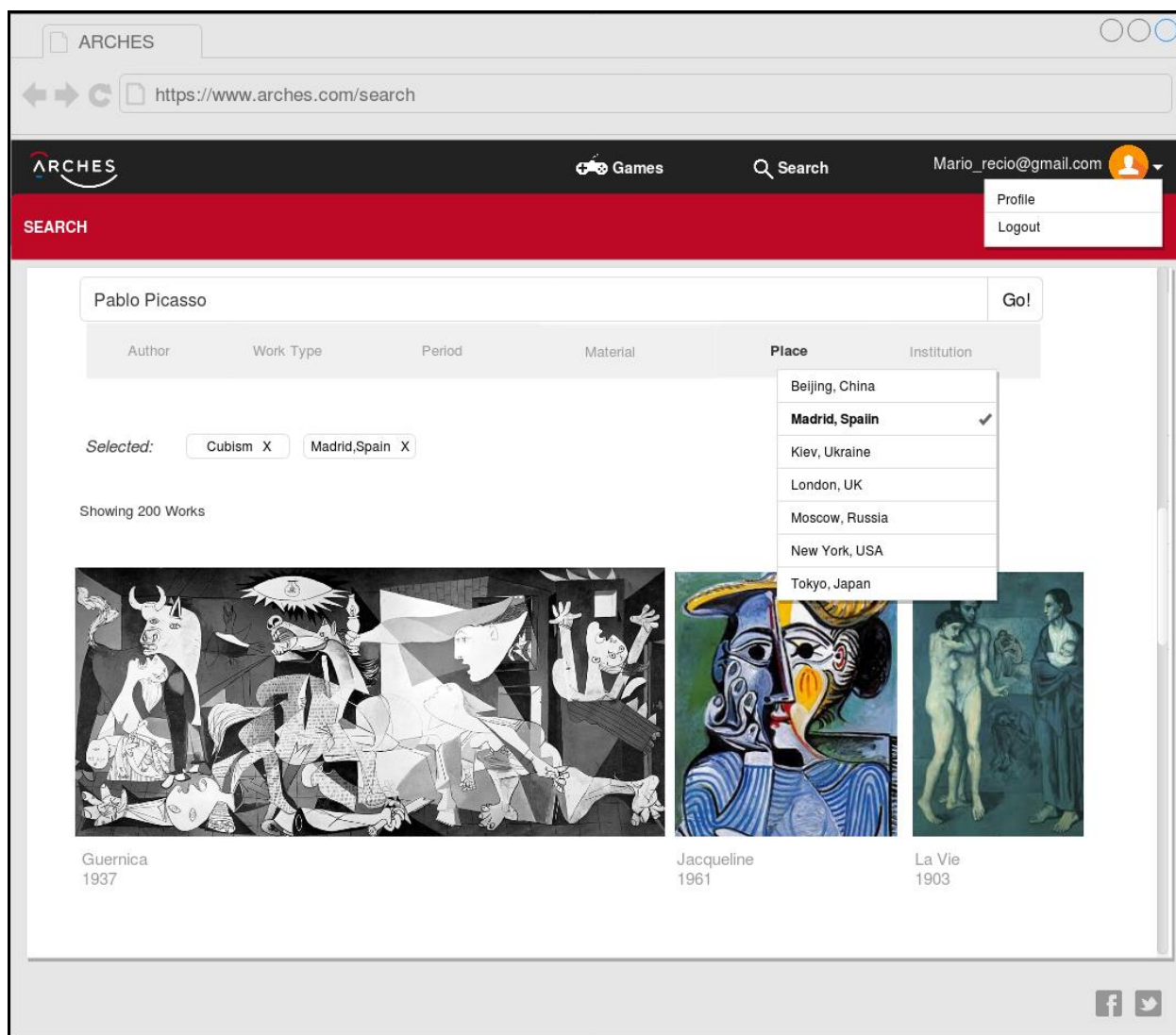
Figure 20 : 'Finder' screen.

The results will be displayed on the 'Finder' screen (see Figure 20). When one of these results is chosen, the user will be redirected to a new screen where all the details of this specific artwork are shown (see Figure 21). At the top of this page, a gallery of pictures related to the artwork will be presented. For each image the user will have several functionalities: zoom in, zoom out, share the image in social networks and full screen among others. This is followed by the details of painting (for example, artist, year, material, dimensions, place, description, etc.) below, and available multimedia resources (such as a video with some accessibility options and avatar video that explain the information of the painting) at the bottom.
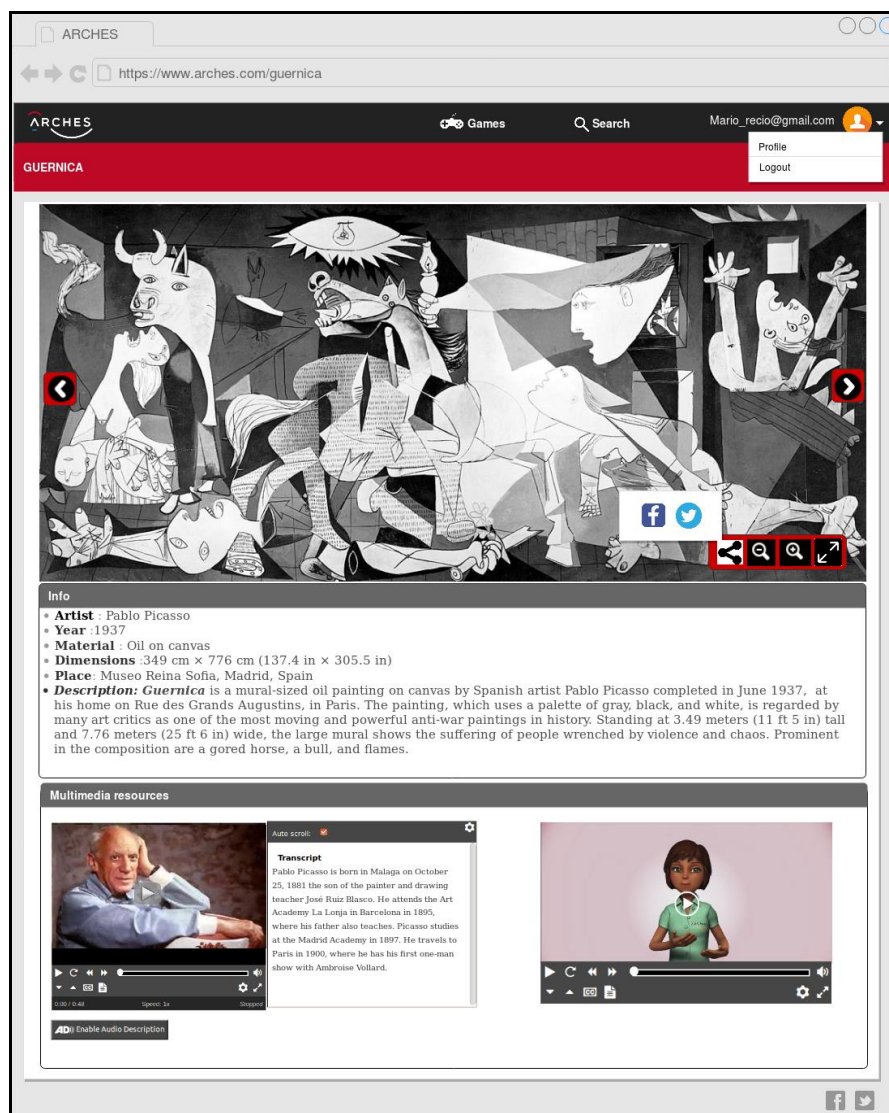
Figure 21: Artwork example screen.

5.6   Games

Games provided by Coprix will also be integrated into the website (see Figure 22). Content for these games will be agreed with several stakeholders, including the museums, technical experts and the exploration groups.

Since there is a lot of testing to be done, we will narrow down the game screen design. For now there are two options:

1. Six independent games selectable as different pieces where each game will have its own menu with game settings and collection albums or

2. A single submenu that will have a unified game settings and a unified collection album. From this Submenu the user will start all the games.

This means that screen layouts may change as result of further testing these screen.
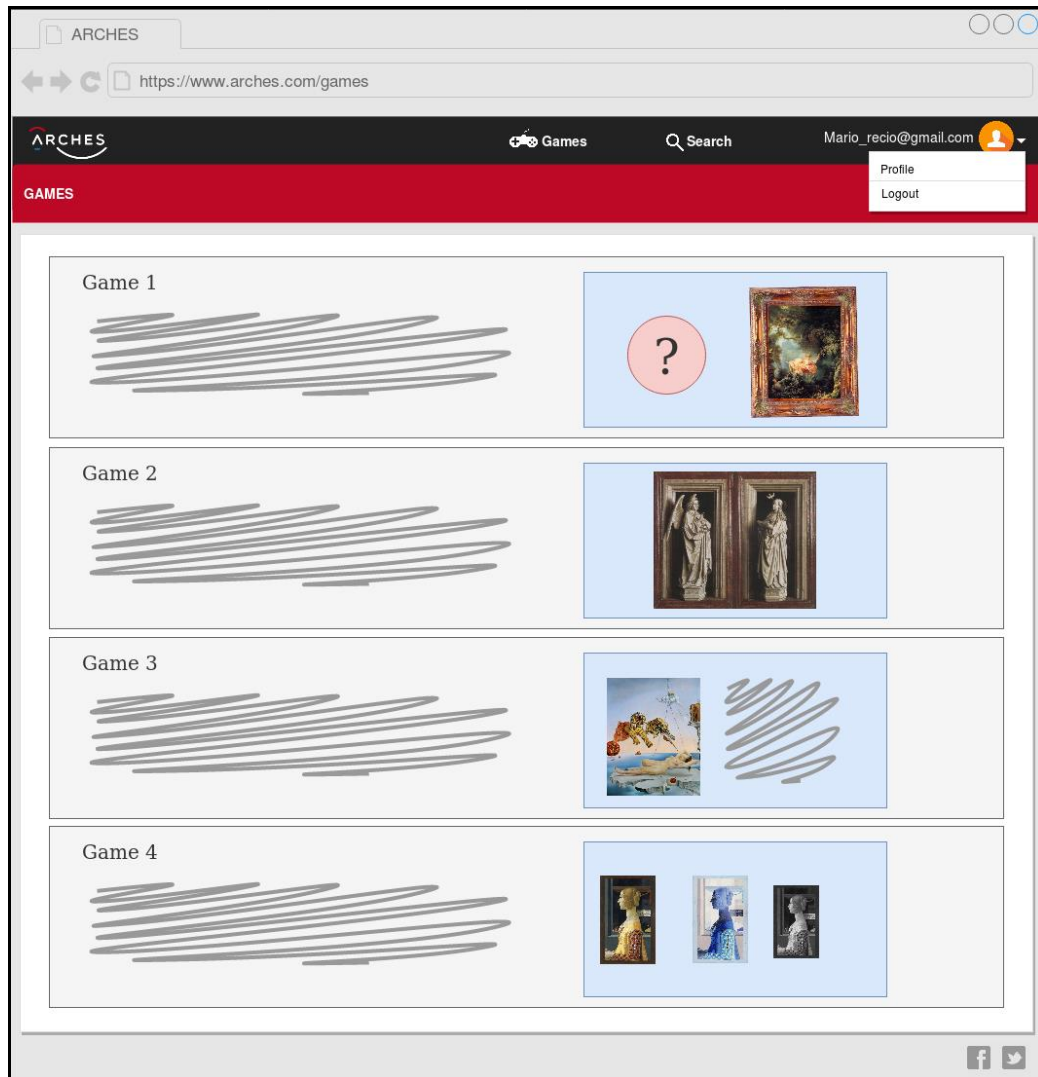
Figure 22: 'Games' screen.

6   Conclusions

This document defines the advances in the analysis and design of the ARCHES platform.

First, the integration between the platform and the subsystems (avatar and games) are explained. Then, based on the functional analysis described in deliverable D3.1 "Report on system architecture definition", the use cases have been described. Likewise, a first approach to the graphical interface of the platform has been designed and will be assessed by the exploration groups. In addition, the actors involved in the ARCHES platform have been identified and described.

Although the development of some components have already started, the implementation of the ARCHES platform is in the scope of design since the feedback of the exploration groups is needed to ensure that an accessible platform fulfilling their needs and expectations is achieved. The next advances and results will be included and detailed in the following deliverables:

- D3.4 "Graphical interface": This deliverable will cover the part of the software platform dedicated to the presentation of the content and appearance. It will summarise the work starting with the design stage up to the final version.

- D3.6 "Report on system integration and testing – 2nd version": This second version corresponds to the updates after the feedback obtained as a result of the pilot exercises II but before the pilot exercises III starts.

- D3.7 "Report on system integration and testing – 3rd version": This is the final version of the report on the integration once the pilot exercises have been completed. The final results of the platform will be included in this document in conjunction with a fully detailed user guide.

References

[1]   D3.1 "Report on system architecture definition", ARCHES project. Available online at (25th September 2017): http://arches-project.eu/download/1002/

[2]   DBpedia API website. Available online at (25th September 2017): http://wiki.dbpedia.org/projects/dbpedia-lookup

[3]   Europeana API website. Available online at (25th September 2017): http://labs.europeana.eu/api/introduction

[4]   Finnish National Gallery API. Available online at (25th September 2017): http://kokoelmat.fng.fi/api/v2support/docs/#/overview

[5]   Rijksmuseum   API   website.   Available   online   at   (25th   September   2017): https://www.rijksmuseum.nl/en/api