



D3.1 Architecture and component specification

ID and title	D3.1 Architecture and component specification
Description	Functional design for MI-Tale application
Work package	WP3 Development and Implementation
Status	Final
Type	Report
Confidentiality	
Version	V1.0
Actual date of delivery	07-06-2018
Contractual date of delivery	
Responsible partner	EVIC
Reviewer for external release	LFTL

Project name	MI-Tale
Project number	70-73500-92-032
Project start date	1 May 2017
Project duration	24 months



Document history

Version	Date	Status	Changes	Author(s)
Vo.1	07-02-2018	Concept	Initial version based on mock-up	Bob Kennedy
Vo.2	20-02-2018	Concept	Processed review remarks LIFEtool and results of discussions with Arne.	Bob Kennedy
Vo.3	23-03-2018	Concept	Processed review remarks LIFEtool and results of discussions with Arne.	Bob Kennedy
Vo.9	29-04-2018	Concept	Processed review remarks LIFEtool, checked with mockup 2018-03-06. Added Technical watch.	Bob Kennedy
V1.0	07-06-2018	Final	Processed evaluation results of the interactive prototype 28-05-2018: help functionality and updated Memory books layout, processed review remarks on 0.9 version from LIFEtool (use camera to add image, demo memory book, remarks on linking caregiver).	Bob Kennedy
V1.1	15-06-2018	Review	Check on user aspects. Added sharper distinction between several groups of older users and persons around them.	Marije Blok

Contributors

Partner Acronym	Partner Full Name	Person
EVIC	Eerste Verdieping Internet Communities	Bob Kennedy, Arne Leeman
LFTL	LIFEtool	Michael Gstöttenbauer Stefan Schürz



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1 Introduction

The main goal of the MI-Tale project is turning the mapping of memories into an interactive game [1]. The functionality of this game and the environment is specified in this document.

MI-Tale offers a personalized environment with different *game* types. It uses a shared and personal library of *categorized media*, like images, movies and audio. Gameplay can be *recorded* and is *logged* for analysis. *Memory books* with images and movies can be created to support a *life review* [1]. The memory books can be *exported* for offline usage.

The application is accessible via the Internet on both desktop PC's and tablets; can be played either as a single player or in a group and will be used in different settings

On the one hand the tool can be used by older adults living independently at home in the private setting. This can be either healthy individuals or people with (early) dementia, using the tool with their relatives from the own or younger generations or with informal caregivers.

On the other hand the tool is developed to be used in the care setting. In this setting we can distinguish clients with cognitive impairments and professional caregivers. *Application managers* and *Data managers* control accounts for caregivers and application metadata.

This functional design specifies the functionalities for the application. For each of the users, the main user stories are specified. Based on these stories, the functional and non-functional requirements and the business logic are specified.

The system stores sensitive personal information. Therefore, special attention is given to roles of the users, authorization and accessibility of data.

After approval, the specification in this document will be used for the technical design and realization of the application.

[1] D2.2 User requirements report, 18-10-2017, version 0.1

[2] Mock-up for MI-Tale, 06-03-2018



2 Assumptions and scope for first delivery

Based on the project documentation, the mock-up and discussions about the design we introduced a number of starting points that will be used during detailed design and development of the application. They are listed in the section Assumptions.

The MI-Tale application must be fully functional for different groups of older users, (in)formal caregivers and application managers. However, some functionalities discussed during the design phase will not be part of the first delivery.

1.1 Assumptions

- An older user owns his or her content like game session data, memory books, images he or she uploaded;
- An older user decides if he or she wishes to give another person, such as a relative or (in)formal caregiver access to personal data;
- Decisions of clients must never impact other clients (e.g. removing shared images);
- Where needed explicit agreement or consent is asked and stored in the system, e.g. on linking a new caregiver and sharing and image;
- The older user (primary end-user) and relatives and (in)formal caregivers (secondary end-user) have the same functionality and can view the same data (game play, management of memory books, review session logs);
- New users can use the application directly (no need to go through configuration or add images);
- Users may personalize the application where needed, e.g. add images or mark images as favourite;
- Each country and/or organization is supported with a separate data set. This data set contains content managed by the older users (the images) and application managers (categories, images and other media) of that country. With this, we avoid issues that images may have different meaning in various countries. Moreover, we only need to manage descriptions of media in one language;
- All users (all roles, all countries) use the same application (version, functionality, business logic, user interface);
- The user interface of the application will support different languages. The user can select the language of the user interface;
- The user may select a theme for the user interface, e.g. without background images or larger fonts;
- Storage of personal information will be avoided where possible;
- Data will be stored anonymously;
- By giving basic information (filling out profile information) the application is able to adapt content to the user;



1.2 In scope

The first delivery of the application supports:

- Support for the user stories as specified in section 2. This includes two game types (puzzle mode and view mode) for single user and group play
- Country and/or organization specific data sets for the application, see section 6.3
- Multi language and various themes for the user interface
- Secure storage of data and secure access to the application

1.3 Out of scope

During the analysis phase, we discussed some functionalities but agreed that these will not be part of the first delivery of the application:

- Support for other game types
- Alternative scenario's or business logic for games
- Advanced layout or editing options for memory books
- Support for other roles as specified, e.g. researcher role
- Reporting functionalities
- Support for workflow, (e-mail) notifications e.g. for management of images or accounts other than specified in this design
- Support to create and store a personal audio/video recording in a memory book
- Support for other functionalities than specified in this design

2 User stories

This section contains the high-level user requirements for MI-Tale. We state these requirements are stated as user stories. A user story states the actor (who), the functionality or action that he wants to perform (what) and the reason why he needs this functionality (why). With user stories we get a first overview of the functionalities we must provide.

The user stories are grouped per *actor*. An actor is a type of user or role for the application.

For MI-Tale, the following actors are supported:

- **Guest:** anonymous user
- **Client:** user with profile and – optionally – own login. Has access to user functionalities like games and memory books. Typical clients for MI-Tale are:
 - (healthy) elderly people and
 - Elderly people with (early) dementia, see [1].
- **Professional caregiver:** account for a person or organization that cares for a group of clients. Has access to functionality and data of the clients and additional management functionalities



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- **Application manager:** manages the application for a country or specific organization. Does not have access to data of clients or caregivers.
- **Data manager:** supports clients and caregivers e.g. management of images and restore data that was accidentally removed

Notes:

- Older users may be using the application together with secondary end users such as (in)formal caregivers, their social network of the same generation and relatives from the new generation [1].
- The secondary end users will only use the application with the older adult as main player and are therefore not considered a separate actor for the MI-Tale application.
- Clients in professional setting may get access to the application via the caregiver. In this case, the caregiver "switches" to the client and the client performs the actions.

2.1 User stories for guest

1.1	As a guest I can use part of the application / play a game anonymously so that I can see how the application works without the need to register. I can view a sample memory book. I cannot record movies, manage images or memory books and I cannot review the session logs
1.2	As a guest I can create an account so that I can use other functionalities of the application as well
1.3	As a guest, I can ask for context sensitive help, so that I understand how I can use the application

2.2 User stories for older user

2.1	As a user I can start a game so that I can recall memories or have fun
2.2	As a user I want to play a game with other participants (group play) so that we can share memories. I do not want this game to be logged.
2.3	As a user I want to make a profile so that content used in games is adapted to my situation. The profile includes date of birth, nationality, occupation, upbringing and a picture
2.4	As a user I want to be able to (un)link a caregiver so that he/she can help me using the application and review the games I played



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2.5	As a user I want to be able to make a video or audio recording of a game, so that I can review it with important others
2.6	As a user I want to be able to test the audio and video recording, so that I can be sure this works correctly
2.7	As a user I want to be able to save my reaction (smiley) for each image in the game, so that caregivers and I can review how I responded on the images
2.8	As a user I want to use shared images in my games, so that I can start playing the game without any preparation
2.9	As a user I want to be able to add images from my personal environment (hard drive, tablet or phone memory) so that I can use personal images in the system
2.10	As a user I want to (un)select images for games ((un)mark as "favourite") so that the system selects images in games that are interesting for me
2.11	As a user I want to be able to share images I uploaded, so that other clients can use these images as well
2.12	As a user I want to search images so that I can quickly find the right images for my memory books
2.13	As a user I want to be able to manage images, movie and audio clips in memory books so that I can collect and review what is important for me
2.14	As a user I want to be able to show memory books to others (in full screen, autoplay), so that we can recall memories together
2.15	As a user I want to be able to export all images and texts of a memory book so that I can view it offline
2.16	As a user I want to be able to review sessions of played games so that I can recall the game and associations I had, e.g. with my caregiver
2.17	As a user I want to be able to add written or audio comment to a session log
2.18	As a user I want to be able to remove images, session logs, memory books or my account so that I control the data that is stored for me
2.19	As a user I want to be able to get back items (image, memory book, session log, account) I accidentally removed, so that I can use them again
2.20	As a user I want to mark an image/video/audio during play so that it is sent to a selected memory book together with my audio/video recording (reaction).



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2.21	As a user I want to report inappropriate content or a violation of copyrights, so that an image/video/audio is removed from the system.
2.22	As a user I wish to control games using keyboard shortcuts, so I can navigate quickly to the next image / give a reaction.
2.23	As a user I can ask for context sensitive help, so that I understand how I can use the application

2.3 User stories for professional caregiver

3.1	As a caregiver I want to be able to use the system together with my clients
3.2	As a caregiver I want to be able to add a client so that he gets access to the system and I can use the system with this client
3.3	As a caregiver I want to be able to select a client so that I can work with the client in the system
3.4	As a caregiver I want to be able to add a login for a client, so that the client can use the application by himself
3.5	As a caregiver I want to be able to remove a client I added entirely from the system e.g. on request of client or after client passed away.
3.6	As a caregiver I want to have the same functionality as my client
3.7	As a caregiver I want to review the game log so that I can analyse how the client reacted on the game
3.8	As a caregiver I want to be able to export a session log from my client in PDF, so that I can review the session log offline.



2.4 User stories for data manager

4.1	As a data manager I want to be able to manage categories, so that I can update the structure of the images in the system when needed
4.2	As a data manager I want to be able to add media (images, video and audio content) and manage metadata so that clients have media to play the game
4.3	As a data manager I want to have an overview of items that need attention, e.g. all images that were added recently by clients where category and/or metadata must be updated
4.4	As a data manager I want to be able to restore items marked for removal by a client, so that the client can use the item again.
4.5	As a data manager I want to be able to remove an image entirely from the system so that we can properly respond to e.g. copyright issues or other complaints

2.5 User stories for application manager

5.1	As an application manager I want to be able to manage users, so that I can keep track who is using the system
5.2	As an application manager I want to be able to remove client accounts, so that we can remove unwanted accounts (e.g. on request of client, family or inactive accounts)
5.3	As an application manager I want to be able to (un)lock accounts so that we can avoid abuse

3 Use cases

This section contains the *use cases* that must be realized for the MI-Tale application. The total set of use cases should realize the user stories for the actors specified in the previous section. A use case is a set of actions performed by a single user at a single moment in time.

The diagram below shows an overview of all use cases linked to the actors. If a use case can be performed by a specific user depends on authorizations.

3.1 Overview of use cases



The use cases are specified in the sections below.

3.2 Play the game

The MI-Tale application aims to support clients to recall memories. The central part of the application is the game where images (photo's, pictures, etc.) are shown. In each step of the game, the system shows an image. Based on the game type, the image will initially be partly obscured using “overlays” and shown completely after a number of steps (*puzzle mode*) or it is shown directly (*view mode*). In puzzle mode, the user is challenged to guess the image. In view mode the image is shown directly. In both game types, the image is meant to trigger memories or associations. The user may select the category for which he wants to view and image, or he can select *random* mode, where the system will select an image from any of the selected categories.



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The system will show only selected images in games. By default, images preselected for the user. The user can mark other images to be used in games. The system will only show categories that contains images marked as favourite and were not picked in previous steps of this game.

For each step in the game, the user is asked to *react* to the image and he can add the image to a *memory book*.

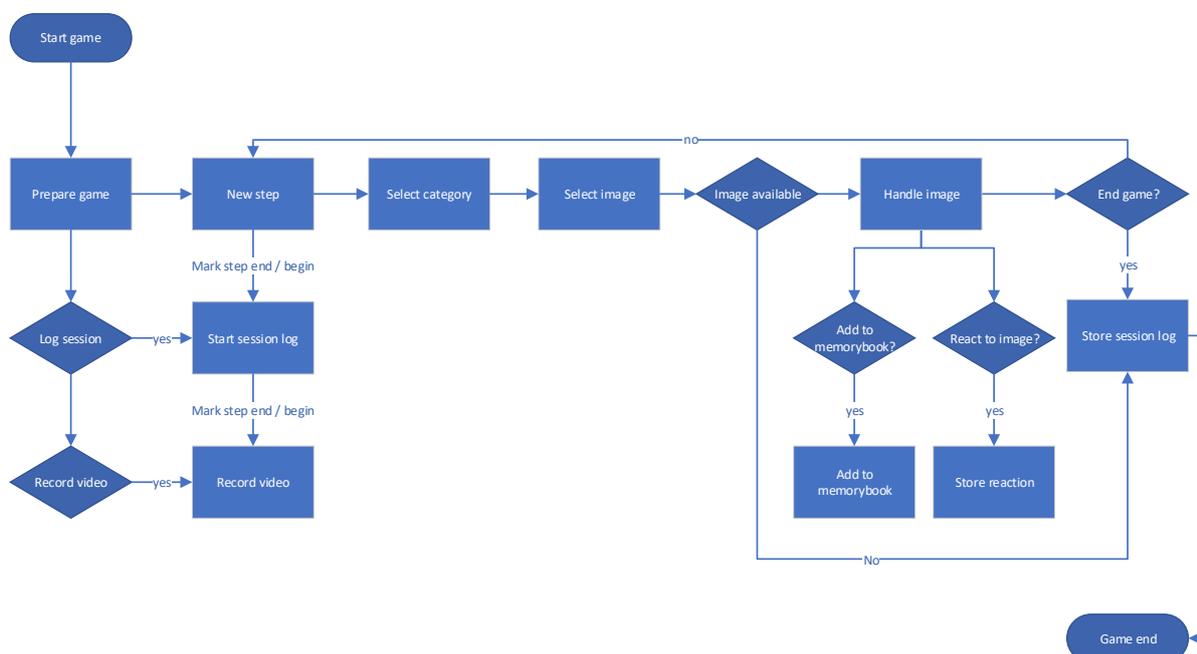
The game ends if all selected images were drawn, or if the user decides to stop the game.

Games are recorded for further analysis. This we call a *session log*. The log contains all the selections made by the user: categories and images that were selected, reaction on images, images that were added to memory books. The user may add an *audio* or *video recording* of his own actions (e.g. recorded by a webcam) to the session.

Games may be played by anonymous users (*guest*) and registered users (*clients*).

A game can be played in *single play* or *group play mode*. In single play, a single user will respond to all images. In group play, a group of users may respond to images in turn.

The diagram below shows the steps and decisions in a game for a client and single play



Notes:

- For guests, the options for personalization (preferred images, reactions, add to memory book), session log and video recording are not available.
- For group play started by a registered user, preferred images will be selected. Reactions, add to memory book, session log and video recording are not available.



3.2.1 Prepare game

A game starts with the selection of the game type.

Initially, two game types are supported:

1. Puzzle mode: the image is shown with an "overlay" and made clearer in steps. In the last step, the original image is shown. For this type of game, the number of steps can be selected (2 – 6).
2. View mode: after selection of a category, the system selects and shows the original image (the result is the same if we select puzzle mode with one step).

Both options aim at interaction with the user, recalling memories and storytelling.

For each game, up to 6 categories can be selected that will be used in the game. The user may also select "*Random categories*". In this case, the system will pick 6 categories at random.

For each game, the user can select if a video and/or audio recording must be made.

The system provides the recordings for a game as clips corresponding to the image displayed. All the recording is done automatically, the user cannot pause the recording.

Before starting the game, the video and audio recording functionality can be tested.

3.2.2 Perform game step

For each step in the game, the system selects and presents an image from the category. In *manual* mode, the user selects one of the 6 categories (he picked at the start of the game) and the system picks an image from this category. In *random* mode, the system automatically selects an image from one of the selected categories. For the puzzle game, the user can tap the image to show a less obscured version of the image. In view mode, the image is shown directly.

The system selects the next image. Selection is based on:

- the selected category
- image marked as "favourite"
- image not shown yet

Exact rules for selection of next image to be defined, see further: business logic, section 4.1

If the user selected this, the system will make a video and/or audio recording of the game. For each step in the game, the system prepares a clip.

During game play the system clearly indicates if a video or audio recording is being made.

Notes:

- Support keyboard / shortcuts for game play



3.2.3 Add reaction

After an image is fully revealed, the user can rate the image. For the initial version, the user can select the reaction (smiley not ok, neutral, ok). This step is optional.

We discussed the option to add reaction automatically based on face recognition. This function is not part of phase 1.

3.2.4 Add image to memory book

The image selected in the game step can be added to a memory book. The memory book to which the images is added, can be set in the game settings.

3.2.5 Write session log for game

Game sessions are recorded by the system and stored in a log. The log contains:

- Game type and selected categories
- Images shown in game
- Reaction of the user
- Movie clip, if the user chose to make a recording
- Metadata (start and end time for the game and the steps)
- The log also contains a reference to the user and - if applicable - the caregiver

Games played by guests and group play games are not logged.

3.2.6 End of the game

The game ends when:

- all "favourite" images for all selected categories were drawn
- the user selects "stop". After confirmation of the user, the game ends.

Note: in case the user closes the browser or the app or leaves the page the game also ends. In this case, special attention will have to be given to completion of the session log. Currently it is not foreseen that the user can continue a game after he stopped it.

3.3 Manage images

3.3.1 View images

User can select a category and view all images in that category. By default, all images are shown. User can filter on "favourite" images (i.e. the selection of images for the category made by the sue or (initially) by the system.



3.3.2 Add image

Upload an image to the system from local storage:

- Select a category.
Any category available in the system can be selected.
- Select Add image.
The system requests a file from local storage or the camera.
- Upload a file.
The file is added in the category where the user started the Add image action.
If the image is shared, the data manager may add other categories for the image. The image will be available in all selected categories.
- Add metadata
The user is requested to add a Description. Additional metadata can be set. This is optional.
For shared images, the data manager may update the description and set the Period, Country, Milieu

After adding the image, the system automatically generates different variants, e.g. versions for use in games and low-resolution versions to show in website pages.

Older users can only upload one file for an image. The data manager may additionally upload an audio and / or video file that is related to the images file.

3.3.3 Share image

Allow an image to be used by other users. On sharing we ask the user to indicate that he or she owns (has copyright on) the image and that he understands that once the image is selected by other users (marked as "favourite", added in memory books) he will not be able to remove the image entirely.

A user may only share images that he or she uploaded (his personal images).

The owner of a shared image may revoke sharing. After this, this image is still available for users that marked the image as "favourite" and in memory books. For other users the image will not be available.

3.3.4 Remove image

Remove an image from the system. Images marked *personal* can only be removed by the user that uploaded the image.

Shared images can be deleted by the user that uploaded the image. However, in this case the images will be marked "deleted". After this, the image is still available for users that marked the image as "favourite" and in memory books. For other users (including the owner) the image will not be available.

Shared images can be removed completely by the data manager. See further section 4.5



3.3.5 (un)Mark images as “favourite”

In games, only images marked as “favourite” will be selected. Initially, the system will automatically select images for each category. The user may update this selection by marking additional images as “favourite” or unmark images.

Proposal for the UI:

- Split the screen with category selector and overview of not yet selected images at one half of the screen and “favourite” images for the category on the other half.
- Use swipe functionality to add and remove images from the set of “favourite” images

3.4 Manage client account

A client can get access to the system:

- By creating a *standalone* account
The client has a personal login and use the system by himself.
- Account for the client is added by a caregiver. The caregiver prepares the system for the client. Optionally, the caregiver can setup a personal login for the client.

3.4.1 Create standalone account

The older user creates a standalone account with personal login. He or she is not linked to a professional caregiver.

Notes:

- On creation of the account, a default set of images per category is marked as “favourite” for the user. The user can update the set of favourite images, see: 3.3.5

3.4.2 Create linked account

The caregiver creates an account for a client. The client is linked to the caregiver. The client can only use the system together with the caregiver.

Notes:

- On creation of the account, a default set of images per category is marked as “favourite” for the user. The user can update the set of favourite images, see: 3.3.5

3.4.3 (un)Link caregiver

A client can link a professional caregiver. Once a client is linked to a caregiver, the caregiver will find the client in his client overview and he can switch to the client environment using his own login. A client can be linked to one caregiver. The client can select another caregiver. The unlinked caregiver will no longer have access to the client environment.



Notes:

- We assume, the client will (un)linking a caregiver only after consulting the caregiver.
- On switching caregiver, no data is removed; in case of mistake, the client can restore the original caregiver.
- If a client changes caregiver, all data of the client (e.g. session logs) will be available for the new caregiver.
- We specified this functionality in the application for the client. However, clients may need support from the caregiver with this functionality, e.g. the caregiver may perform this action for the client.

3.4.4 Manage client profile

The client profile contains the following settings:

- Indication standalone account
- E-mail address
- Password
- Year of birth
- Country of birth
- Milieu
- ...

Update of the e-mail address and password is only available for standalone accounts. A standalone account can be created by a user or a caregiver can mark a linked account and add login data.

3.4.5 Remove account

Remove a user account including all personal settings, session logs, memory books, personal images and movies.

On a remove request, the account is marked "removed". The user (or caregiver) cannot access the account or data anymore.

Notes:

- See section 4.6 for management of removed items.
- On removing an account, shared images will not be removed.

3.4.6 Restore account

If a client removed his account by accident, the application manager can restore the account. See further section 4.6

3.4.7 Forgot password

User with a standalone can request a reset password by entering the e-mail address that was set in the account.



Notes:

- Users with a linked account cannot request a new password.
- No e-mail will be send in case the account is locked (marked to remove, locked by application manager).

3.4.8 Use the application as guest

The application is available for guests. Guests can play games with a default selection of categories and images. Recording of the game and reactions are not available. Game sessions are not recorded and cannot be reviewed. Other functionalities (e.g. memory book, upload images) are not available. A demo memory book can be viewed. This memory book cannot be changed by the user.

3.5 Manage memory book

3.5.1 Select memory book

A user can have multiple memory books. The user can select one memory book from the list to work with. The memory book can be *viewed, edited, exported or removed*. List shows cover image and the title of the memory book

3.5.2 Add memory book

The user can add memory books. A memory book must have a (unique) name. The name can be updated at any point in time. After adding the memory book, the user can start adding images and clips.

3.5.3 View memory book

Select a memory book and browse the pages of the memory book. The pages in the memory book are shown according to the *settings*.

Notes:

- Each page can contain one image and – optionally – an audio or video recording.
- for movie or audio clips added to the memory book, a link or icon is shown on the page. When the client clicks the link, the audio or video clip is displayed.

3.5.4 Manage settings

- Setting "autoplay" and "full screen"
With autoplay, images are shown automatically. If an audio or movie clip was added, this file is played automatically. The delay per page can be set (in seconds).



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- In "full screen", the images are automatically shown in full screen mode when viewing the memory book. Both settings can be combined.
- Font (typeface and size) for titles and text can be set

Settings will be applied to all memory books and can be updated at any point in time.

3.5.5 Add images, video or audio clip to memory book

Images can be added in the memory book in several ways:

- Search and select an image from the image base (shared and personal images of the user) using search or browse functions.
- Upload a new image. The image is uploaded from the device (PC, tablet) of the client. The image is only added to the memory book and will not be available in the list of images per category, cannot be selected for games and cannot be shared with other users.
- Create a new image using the camera and add it to the memory book
- Choose to add the image to a memory book while playing a game, see 3.2.4

Audio and video content can be added in the following ways:

- select an image that also holds an audio and/or video file
- select a log video file (file recorded while playing a game)
- create an audio or video file using the microphone or camera of the computer and add it to the memory book

Notes:

- On adding a new page, a template is shown where the user can upload one image and (optionally) add one audio or video file.
- The user may upload or add the same image or video multiple times in a memory book
- Media items created by the data manager may include an image and linked audio and/or video file
- Image will automatically be fit the best way possible
- Support for rotate / crop functionality for images is to be investigated

3.5.6 Search images

Images can be searched using (words in) the description, the category of the image and the metadata. A search engine will search shared images and personal images of the client.

Search results are shown in a list with thumbnail and description.

3.5.7 Re-arrange or edit content

Content in memory books can be updated and re-arranged:



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- Insert blank page on current position. A template page with a placeholder for an image, an audio/video recording and a description is shown.
- Add, update or remove a page description
- Move an entire page to another position in the book
- Replace an image or audio/video clip (the current item is removed from the memory book)
- Remove the entire page (content of the page is removed)

On editing the memory book, the system will always show a template page with a placeholder for an image and an audio/video even if the page currently only contains one item.

3.5.8 Export memory book

Generate a PDF document with all images and descriptions of a memory book.

Note: other type of media will not be available in the PDF.

Other types of export (see e.g. iBook creator) were discussed but are out of scope for version 1.

3.5.9 Remove memory book

Remove the entire memory book. Note that the items specifically uploaded for the memory book, will be deleted. Items that were added for games (by clients or data manager), will not be deleted.

See section 4.6 for management of removed items.

3.6 View game session log

The session log contains an overview of all games played by the user. For each game the steps can be reviewed. For each step, the image, reaction and movie clip can be reviewed.

3.6.1 Add text comment to log file

Add a written comment for a step in a session log.

3.6.2 Export log file

Generate a PDF document with the content of a session log. The PDF is shown and can be stored or printed by the user.

3.6.3 Delete session log

Delete the session log for a game.

See section 4.6 for management of removed items.



3.7 Manage clients as a professional caregiver

A can add new clients or select a client to use the system together with that client.

3.7.1 Add client by caregiver

Add a new client. Client is automatically linked to caregiver. Caregiver can create a personal login for the client. This is not required. See further section 3.4.2

Note that a caregiver cannot link a client that already has an account. In this case, the client can link to the (new) caregiver. Caregiver may support the client in performing this action in the application.

3.7.2 Select client

After login, the caregiver gets an overview of his clients; i.e. client linked to this caregiver. The caregiver selects a client. The client environment is shown. If a caregiver is logged in and he selects a client, we assume that client and caregiver work together in the system. The profile and settings of the client are used by the system. Functionality for playing games, managing memory books or reviewing logs is the same. In this variant, an option is available to switch back to the client overview and select another client.

Notes:

- The option to switch to another client assumes that the client is not left unattended by the caregiver. Otherwise, the client should login using his personal login. In that case, the option to switch to another client is not available
- We discussed if a password should be required on switching to another client. It was decided that this is not necessary.

3.7.3 Manage client login

The caregiver can create a personal login (username and password) for his clients. With the login the client can login and use the system by himself.

The caregiver can also remove the login of the client. In this case, the client will no longer be able to login by himself.

In case the client forgot his password, the caregiver can reset the password or the client can use the function Forgot password, see 3.4.7.

3.7.4 Remove client by caregiver

If a client has no separate login and he wishes to remove his account, the caregiver will have to perform this action for the client. See further: remove account, section: 3.4.5.



Note that if the client has a linked account and he wishes to keep his account for standalone usage,

- the client will have to ask the caregiver to create an account (the account can now be used standalone)
- the client can now unlink the caregiver.

3.8 Manage caregivers

Application manager manages the accounts for caregivers. A shared account on organization level may be used (depending on the caregiver organization and legislation). Multiple caregivers can use this account to work with the clients for that organization.

Notes:

- This will only work if multiple sessions for one login are supported.

3.9 Manage media

Het data manager manages (shared) media in the system. The following functionalities must be available:

- Filter options for shared media
- Add media
- Manage metadata
- Remove media

3.9.1 Filter options

The data manager can view all shared media in the system. The media can be filtered on:

- Media type (image, audio, video)
- Category
- Recently added media
- Metadata is missing
- Marked to be removed
- User that added the media

3.9.2 Add media

Add new media. The application manager can add new images, audio and video. The media will be available for all users ("shared"). A media file must have an image and may (optionally) have an audio or video file. The image is shown in games and memory books.



3.9.3 Update metadata

The data manager may update the description and set one or more categories for the images. If a client added the image, then the category selected by the client may not be changed. However, the data manager may add other categories.

Updated metadata is available for all users.

3.9.4 Managed items marked for removal

If users remove items (memory book, session log, account), the item is marked for removal. The data manager can restore the items on request. Restored items are available for the user.

After some time, the data manager can decide to definitely remove the items. The selected items are cleaned up and no longer available in the system.

3.9.5 Directly remove media

In case of e.g. copyright issues with images, the data manager can directly remove a media file. This action will completely remove the image from the system. The image will no longer be available for users; it cannot be used in games. A placeholder will be shown in memory books and session logs.

3.10 (un)Lock account

The application manager can (un)lock accounts. A locked account is temporary unavailable for the caregiver or client.

Notes:

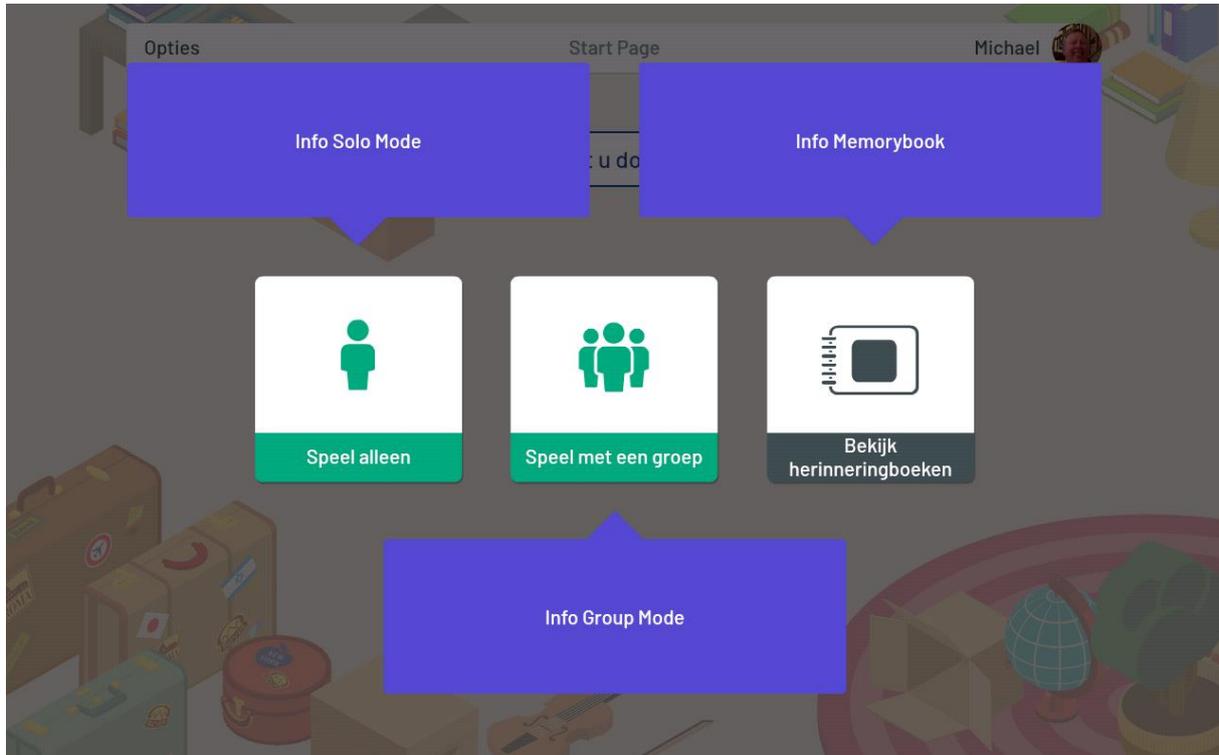
- accounts marked for removal are automatically locked.
- on system level it can be configured if an account must be automatically be locked after the user entered the incorrect password x times / unlocked after x hours



3.11 Get help

3.11.1 Show help texts

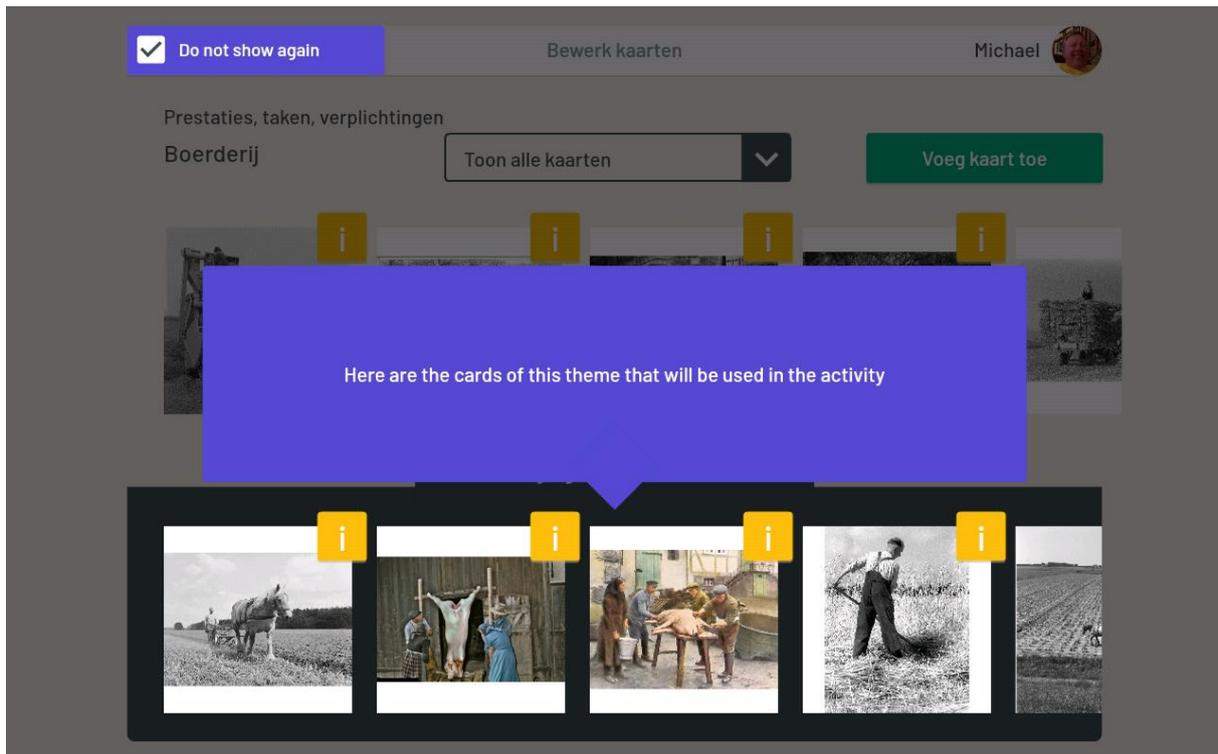
Where applicable, the user can click on the owl to retrieve context sensitive help text.



3.11.2 Show first use help

Where applicable, help texts can be shown automatically each time the user visits the page. After the user closes the help text, he can continue to use the application.

For each page, the user can indicate that the help text must not be shown automatically anymore ("Do not show again" in the prototype page below).



Notes:

- The help texts are part of the application data and are updated using an upload. Help texts cannot be managed in the application itself.
- For one page in the app, multiple help texts may be shown (in the prototype page for context sensitive help, three texts are shown). Where possible, the texts will be positioned near the graphical element.
- The indication "Do not show again" is registered per page per user. It must be possible to reset the indication for a user. After this, all automatic help pages are shown again.
- The system does not support a search function for help.



4 Business logic

4.1 Game play

Selection of images in games

- The category selected by the user (from the categories selected at the start of the game)
- Images marked "favourite" in the category
- The images already used in this game
- The images used in previous games
- The profile of the user
- Match of metadata of the image and client profile

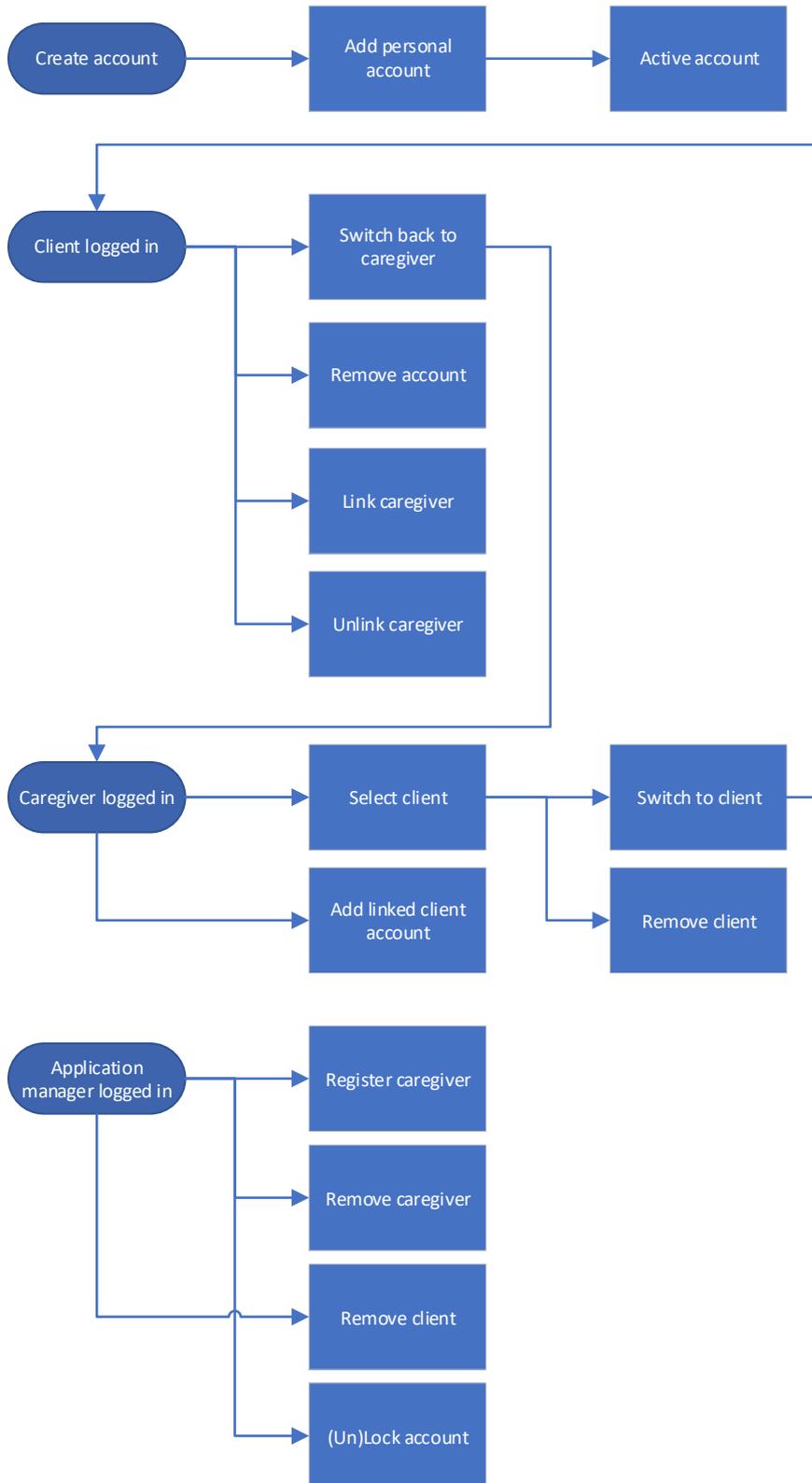
4.2 Account creation, usage and removal

The diagram below shows the creation of new accounts, login as client or caregiver to access the client environment.

The diagram shows a "login caregiver" to switch from one client to another. In the sessions it was stated that a client and caregiver will always use the system together. If a caregiver logs in and switches to a client, the client will not use the system unattended. The additional login may not be necessary.



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4.3 Authorization

The system supports the following roles:

- Older user (either in private or care setting)
- Caregiver
- Data manager
- Application manager

Users are authorized using a username and a password. A user will have a single role.

For clients we have two types of accounts:

- Linked account. client does have a profile but no login. Client account is always accessed via the caregiver
- Standalone account. User has a profile with a login.

Older users with a standalone account may be linked to a caregiver. In that case, the client account can also be accessed via the caregiver

System may be used by guests (= anonymous, not registered user). In that case, functionality is limited to playing games using a default set of images and viewing a demo memory book. Images, settings or memory book cannot be updated.

4.4 Logging of sessions

- Game play of clients is logged in a so-called session log. See section 3.2.5
- Other actions, e.g. reviewing sessions by caregivers, managing / viewing memory books are not logged.
- Actions of guests are not logged.
- Management of users and exceptions are logged but only for technical systems management.

4.5 Management of media

The application provides categories with media. The data manager may add images and – optionally – add an audio or video file to it. Older users may add images to the system. An image can be shared. By this we build an image database that can be used by all clients. The client and the data manager add the metadata. The data manager can update the meta data. Each client may select images that should be part of the “deck” for games (mark it as “favourite”).

Images may only be shared if the owner holds the copyright and allows sharing the image. For shared images, the data manager will complete the meta data. It is advised to explicitly inform the user about this on sharing an image.



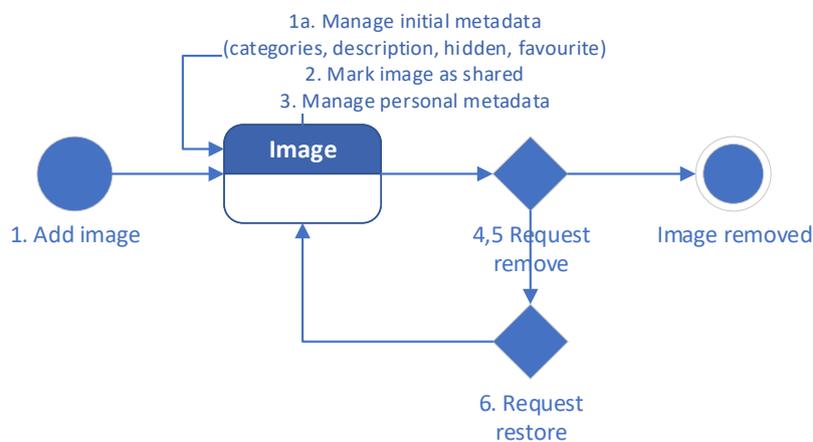
A client may remove images he added to the system. The image will not be available anymore for selection in games or adding it in memory books. A shared image that was already selected by other clients, will still be available for those clients. Reason for this, is that we do not wish that an action of one client impacts other clients.

The data manager may remove an image directly and completely from the system, e.g.in case of copyright issues.

Media added to the system for memory books, will not be available for games and cannot be shared.

4.5.1 Image life cycle

The diagram below shows the lifecycle of an image.



1. New image added by user.
The image is marked personal.
- 1a. Set initial metadata (categories, description, country, year, etc)
Image is available in selected category and can be selected by the system in game for the client. Image can be added in memory books
2. Mark image as shared
Image is now available for all clients. It can be used in games and added in memory books
3. Set personal metadata
- (Un)Mark the image as "favourite" (so that it will (not) appear in games)
Data manager can update metadata, e.g. update description or add additional categories
4. User wishes to delete an image
- 4a. The image is a personal (not shared) image
The image is marked to be removed from the system; the image is no longer available for games. If the image was added in memory books or part of a session log, it will still be



shown.

- 4b. User deletes an image he uploaded, that he previously marked as shared
The image is marked to be removed
The item is no longer available in games. The image will not be shown anymore in list of images per category, will not be shown in search results and will not be selected for games.
The image cannot be added to memory books.
If the images was added in memory books or part of a session log, it will still be shown.
5. Application manager deletes an image that was marked as shared
The image is removed entirely from the system; the image is no longer available for games, removed from memory books. In session logs, a placeholder is shown
6. Data manager processes the image marked for removal:
 - he confirms the removal. The image is deleted from the system.
 - he restores the image, e.g. if the client removed the image by accident.See further: section 4.6.
7. User shared an image. He wishes to withdraw the sharing. The image is marked "personal" and is not available anymore for other users e.g. to use in games or to add in memory books. User that already added the image in a memory book or have it in a session log, will still be able to view the image.

Scenario 5 is added for cases where images must entirely be removed e.g. due to policy or copyright issues.

4.5.2 Usage of image metadata

We ask the user that uploads an item to provide a description. The user may update the description for his own items (the items he uploaded). The data manager may update the description and set other meta data (year, milieu, etc.) for all items. The category for the image is set based on the category where the user selected the option to add an item. The data manager may add other categories. location where the user. We discussed the option to have personal metadata. It was decided that this is out of scope of version 1.

Note: in case an image is shared, the description will be visible for other users. The data manager may check and update the description, but this is not required by the system. The user should be informed about this e.g. by stating: "Please share information on this image. Information should not contain personal information and include date and place if possible."



4.6 Management of items marked for removal

If a user removes an item like image, account, memory book, session log, the system will:

- hide the item for the client (and other clients in case of shared images)
- list the item for the data manager.

The data manager can either:

- remove the item. The item is removed completely from the system
- restore the item. The item is restored in its original state.

With this approach:

- we can give the client full control
- we do not have to add additional authorization levels and
- we still have a safeguard in case the client accidentally removed items.

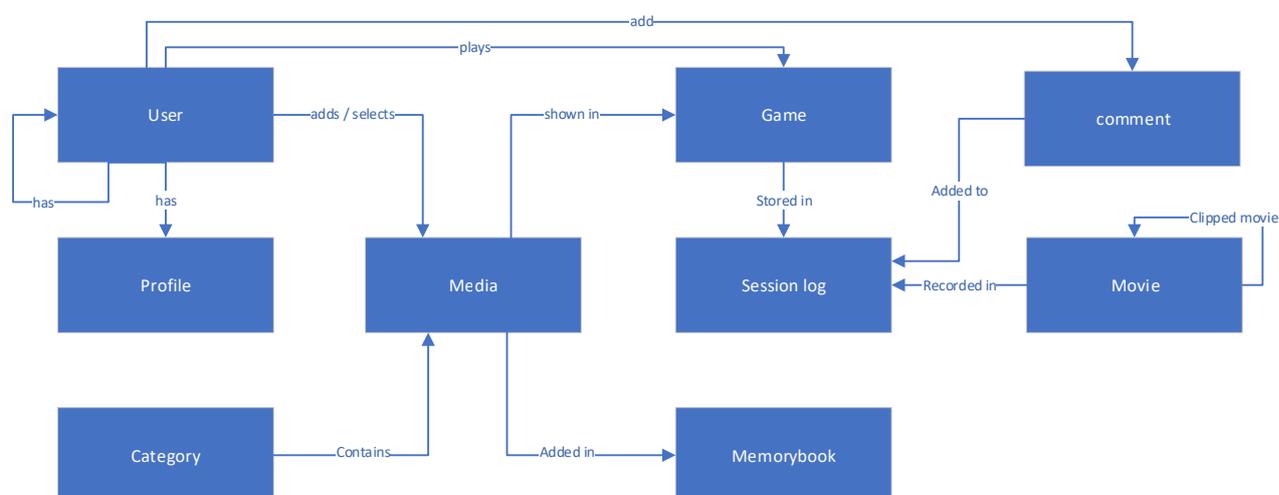
We discussed options where the caregiver keeps a copy of the removed data. This complicates the (use of the) system. Therefore, it was decided to not add these options in the first version of the application.

Notes:

- Caregiver can remove an account of his clients. The account will be marked "removed"
- Data manager can directly and irreversible remove an image
- Application manager can irreversible remove the account of a client (based on username) including all data, e.g. on request of the client or his family

5 Object model

To support the use cases, we need the following objects and relations:



Note: this is a high-level object model that will be refined in the technical design.



6 Non-functional requirements

6.1 Accessibility of data

This section specifies what data is available for the different types of users. Note that this section only focuses on data; functionality is specified in the functional requirements, section 3.

6.1.1 Older user

Older users can access the following data:

- Personal profile
- Categories
- Shared images including shared or personal category selection and meta data
- Personal images
- Personal movies and clips
- Games
- Own sessions of games played
- Own memory books
- In care setting: List of caregiver names (to link a caregiver)
- Comments on sessions

If we do not wish to expose a list of caregivers to clients, linking may also be done by entering a code provided by the caregiver.

6.1.2 Caregiver

Caregivers can access:

- Overview of clients linked to the caregiver
- All data available for clients (see above)

Notes:

- Data of clients linked to the caregiver can be accessed by the caregiver by switching to the client.

6.1.3 Data manager

Data manager can access:

- Personal profile
- Category structure
- Shared media (to update / add metadata)



- Items marked for removal (to be removed or restored)

6.1.4 Application manager

Application manager can access:

- Personal profile
- Application logs (anonymous data for issue analysis)
- Overview of all accounts (caregivers and clients)

6.2 Identification of users and user data

The system will not require that real names or other personal information of users are stored. Users with own login must provide an e-mail address. This address is used for verification and password reset functionality. For users that are added by caregivers, a nickname is sufficient. The e-mail address and nickname are part of the user profile. All other information stored will not contain data linked to a specific client. Data is linked to the client profile using (anonymous) keys.

6.3 Support for different user groups and multi-language support

The MI-Tale system will be used in different countries. The *user interface* will be available in multiple languages. The *content*, like category names and media descriptions will only be available for a single language.

Proposal:

- One version of the application (all users have the same functionality and user interface)
- Separate instance of the application for each nationality or organization
- Multi language support for the user interface; each user may choose the language of the user interface (including help texts)

Per instance:

- Application manager
- Set of categories and images
- Caregivers
- Clients

Restrictions:

- A user (client, caregiver, application manager) belongs to / has access to one instance
- The instance selected for the user is selected on the nationality (or organization) selected in the profile. Note: after the account is created, the nationality cannot be changed.
- If an item must be available in all instances, must be uploaded for each instance



7 MI-Tale application architecture

In this section the technical solutions available for the realization of this functional design are specified.

The following parts of the system are addressed:

- The MI-Tale client application (the app)
- The back end system
- Technology for audio and video recording and archiving

7.1 The MI-Tale client application

The MI-Tale client application must be available as an app for the mobile operating systems. The app will be developed using the Phonegap. Based on the open source platform Apache Cordova, Phonegap supports the development of multi platform hybrid apps. This means, the app serves as a container that interacts with the mobile device, while the content of the app (the data and functionality presented to the user) is served from the backend system. With this we can dynamically update the behavior of the app – e.g. add functionality or fix bugs, without requiring update actions by the client.

7.2 The back end application

The backend system must support a large number of users, store data in a secure way where new functionality can be developed quickly. At the start of the MI-Tale project, we already decided to use Liferay for the backend platform. Liferay is a modern, highly scalable and extensible Open source platform to build portals. The platform is used by many developers and companies around the world. Wikiwijs, the community portal of EVIC is based on Liferay.

The requirements specified for MI-Tale in this design, confirm that Liferay is the proper choice for the MI-Tale application.

In the technical design, we will provide a further specification of the components and the data model we will use to support the MI-Tale system.

7.3 Technology for audio and video recording and archiving

With MI-Tale we aim at potentially 10.000's of users. Audio and video recording can be demanding for a portal system with a large number of users. As specified in the functional design, the user can select to make automatic recordings of games. The recordings must be stored securely and anonymously. Users must be able to review recordings on demand.



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Images for games can also include audio and video recordings. These recordings are uploaded by the data manager, must be stored securely and must be available on demand for users while playing games or viewing memory books.

Given the requirements, we selected OpenTok for management of audio and video files for the MI-Tale application. OpenTok is a platform to support audio, video and messaging functionality build with the WebRTC protocol. OpenTok supports encrypted archiving of the audio and video recordings. At EVIC we have successfully implemented portal solutions with Liferay and OpenTok.



8 Appendix 1: Questions / issues

This section lists the questions that were raised during the analysis for this functional design. Where applicable, the results of the questions are processed in the design. The discussion and options discussed can be found here.

Question / issue	Answer / design decision
<p>1 Request is to have clips linked to specific images shown in the game. If user records a session, make recording of entire session and recording / start- end markers per image. This way we can link a recording to a recording.</p>	<p>During recording, automatically set markers or compile clips. With this approach, the user does not need to take action to start/stop recording or mark clips for game steps.</p>
<p>2 Management of relation between client and caregiver. Michael suggests that the caregiver gets access to an existing standalone account and that the caregiver should release the client. After discussion we specified that the client controls which caregiver is linked to / has access to his account. With this, the client is in control of his data. We think this is important. Of course, a linked caregiver can support a client in unlinking a caregiver or switching to another caregiver.</p> <p>See also Michaels comment on linking a caregiver:</p> <p><i>I would do it the other way round. If a user gives his log in data to a caregiver, the caregiver can add a new client and select: Add existing user.</i></p> <p><i>Let's discuss the pros and cons of the different approaches</i></p>	<p>During the discussions it became clear that caregiver and client will always work together. The caregiver can request the client to login. Together they can set the caregiver. After this, the client profile can be activated via the caregiver login (select client).</p> <p>Michael: I still think, my approach is "easier" as the linking would be done by the caregiver and not the client (with dementia). The client is still in control as he decides, if he wants to give his login data to a caregiver. If he does not give his login data, a caregiver cannot add an existing user as client.</p> <p>We discussed several options. In the specification we kept this function in the application of the client. Caregiver can support the client with the linking.</p>
<p>3 Validation needed for e-mail addresses</p>	<p>In the technical platform, it is possible to set e-mail validation. This can be activated at any point in time.</p>



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<p>4 Image properties / tags shared and/or personal? Who is allowed to update the properties?</p>	<p>The user that uploads the image provides the metadata. Metadata is:</p> <p>The category/theme where the user uploads the image, a description (free text, can be left blank); an information/help text tells the user, what information is desired)</p> <p>For personal images, only the owner can set or update metadata</p> <p>For shared images, the data manager can add additional categories, metadata like milieu, year, etc. and he may update the description. If another user wishes to correct metadata, he/she has to contact the data manager.</p>
<p>5 Ownership of data (images, session recording)</p>	<p>Data is owned by the client.</p> <p>Shared images are owned by the application</p>
<p>6 Explicit tagging of images needed for proper filtering of images used in game?</p>	<p>Categories and metadata are used to tag the images.</p>
<p>7 Can user delete log or even entire profile when he/she is linked with a caregiver?</p>	<p>Based on discussions we concluded that we should not keep a copy of data for the caregiver. To prevent accidental removal of data, we introduced the data manager. He can restore items marked to be removed. The data (e.g. content of a memory book) of the items marked to be removed cannot be viewed by any user.</p>
<p>8 Can an image have multiple categories? Can category of an image be changed by a user (is there an application default and a user specific selection?)</p>	<p>Yes, design should support for multiple categories</p> <p>See further handling of metadata, also valid for categories</p>
<p>9 What happens if I add an image / movie from a session in an existing storybook? Add at the end?</p>	<p>Yes, at the end</p>
<p>10 What happens if I add an image in a storybook (from file from a session) that was already added? Allow or prevent duplicates?</p>	<p>Application should allow that the same image is added multiple times. Added in design.</p>



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11	Can I add the same image in multiple storybooks with clips from different sessions	Application should allow that the same image is added multiple times. Added in design.
12	Rule: if an image is linked to session log, storybook, user selection, do not allow delete	Added in the design
13	Additional game ideas (phase 2, prepare data): in what year was the image taken / item produced, how many steps (4 refinement steps shown in the demo) does the client need to guess the image	Out of scope
14	If we wish to have functionality for the caregiver like adding comments in session log (of a client), we have to add a choice for the caregiver on switching to the client: use client profile or caregiver profile?	Based on discussion we concluded that the client and caregiver will work together. Functionality for the client and caregiver is equal; we know that the caregiver is logged in and that he switched to a particular client. we do not need to ask who is using the system
15	Business logic for game: which images to select? When does a game end? All favourite images used? What if no images were marked "favourite" for a category?	Discussed and results added in the design. Game ends if all cards in the deck (= favourite images for the selected category) were drawn or user ends the game by himself. Note: only categories that contain cards (marked favourite and not yet used in the game)
16	Icons e.g. for profile – 1 set for application or specific for caregiver / country / other group?	Currently in scope: one set of icons for the application. We do support various skins that may use their own icons.
17	Group play support for phase 1?	Group play uses the selection of cards of the user that was logged in, no logging of the session, no video/audio recording. Added in the design
18	Keep track on games played in the system: inform caregiver when client played a new game?	No. Surveillance is not required/wished.
19	Clearly separate medical treatment and games played for fun: if client has own login and no caregiver -> fun, all games	Response Michael (v.01 review): I do not think this is necessary.



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	<p>added with own login -> fun, question on start of game? Comments on sessions by caregiver? The question about sharing info may become relevant on adding / changing caregiver. Mark each session as fun / treatment. What about sharing memory books with caregiver?</p>	<p>We will need a good manual on how to use the app properly in professional settings for non-Böhm professionals</p>
<p>20 Multi language vs sharing a set of categories and images with meta data. Should we have one global category structure and image base or multiple language specific based with own application manager? Or separate instance of the application per language? Can user select language?</p>	<p>Separate instance of the application for each nationality and/or organization. An instance has an application manager, set of categories and images (including meta data).</p> <p>Note: on creation of the user, the nationality provided, can be used to pick the proper instance. However, this choice can only be made once. After a user is created, changing the nationality will not transfer the user to another instance.</p> <p>Note that <i>user interface</i> will be multi language for all users. User may set the user interface language in preferences</p>	
<p>21 What is the meaning of the mockup pages marked as Alternate g8e? Is this required functionality for the first version?</p>		<p>Not relevant for MI-Tale design. Removed in new version of the mockup</p>
<p>22 The mockup specified: add image (from game or library) to memory book using default memory book from profile. Alternative: if user has 1 memory book: use this one. If user has multiple memory books, <u>on adding an image to a memory book</u>, ask the user to which memory book the image must be added (e.g. dropdown with memory book names)</p>		<p>Discussed and we keep the approach as stated in the mockup: user can select one memory book in the settings, images will be added to this memory book.</p>
<p>23 Is there a contract between caregiver and client. Do we need to store information about this (e.g. start-end date) or explicit consent of client that a caregiver can view</p>		<p>Comment Michael, review 0.1: We should address this once more with the care professionals. Maybe there have to be guidelines for caregivers who use the app with clients. We can probably propose a</p>



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<p>information of the client like memory books and video recordings</p>	<p>form that has to be printed out and signed by the client.</p>
<p>24 Concerning shared / personal images: to be discussed what should happen if a client shared an image but wishes to undo this – control by owner of image vs impact for users who added the image in memory books.</p>	<p>Currently we specified that we leave the memory books (and session logs) of other clients untouched after removing a shared image or undo sharing.</p>
<p>25 Scope: All users (all roles, all countries) use the same application (version, functionality, business logic, user interface)</p>	<p>As discussed, this seems to be the proper approach to separate sets of content</p>
<p>26 Should it be possible to have country specific layout/theme. Not for the project phase, but for a possible successful product later on. Now we have flea market/attic as framing theme.</p>	<p>Support for multiple UI layouts added in the design</p>
<p>27 Out of scope: reporting functionalities: Should be discussed. No help desk in case of technical problems, no support in case of questions?</p>	<p>Agreed that this will not in scope.</p>
<p>28 Use stories caregiver; authorizations. In version 0.2 We introduced the approach where we allow the client to remove any data but we keep a copy for the caregiver (with a request to remove it). With this approach, we do not need authorizations managed by the caregiver. All sections concerning authorizations managed by caregivers are rewritten/replaced.</p> <p>See also Michael’s comment: <i>We have talked with Marianne Kochanski about this: Her opinion is, that the client does not need any authorization. "If he has access to the app and his content without presence of the caregiver and deletes data, it is bad luck."</i></p>	<p>We discussed the proposal. Based on this, we concluded that it is valuable if data that was removed accidentally can be restored. For this, we introduced the data manager.</p> <p>To keep the first version of the application as straight forward as possible, we keep functionality, authorizations and data shown the same for clients and caregivers.</p> <p>We still have to check how we can use these functionalities within the boundaries of GDPR.</p>



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	<p><i>I would like to address this once again as I fear that valuable data can get lost. Maybe it reassures a client if he cannot "wreck the app" when he uses it alone.</i></p>	
29	<p>Images vs media. All type of images can be used in games and memory books.</p>	<p>We added management for media for de data manager, where we agreed that we must always have an image and we may have a supporting video or audio file</p>
30	<p>End of the game: all images are drawn: to be specified what is the set of images we use for a game: only "favourite" images?</p>	<p>The game ends if the user quits or when all cards (=favourite images) were drawn.</p>
31	<p>Exclude category: user selects max 6 categories from the category list. Is it necessary that he can mark categories so that the category list from which the max 6 categories are selected, is filtered? This means additional management for the user.</p>	<p>No additional marking of categories needed. Not necessary. If a user does not like a category, he is not forced to select it. That's why one can choose categories in the first place</p>
32	<p>Mark images as "hidden": this is not in the mock-up</p>	<p>We discussed the option to explicitly hide images. Since we will only use "favourite" images in games and the user can already remove the image from the favourite images, we do not need an additional functionality to "hide" images</p>
33	<p>Manage metadata: Michael stated that the user that uploads the image, sets the metadata. However, other users may have their own idea for metadata. We specified that all users can set their <u>own</u> metadata. Metadata initially set by the user that uploaded the image is default.</p>	<p>For phase 1, we did not add the idea of user-based metadata. Instead, the user that uploads an image picks the initial category and can set the description. The data manager may adjust / add metadata.</p>
34	<p>Concerning selection of role of caregiver on switching to a client: <i>Is this necessary? In my vision, all happens when logging in: if a caregiver logs in and chooses a client, this means that the caregiver is present during the use of the</i></p>	<p>As discussed, if a caregiver logs in and switches to a client, the caregiver will always be present / working together with the client. We log that the caregiver is using the system for the client. Client and caregiver can perform the same actions within the client profile. With these starting</p>



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<p><i>app. Otherwise the client needs to log in separately.</i></p>	<p>points, we do not need to ask who is using the system.</p>
<p>35 Concerning personal management of metadata for images:</p> <p><i>Wow, that's not trivial.</i></p> <p><i>My suggestion was that only the owner of an image may change the meta data.</i></p> <p><i>But it makes sense that everybody at least can change the category (so it's clear to the user where to find it).</i></p> <p><i>Maybe we should discuss this, but your suggestion sounds good.</i></p>	<p>In our last discussion we concluded that it is sufficient if the data manager can update the description and/or can set additional categories for a shared image. With this approach we do not need personal metadata.</p>



9 Appendix 2: definition of terms

9.1 Card

An image with – optionally – a video or audio clip. Note, that for game types specified in this design, we must always have an image. Synonym: *media*

9.2 Category

Cards are grouped in categories. The Böhm-method distinguishes five main categories. Each category may have multiple themes. In the MI-Tale application the data manager can manage the structure of categories and themes. Each image must at least have one category. Additional categories may be selected by the data manager.

9.3 Deck

The images in a (sub) category used in games. The deck is selected by the user (images marked "favourite"). On creation of an account, the system will automatically prepare a deck (= mark some images as "favourite" for each (sub)category.

9.4 Image

A picture, photo uploaded by a client or an application manager.

9.5 Video clip

Part of a movie that corresponds to the timeframe of one step in a game

9.6 Audio clip

An audio file containing a song or spoken text.

9.7 Memory book

An album with a collection of images, video clips and descriptions. A memory book is owned by a (one) client. Synonym: *storybook*.

9.8 Game session

A game played by one user. A game session has a start and an end and may contain one or more steps. In each step an image is selected and shown.



9.9 User

Every person that uses the system. In the MI-Tale application, a user is recognized based on its account. Note that an account is bound to an instance of the system (e.g. the Austrian or Dutch version of the application).

9.10 Role

- Guest: An anonymous user. We do not have any personal information about this user.
- Older user : A user, in private or care setting, with a personal account and – optionally – an own login to the system.
- Caregiver: a (member of a) professional organization that cares for one or more clients
- Data manager: a person that manages categories and media for the system
- Application manager: a person that manages the MI-Tale application like caregiver accounts, category structure and metadata for images.

In the design we use “user” for generic actions or functionalities and specific roles like “client” if the action or functionality is only applicable for that role.

The roles specified here are equal to the *actors* we introduced for the user stories in section 2

9.11 User profile

A collection of settings for a user, e.g. account data, personal information like country of birth.

10 Appendix 3: Category structure

This appendix contains the default category structure. Category structure can be managed by the application manager.

Structure to be delivered during implementation (to verify if the structure can be implemented) and during configuration to setup the system.