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Personalising health and care: Advancing active and healthy ageing
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Authors: Mladjan Jovanovic, Antonella De Angeli (UNITN), Andrew McNeill, Lynne Coventry, Scott Houghton (UNAN)	
Internal reviewer: Aliaksei Miniukovich (UNITN)	

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1. Executive Summary

This deliverable describes the conceptual and interface design of the FriTab. Following general requirements to increase levels of physical activity and social interaction, we designed a persuasive user interface to social network and recommendation system. The target user group are older adults in stable health situation. We anticipate two modes of usage – in combination with the walker (mounted on and with tablet device) and independently. The UI design described here focusses on the design of a UI for the social network system rather than for navigating with the FriWalk.

First, we describe the starting requirements used for conceptual design. These requirements were established through work with older adults. The requirements were drawn from previous work in WP1 such as work on privacy (D1.1), older adults' barriers and motivators for physical activity (D1.3), and lists of user requirements (D1.6, D1.7). Requirements were also drawn from the structure of the cyber-physical social network (CPSN; WP4) and from behavior change research. These were all translated into UI-specific requirements.

Having generated these requirements, through our work with older adults, a conceptual design was instantiated using mockup design software. This resulted in a navigation-enabled prototype of the UI, which could then be used in discussions with older adults. The UI has four main features: the user profile, the calendar (displaying event-related information), groups (displaying groups of related users on the system), and messaging (allowing users to send messages to other users). These four features represent the core functionality of the system and link clearly to work being conducted in WP4 on the back-end of the CPSN. A key part of this was the representation of the users' activities and goal attainment through a garden metaphor.

The next step presented in the deliverable is the results of evaluating the UI with users. We decided to work individually with users on the design of the UI as their needs, expectations and previous experience were diverse, and this allowed us to acquire a more detailed insight into their thoughts about the concept. While team-members provided feedback on the UI and changes were continually made throughout the process, feedback from older adults who are the end-users, was invaluable. For the evaluations reported here, 16 participants were involved who provided feedback. Subsequent studies have been conducted too, but the early participant involvement was particularly useful. Some of the important feedback received was about the importance of explaining the icons (perhaps by providing an initial guide or "cheat-sheet"), the need for simplicity in the UI, and the need for clear and consistent aesthetics (e.g. consistent appearance of editable fields). The results of these usability feedback sessions have been fed into re-designs of the UI and further usability testing will be carried out in line with agile development principles.

Following the section on the overall structure and design, a section is presented on how to design for trust in the ACANTO system; both trust between users and users' trust in the system. The former is vital for the acceptance of recommendations to meet with new people, the latter for acceptance of the system as a viable way of getting recommendations for activities. Having established trust as a key facilitator to acceptance of the concept, this issue was given special attention. We asked 10 participants over 65 to explore different representations of users of the ACANTO

system, to understand what would make the system trustworthy. 4 key themes were identified:

- 1 Motivation. Participants wanted to know why others were using the site and why they would want to meet with them.
- 2 Control. Participants wanted to be able to control the amount of information they shared on the site.
- 3 Credibility validation. Participants sought cues to show that the site was safe and reliable.
- 4 Similarities. Participants were more likely to trust another user if the user was more similar to them than dissimilar.

These points are translated into suggestions for detail in the UI design as it develops, such as ensuring appropriate branding of the social network site, including data fields that allow users to explain to other users why they are using the site, and showing similarities of interests, friends and backgrounds to users to encourage them to accept recommendations with users they have not met.

This deliverable therefore, provides the groundwork for a UI that will be usable for older adults and will encourage trust among users and in the system itself. Further revisions of the UI will be produced and implemented as evaluations of the SNS functionality with older adults continue.

2. Introduction

The UI design is the result of the requirements engineering process (Sutcliffe, 2013) we followed. The initial phase (scoping) was defined by following general requirements of the project – using a socio-technical intervention consisting of the FriWalk and FriTab to increase physical activities and social interactions among healthy older adults to increase their well-being. Based on the problem statement, we carried out fact gathering and analysis in which we further decomposed the problem by identifying:

- privacy concerns of older adults (Coventry, McNeill, & Pywell, 2016),
- preferred activities of older adults, together with motivations, facilitators and barriers to participate in these activities (Angeli, Paladino, Coventry, Targher, & McNeill, 2015; Coventry et al., 2015), and
- drafting the scenarios in which the system is used as a support for the activities (McNeill et al., 2016).

In the modeling phase, we made audio-video descriptions of the scenarios as animated storyboards. Finally, in the validation phase we evaluated the feasibility of the scenarios with older adults (McNeill et al., 2016). The result of this study was a set of the requirements (functional and non-functional) that cover the walker, social network, recommendation system and user interface for older adults. Based on this set of requirements, we designed the mockup of the user interface (UI) for healthy older adults. For the purpose of clarification, from now on in this deliverable we use the term *interface* to refer to the UI mockup. Source file and executable versions of the interface can be found at the link below¹.

This mock up was then discussed with potential users for their thoughts on how to improve it. In addition more detailed work was carried out to understand how to optimize trust within the system by looking specifically at the photos that might be provided by a user, and the information that they would look for from other users.

¹ FriTab Mockup – version evaluated: <http://bit.ly/2vSJXt5>

3. Starting requirements

The requirements can be classified into three categories:

- **User-centered design (WP1)** – following our work on identifying privacy concerns (Coventry et al., 2016), facilitators and barriers around preferred activities of older adults (Angeli et al., 2015; Coventry et al., 2015), and examining older adult's attitudes towards scenarios of system usage, we made a list of system requirements (McNeill et al., 2016). From this list, we extracted a set of the UI-specific requirements (Appendix 1).
- **CPSN (WP4)** – we make a connection with the work on user profiles repository and social networking (Appendix 2).
- **Design for behavior change guidelines** – given that the aim of the system is to increase levels of physical activities and social interaction, we used the design for behavior change principles (Consolvo, McDonald, & Landay, 2009).

4. FriTab UI design

The FriTab contains four main components (Figure 1):

- *Profile* – refers to the existence of the person in the system, with relevant information and characteristics;
- *Calendar* – organizes *Events* that represent different kinds of activities that the user may or participates in;
- *Groups* - describes different kinds of user groups that the user may be member of;
- *Messages* - helps users communicate with other people.

Profile, Calendar (Events) and Groups features correspond to existing data structures from the CPSN (described in Appendix 2), while Messages are a newly introduced component based on the WP1 requirements (described in Appendix 1). An online version of the mockup is available at the link below².

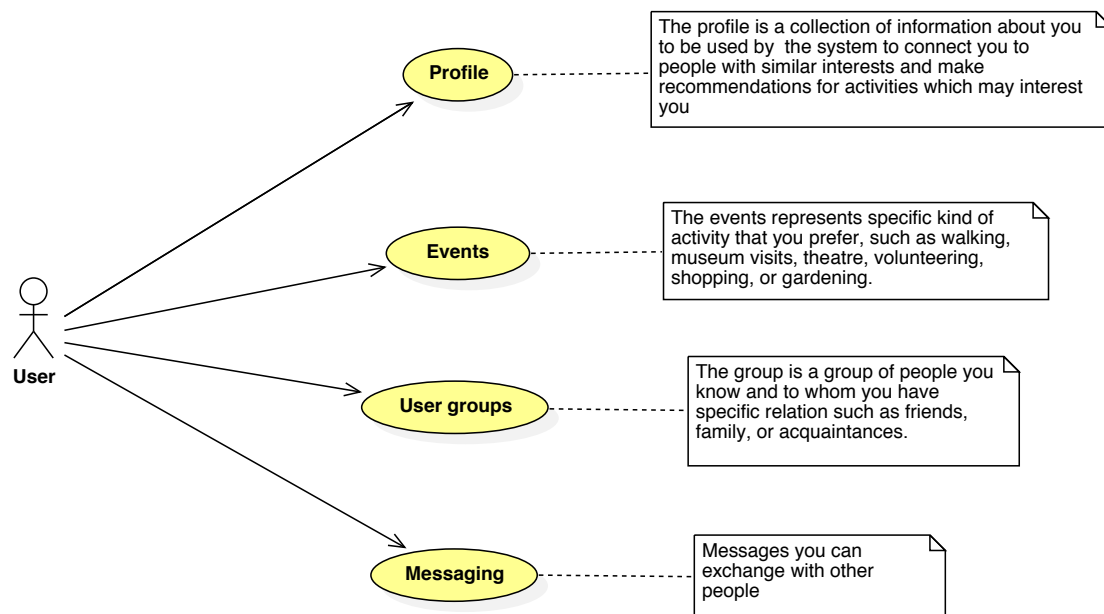


Figure 1. Main FriTab use cases.

This diagram of the use cases (how a person would interact with the system to perform key functions) was translated into the UI by creating one home screen and four sub-screens that match each of the components (Figure 2).

² FriTab Mockup – latest version after evaluation: <http://bit.ly/2hb82YP>



Figure 2: Overview of UI structure

Navigation

The FriTab provides two basic ways to navigate among the main components:

- by using topbar to access the main components;
- by using the menu to access additional components (Figure 3).

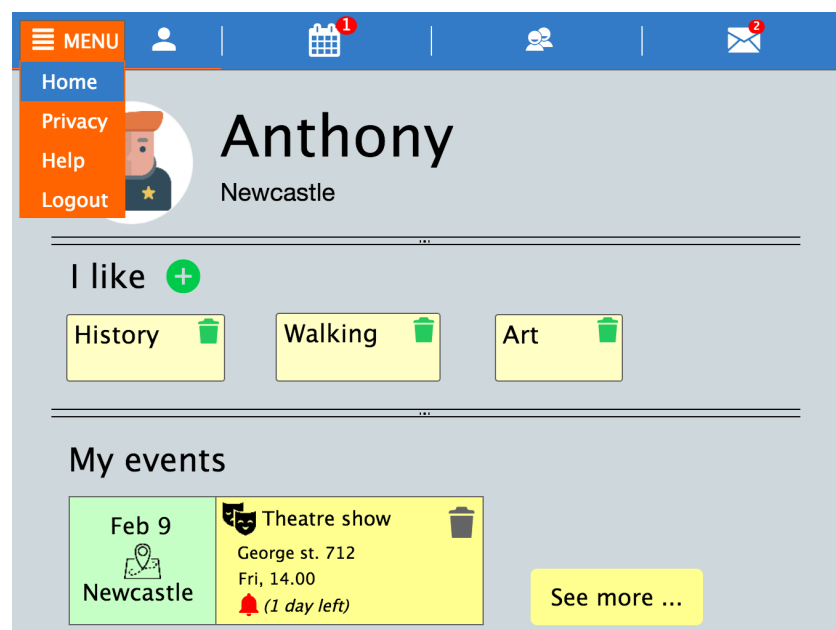


Figure 3. FriTab navigation.

Authentication

The *Authentication* component checks and verifies the user's identity when accessing the system. Its main purpose is to protect user data from unauthorized access. The component has two use cases:

- *Sign up* – providing data to create a new user account;
- *Sign in* – providing user credentials to enter the system.

The *Sign up* component collects relevant information from a new user (Figure 4).

(a) (b) (c)

Figure 4. Sign up pages – information necessary to personalize the FriTab.

The *Sign in* component contains fields to provide user credentials, and features for memorizing the credentials and password recovery (Figure 5).

Figure 5. FriTab's landing page.

After login, the page showing user progress in terms of steps and distance made during the activities is displayed as part of a motivational page, representing success as a garden with the number of butterflies representing distance and flowers representing active time (Figure 6).

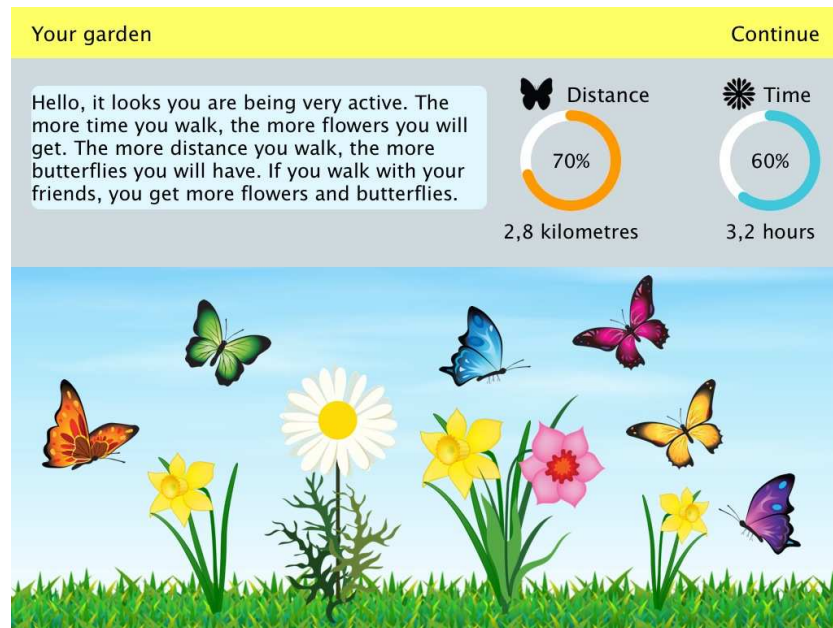


Figure 6. Progress related to the activities shown after login (garden metaphor).

On pressing continue, the FriTab takes the user to the home page that provides access to the main components (Figure 7).



Figure 7. Home Page: Main FriTab features.

Profile

The *Profile* is a collection of information about the user that the system uses to connect people with similar interests and make recommendations for activities that the user may like. The component is initially designed according to the Profile group of the requirements (Appendix 1). The main use cases of the Profile are:

- *Edit basic profile information* – maintain up to date user information relevant to the system;
- *Edit personal interests* – maintain user preferences for different kinds of activities;
- *See upcoming events* – the events that the user is intending to participate in;
- *See calendar of events* – view all possible events (Figure 8).

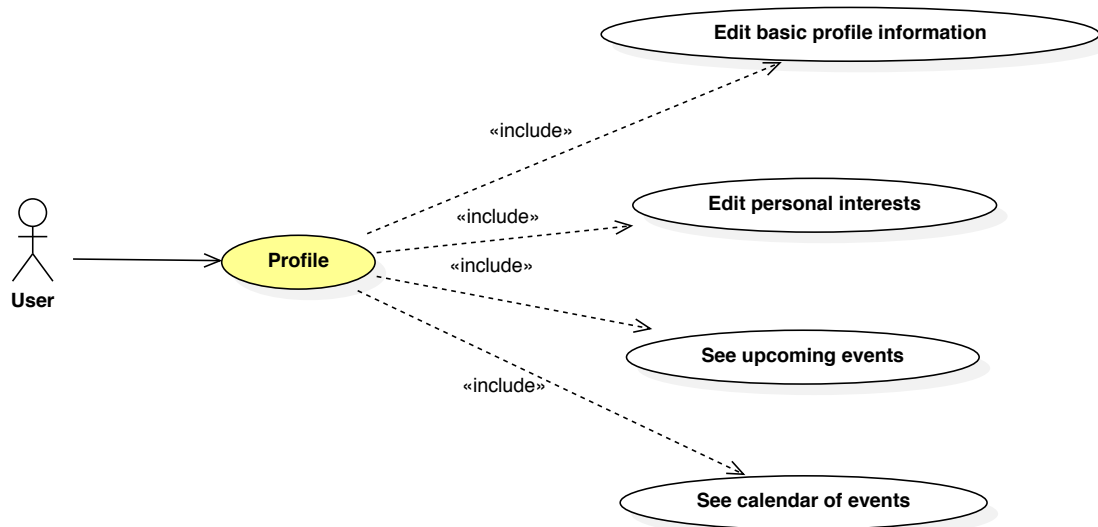


Figure 8. FriTab Profile use cases.

Basic personal information

Relevant user information maintained from the profile page. It contains three sections – basic user information, interests and upcoming events (Figure 9).

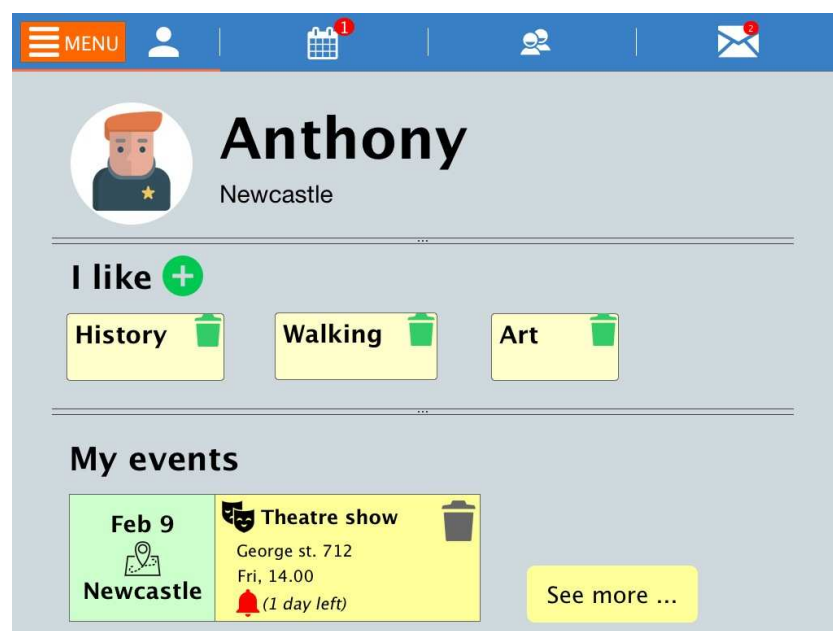


Figure 9. FriTab Profile page.

Pages for specifying basic user information which is necessary for the CPSN and recommendation system are available by clicking on the profile photo or user name (Figure 10).

(a)

(b)

Figure 10. Pages for specifying basic user information

Interests

The page for specifying user preferences is shown in Figure 11. The concept of Interest corresponds to the Tag structure from the CPSN (Appendix 2).

Figure 11. Interests page.

Groups

The *Groups* component represents different kinds of user groups that the user can be a member of. The component is designed according to the Groups set of the requirements (Appendix 1). Additionally, it is a significant component of the CPSN (Appendix 2). The main use cases of the Groups are:

- *Edit user group* – maintaining information about the specific user group, includes adding new users, seeing members' information, messaging group members, and receiving system-generated recommendations to connect with new people;
- *Chat with your contacts* – real-time communication (Figure 12).

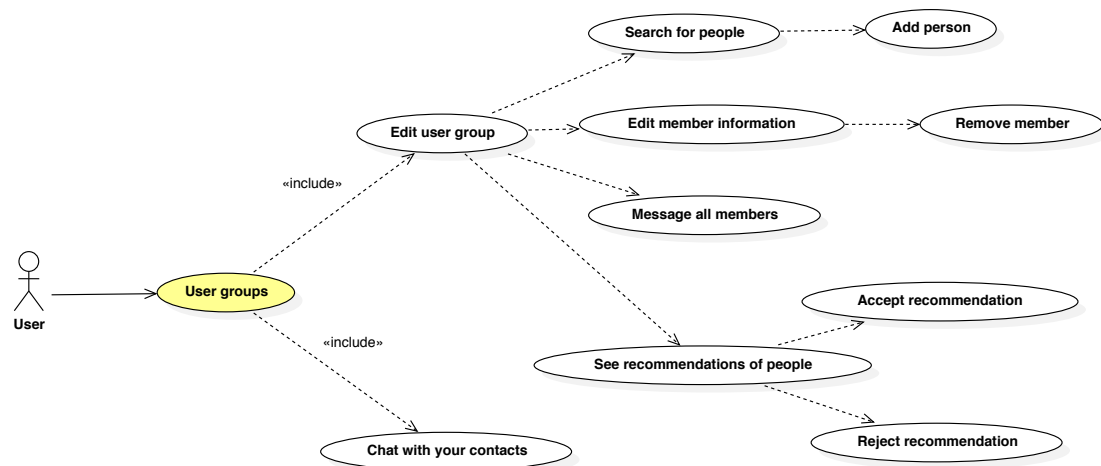


Figure 12. Groups features as use cases.

Figure 13 shows the Groups page.

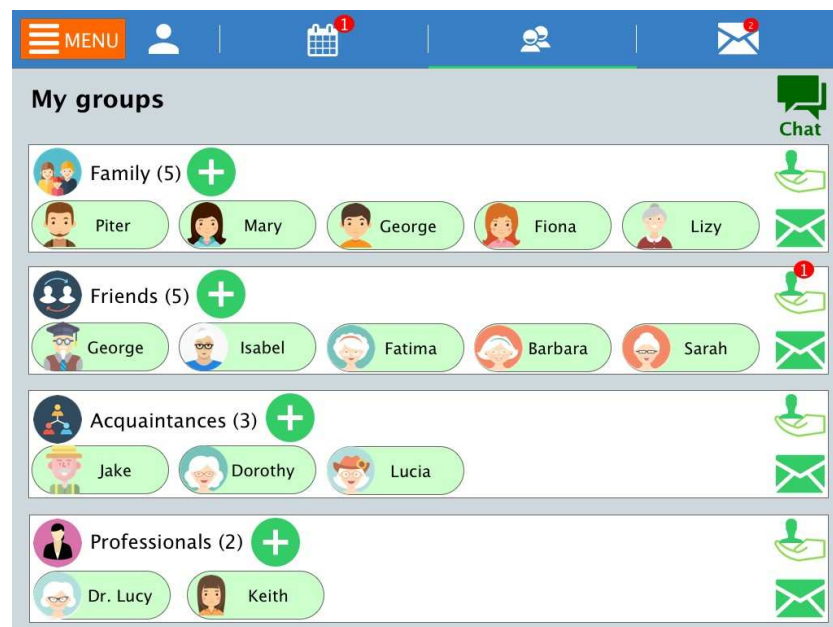


Figure 13. FriTab Groups page.

The Circle structure from the CPSN is generic and doesn't describe any specific user group. However, based on: the relations between Circles (Appendix 2); the groups identified in the study with users (Appendix 5); and the privacy profile of older adults (Appendix 4) we have proposed four user groups:

- Friends – longer-term friends and people with high level of trust;
- Acquaintances – known people, but with medium level of trust;
- Family – family members, such as spouse, children, grandchildren, relatives;
- Professionals – social carers with a specific role in looking after the social well-being of a person, ranging from housework to full personal care, and doctors and medical staff.

User group operations

By clicking on the member tag the details are displayed (Figure 14).

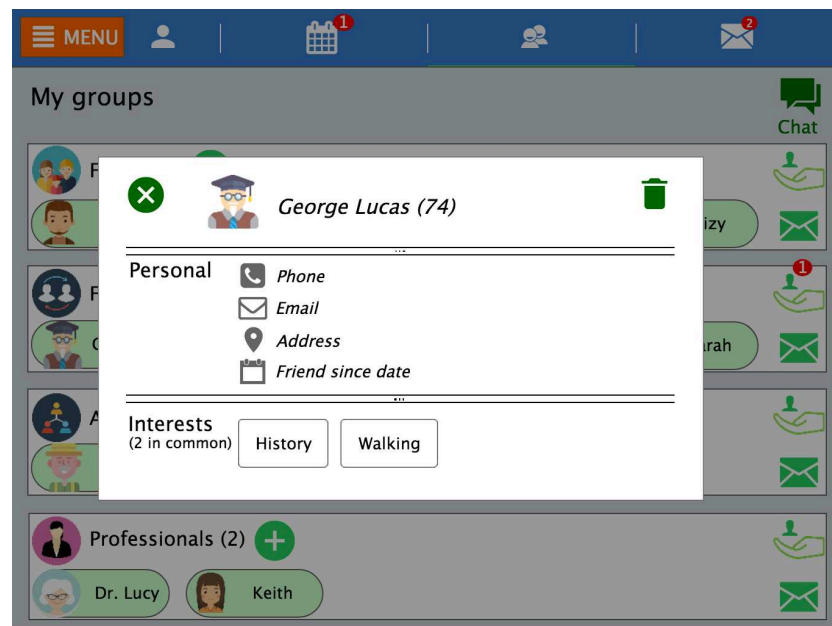


Figure 14. User group member details.

Adding a new member is activated with the plus icon (Figure 15).

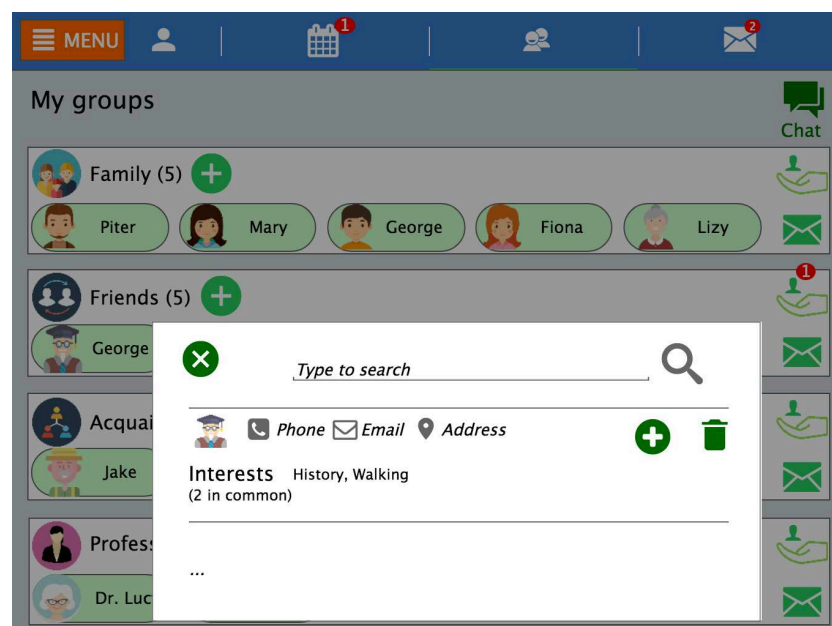


Figure 15. Adding people to the group.

The envelope icon opens the page to send a message to the user group (Figure 16).

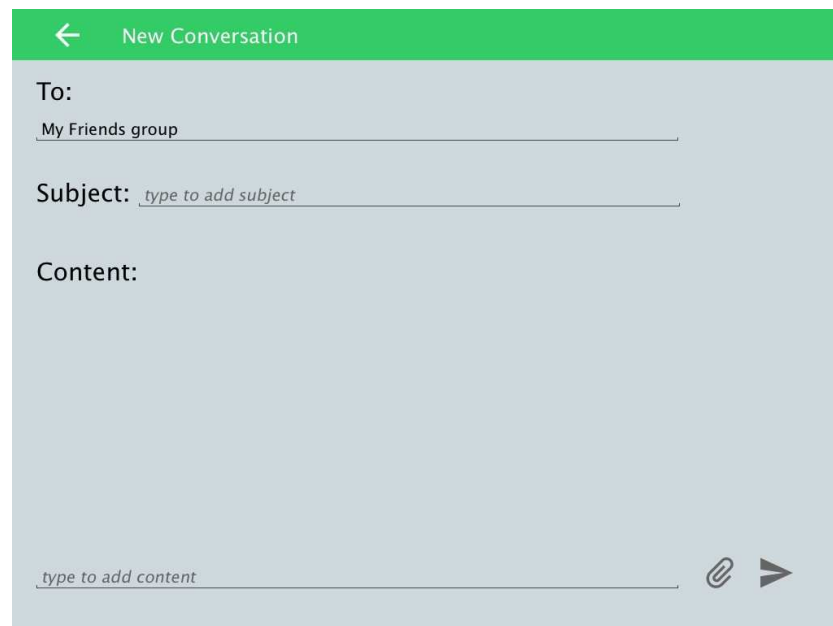


Figure 16. Page for sending a message to the user group.

Recommendation of users

The page for system-generated recommendations of users is shown in Figure 17. This feature comes from the Group requirements based on the study with users (Appendix 1).

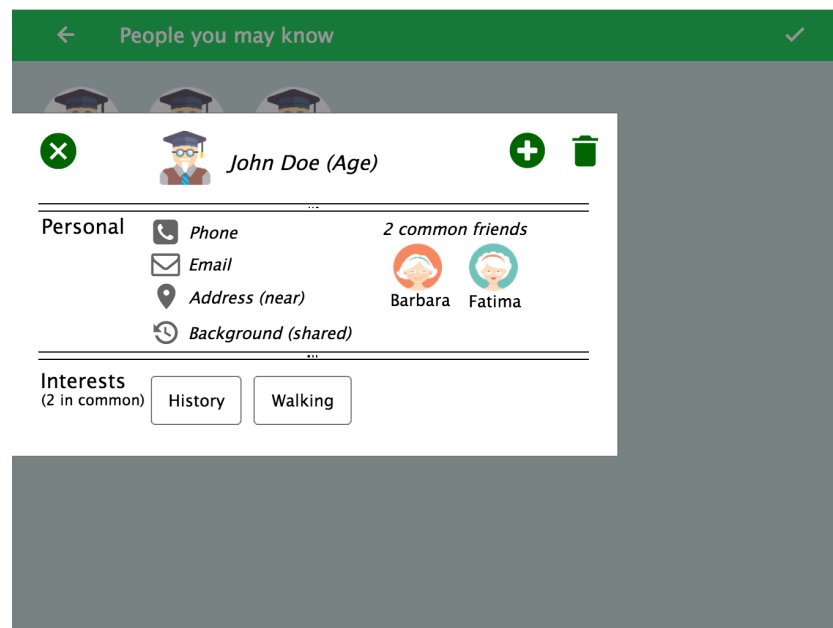


Figure 17. Page for system-generated recommendations of users.

Chat

The chat feature allows for real-time communication with contacts (Figure 18). The feature originates from the Groups requirements based on the study with users (Appendix 1).

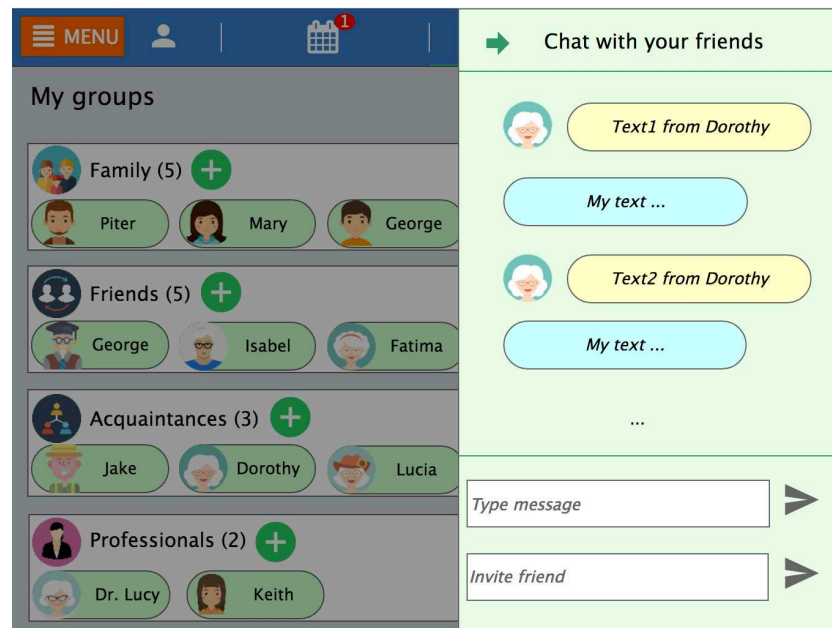


Figure 18. Chat dialog.

Calendar

The *Calendar* component serves to organize and manage *events*. The *event* represents different kinds of user activities. The component is designed according to the core concept of ACANTO – Activity (Appendix 2). The main use cases of the component are:

- *Edit upcoming event;*
- *Edit event recommended by the system;*
- *Edit progress information related to your events (garden metaphor)* – reflecting on personal achievements (distance, time), progress information and comparisons with similar others;
- *Edit previous events;*
- *Search for events;*
- *Create event* (Figure 19).

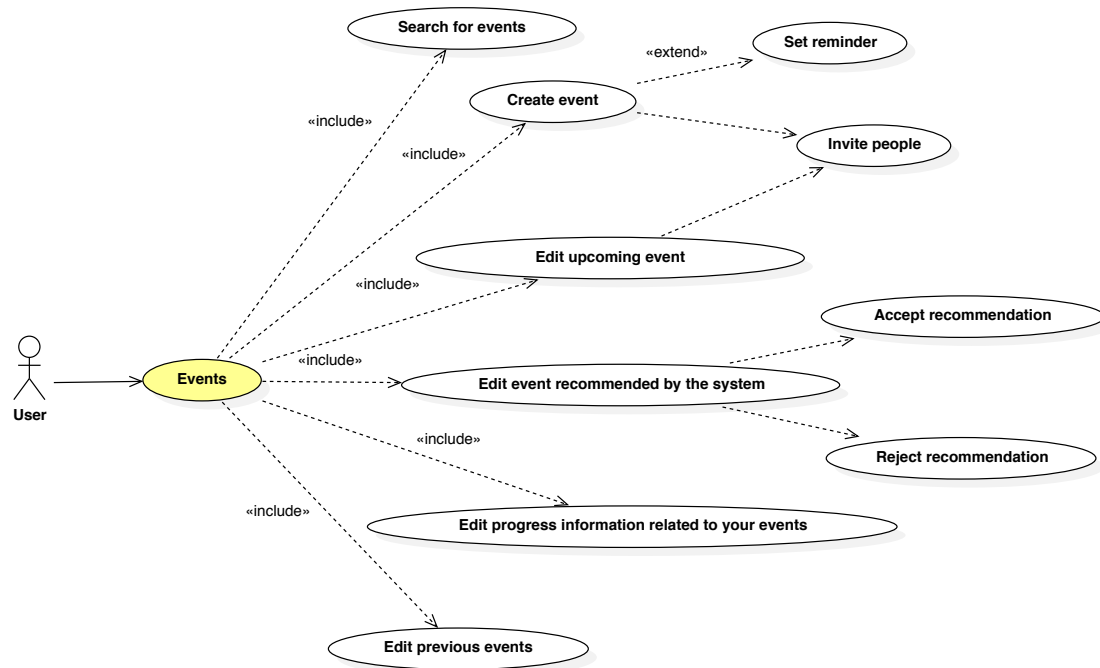


Figure 19. FriTab Calendar use cases.

Figure 20 shows main Calendar page. The left part displays the list of upcoming events with a search function, while the right part contains options to create events, see past events, system recommendations of events and personal progress.

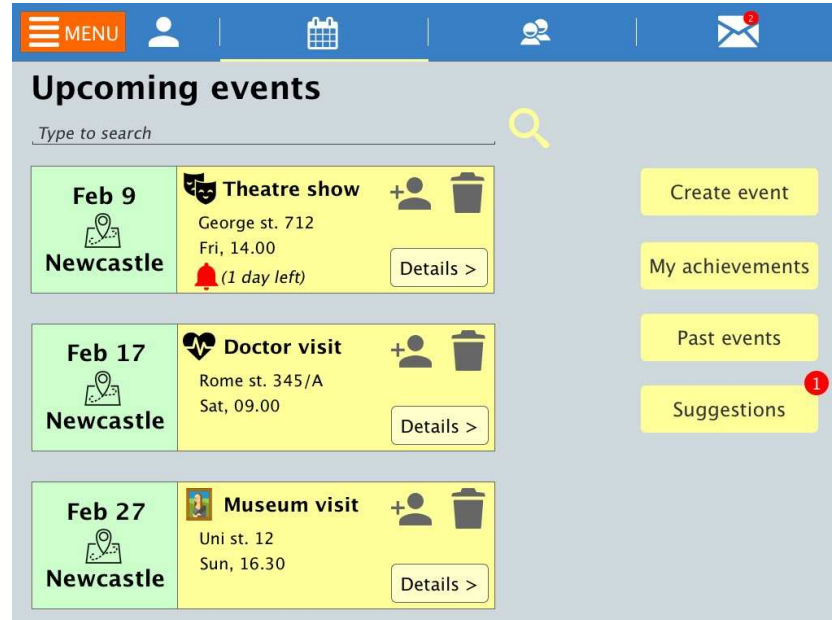


Figure 20. FriTab Calendar page.

Edit upcoming event

Clicking on the “Details” button that represents the event (for example, *theatre show* from the figure above), opens the dialog with more information (Figure 21). The dialog allows for changing information such as title, time and location. Only the creator of an event will be able to edit this information.

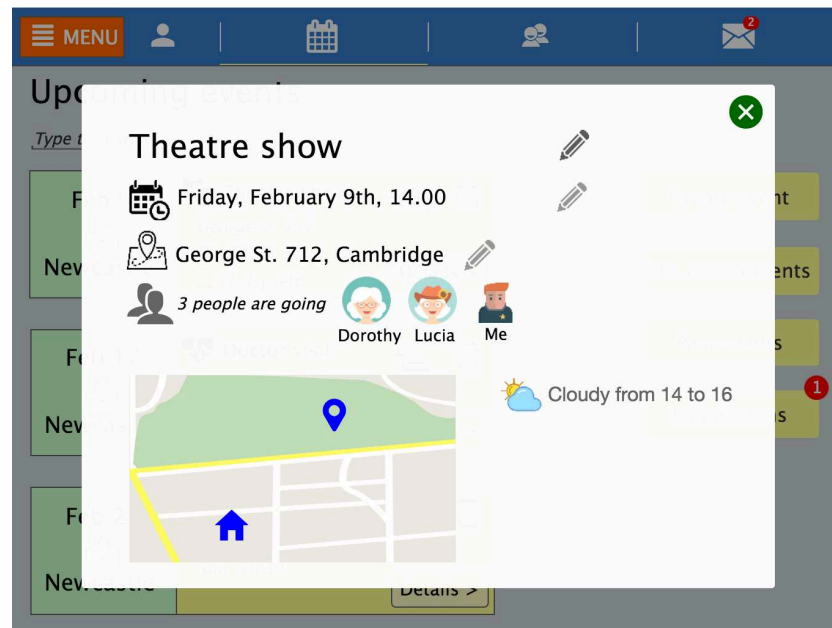


Figure 21. Dialog to edit event details.

Similar to previous pages, clicking on the person icon with the plus sign displays the page for inviting contacts to the event (Figure 22).

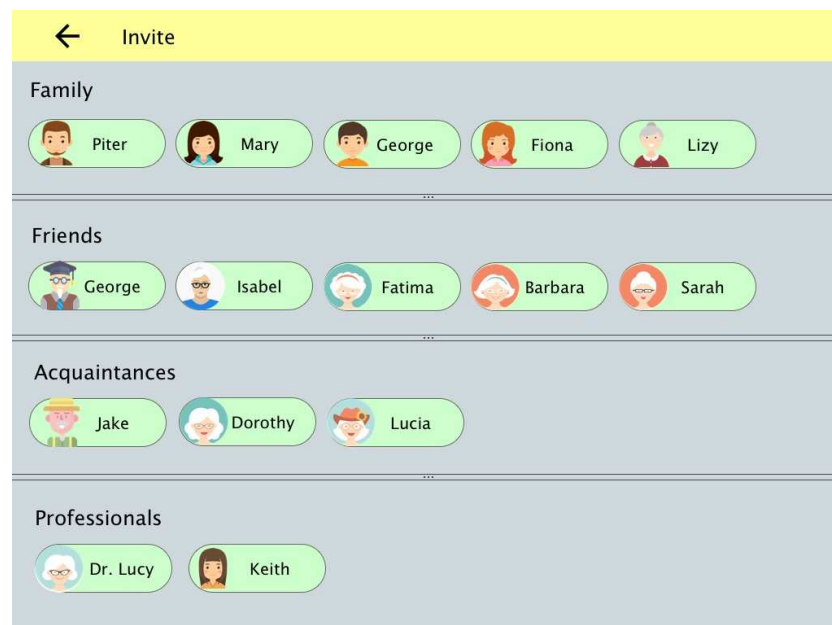


Figure 22. Page for inviting contacts to event.

The map icon with the pin on top (event widget) displays the view for navigation (Figure 23).

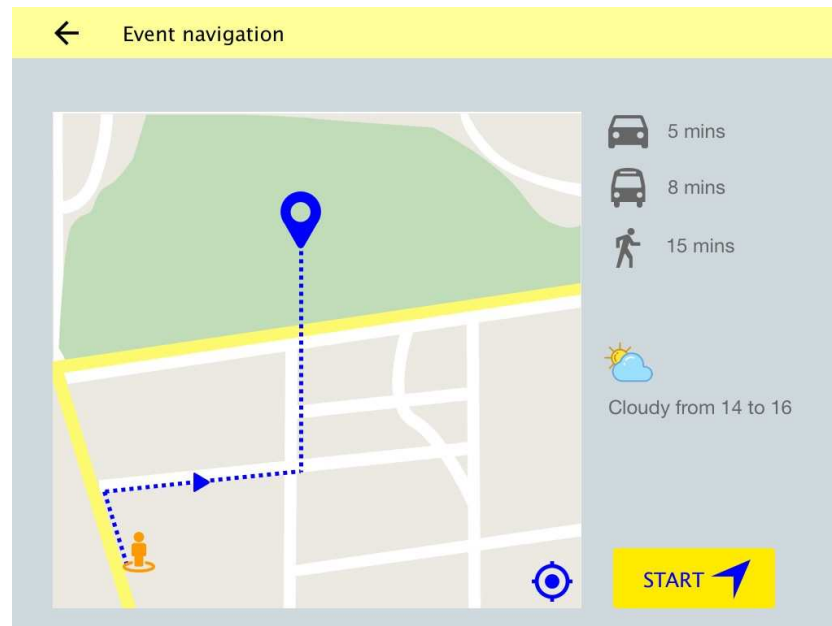


Figure 23. Event navigation page.

Recommendation of events

Recommendation of activities is ACANTO's fundamental feature (Ramos, Brauckhoff, & Marchese, 2017). The page for events recommendation is shown in Figure 24. The page is designed according to the Activities group of the requirements (Appendix 1). The event widget contains options to accept or reject as check/tick and trash icons respectively.

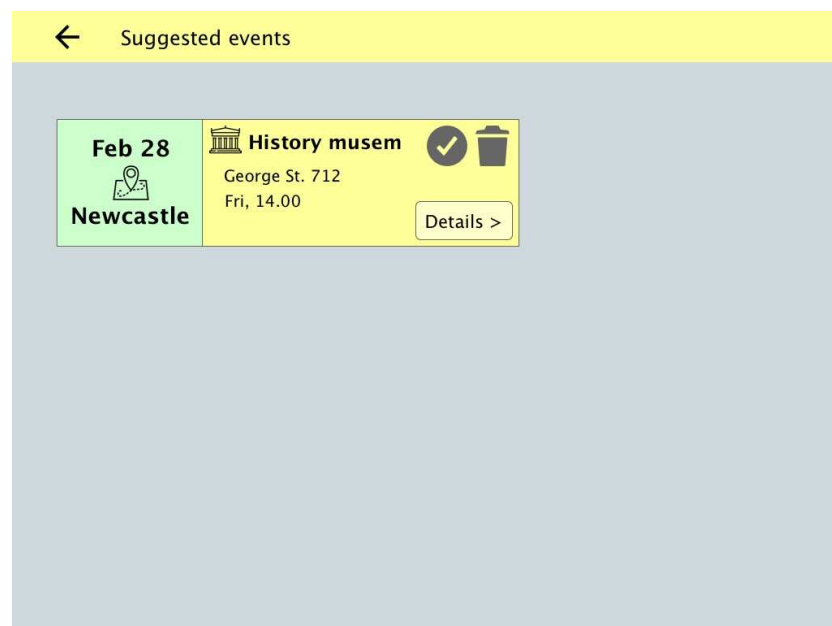


Figure 24. Page for events recommendation.

Details of the recommended event are displayed from the "Details" button (Figure 25).

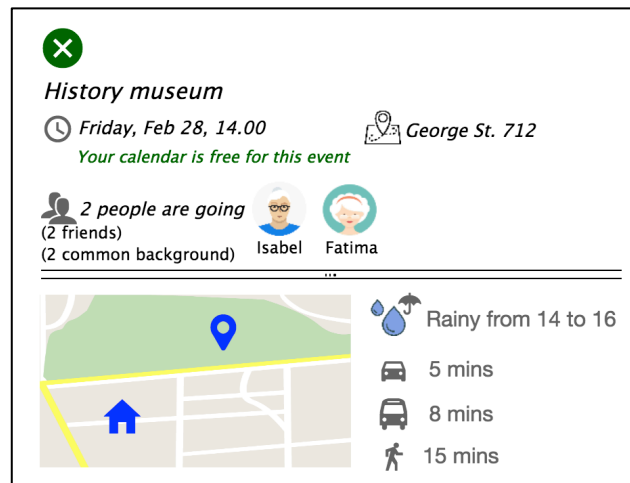


Figure 25. Recommended event's details.

Progress information

One of the goals of ACANTO is to facilitate the well-being of older people by encouraging regular and sustained physical and social activities. Therefore, persuasive design becomes an important part of FriTab design. Part of the requirements relates to reflections on the performance of activities (see Activities requirements, Appendix 1). The first version of the mockup contained diagrammatic representations of the metrics (such as time spent walking or distance covered). However, based on the results of the pilot-study and having in mind that older adults are a heterogeneous user community, we designed a form of presentation that combines numeric and pictorial features with a growing garden metaphor as an aesthetic, stylized element to convey and reflect on personal progress. We also followed general design principles for behavior change technologies (Appendix 3). The page that displays the users' performance is shown below (Figure 26). It combines numerical presentations on top, and the garden below. A similar view is shown after login (Figure 6), in which case the user is briefly explained the way in which the garden "grows" (more distance brings more butterflies, and more time brings more flowers).

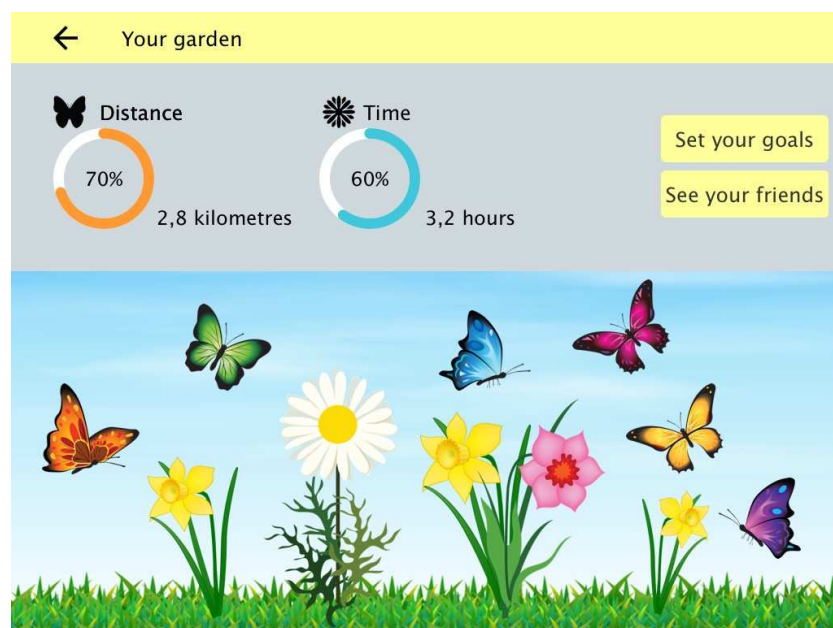


Figure 26. Personal progress as garden metaphor.

In addition to the information shown on the main page, more details are available

when clicking either the numbers or the circular progress bar (Figure 27).

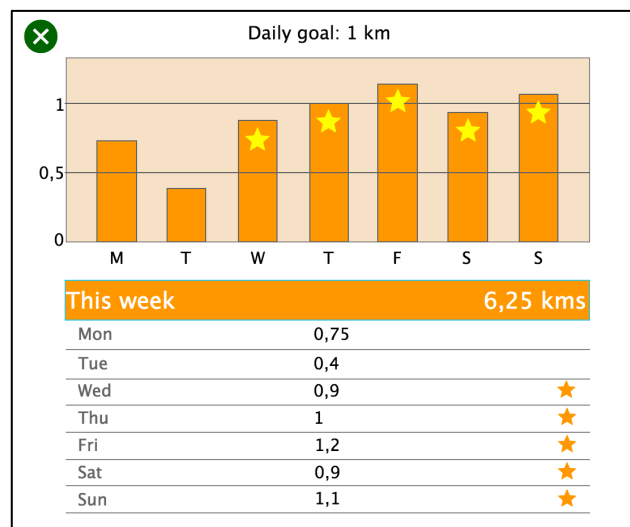


Figure 27. Diagram showing progress for distance.

The view contains options to set goals regarding activities and timeframes to monitor goals (Figure 28a). The option to see and compare with known people is also available (Figure 28b). For some older adults, comparisons with other people may be a reputation-based incentive to be more physically active. Being too competitive can be alleviated by adding the possibility to directly communicate and share experiences through chat.

Set goals:

☐ Duration (minutes) *click to enter*

☐ Distance (kilometres) _____

Choose time frame:

☒ Daily

☐ Weekly

☐ Monthly

Chat with your friends

Isabel

George

Me

Fatima

Message from Fatima

message

Message from George

...

Insert text

Enter address to invite more friends ...

(a)
(b)

Figure 28. Dialog (a) to set goals and time to monitor the goals, and (b) to compare and share experiences with other people.

Creating a new event

The page for creating new events is shown in Figure 29. Users can provide the usual details of the event. The map-based interface is available to specify location (Figure 30a), and a page for choosing people to invite (Figure 30b). While not all users will want to create events, and users do not need to create events (since they are recommended by the system), some users appreciate the ability to create their own events to which they can invite other people.

← Create event ✓

☰ Click to add description ...

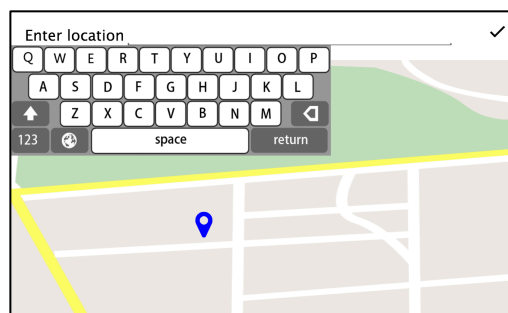
🕒 Click to insert start date start time
Click to insert end date end time

📍 Click to insert location

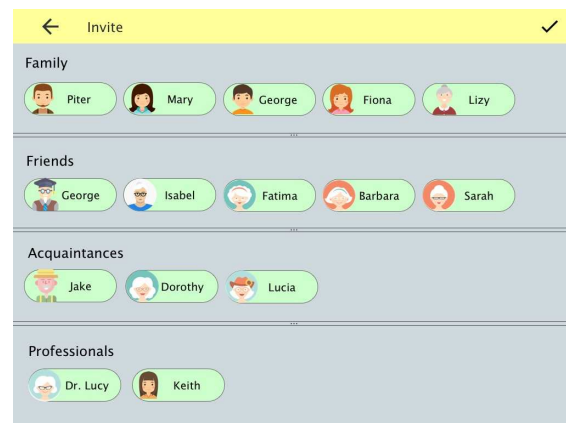
🔔 Click to add reminder

+👤 Click to invite people

Figure 29. Page for creating new event.



(a)



(b)

Figure 30. Creating new event: (a) map interface for specifying location and (b) page for inviting people.

History of events

History of events is an important component for two main reasons. Firstly, from the user side, memories of previous experiences have a positive influence on the well-being of older adults (Vines, Pritchard, Wright, Olivier, & Brittain, 2015). Secondly, from the system side, the existence of an events' history with users' feedback is crucial for future recommendations of acceptable activities, which further influences users' positive attitudes and acceptance of the system. The page showing a user's previous event is shown in Figure 31.

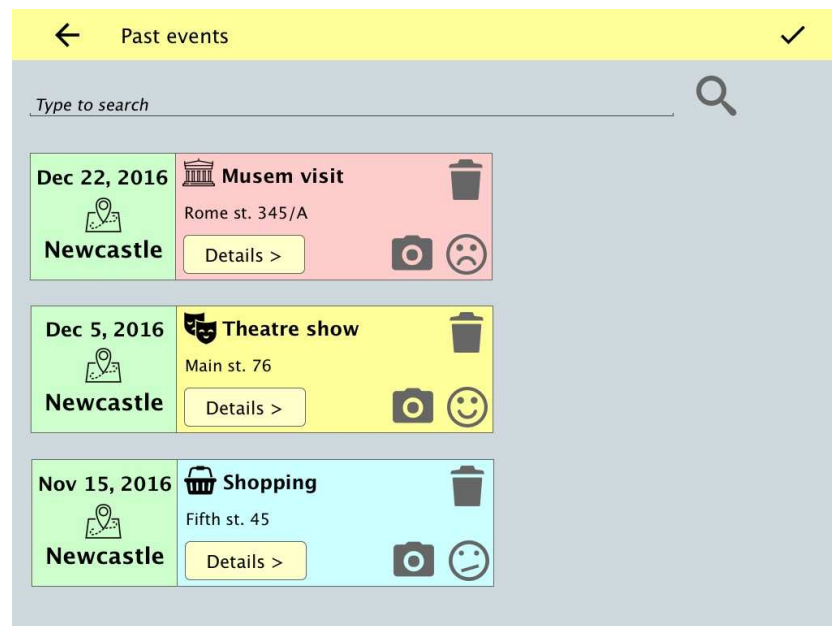
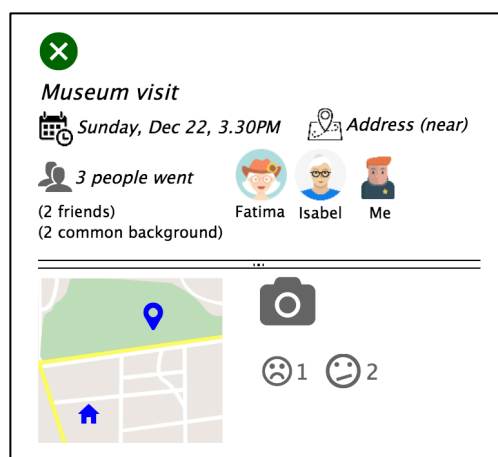
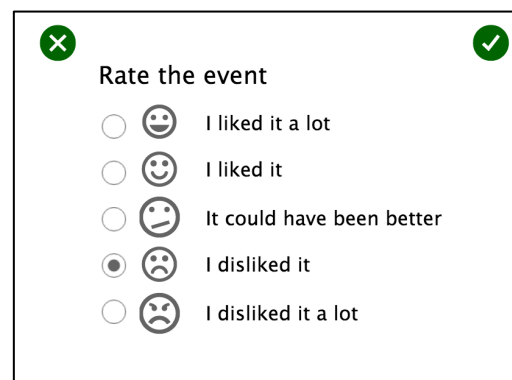


Figure 31. Events history page.

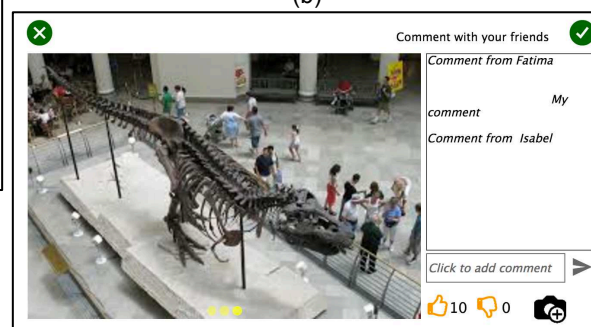
The “details” button displays an event’s details (Figure 32a). The smiley icon opens a dialog in which the user can provide their level of satisfaction for the event (Figure 32b). The camera icon opens a view in which users can share photos of the event, add textual comments, and rate the photos (Figure 32c).



(a)



(b)



(c)

Figure 32. Dialog for (a) display past event details, (b) rate the event, and (c) share and comment photos of the events.

Messages

The *Messages* component provides a means to communicate with contacts (Appendix 1). The main use cases are:

- *Search messages;*
- *Delete message;*
- *Reply to message;*
- *Create message* (Figure 33).

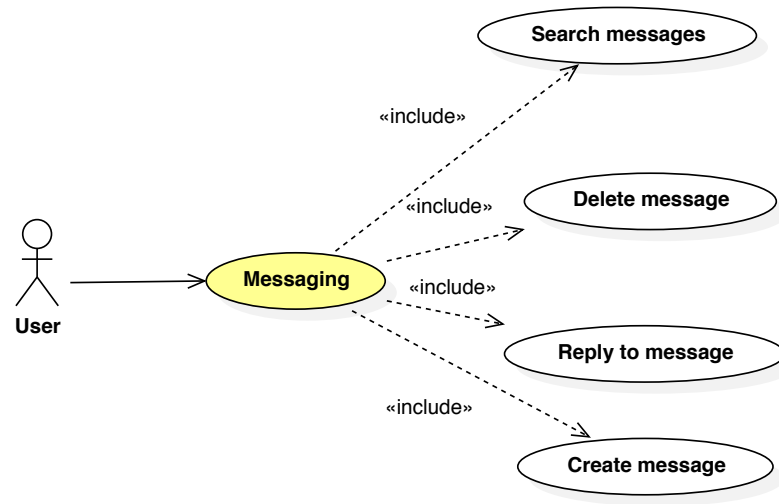


Figure 33. FriTab Messages use cases.

Figure 34 shows the main messaging page.

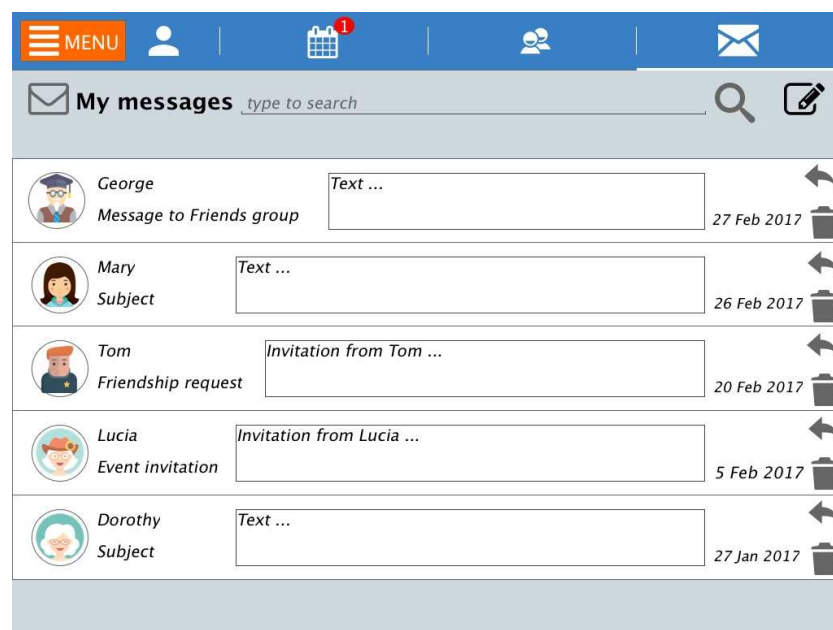


Figure 34. FriTab messaging page.

Figure 35 shows the page for replying to the message. It includes standard *reply* features, such as adding participants in conversation, and the option to add attachments.

← Reply

To: type to add address

Subject: type to add subject

Content: type to add content

Old text ...

27 Feb 2017

Figure 35. Page for replying to the message.

Similar to previous pages, Figure 36 shows the page for creating new message.

← New Conversation

To: type to add address

Subject: type to add subject

Content: type to add content

Figure 36. Page for creating new message.

Privacy

The *Privacy* component is introduced according to the need of the users to specify information disclosure settings. It is designed based on the privacy profile of older adults (Appendix 4). The study (Coventry et al., 2016) suggests that older adults may share information with individuals, and not necessarily with the groups. However, at the moment, for the reasons of clarity and simplicity of the UI, the information is shared among the groups.

Figure 37 shows the page for specifying privacy information.

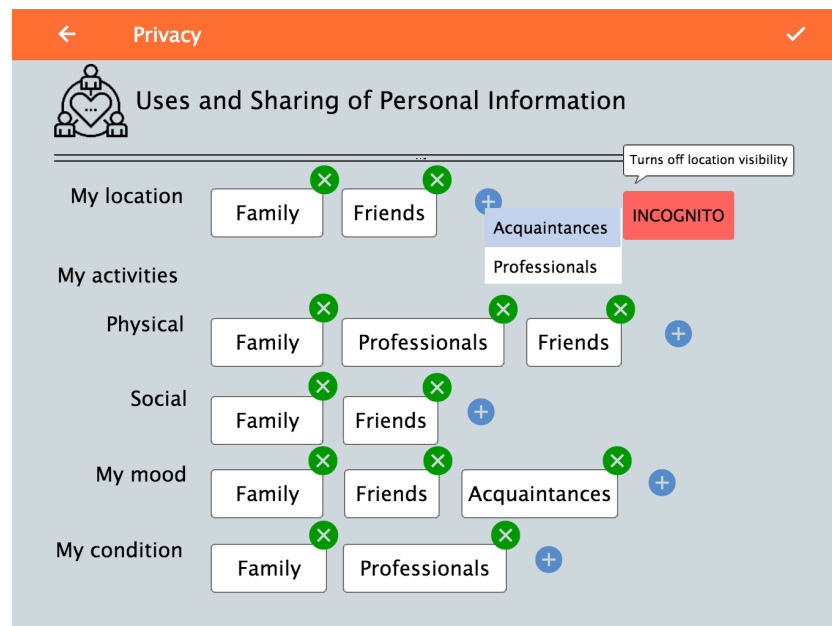


Figure 37. FriTab Privacy page.

5. FriTab initial UI evaluation

In line with good practice, we conducted a pilot study to assess the suitability of the methods for assessing the UI. Pilot usability studies help to test the tasks to ensure that they are understandable by participants, provides some idea of how long the tasks will take, and provides initial feedback on some of the bigger problems in the UI (Schade, 2015). To commence our testing of the social network UI, we conducted a pilot study on a mockup of the UI designed according to starting user requirements (Appendix 1). The goal was to identify serious usability issues or problems with understanding the FriTab's features early in the design cycles.

Methods

Participants

We recruited 4 participants (2 females and 2 males; age range 60-73) from an urban area. The participants had previous experience with touchscreen smartphones, and social network applications.

Materials

The UI used for this pilot study is shown below in the form of a diagram (Figure 38: Diagram of UI for pilot testing). The full mockup can also be viewed online³.

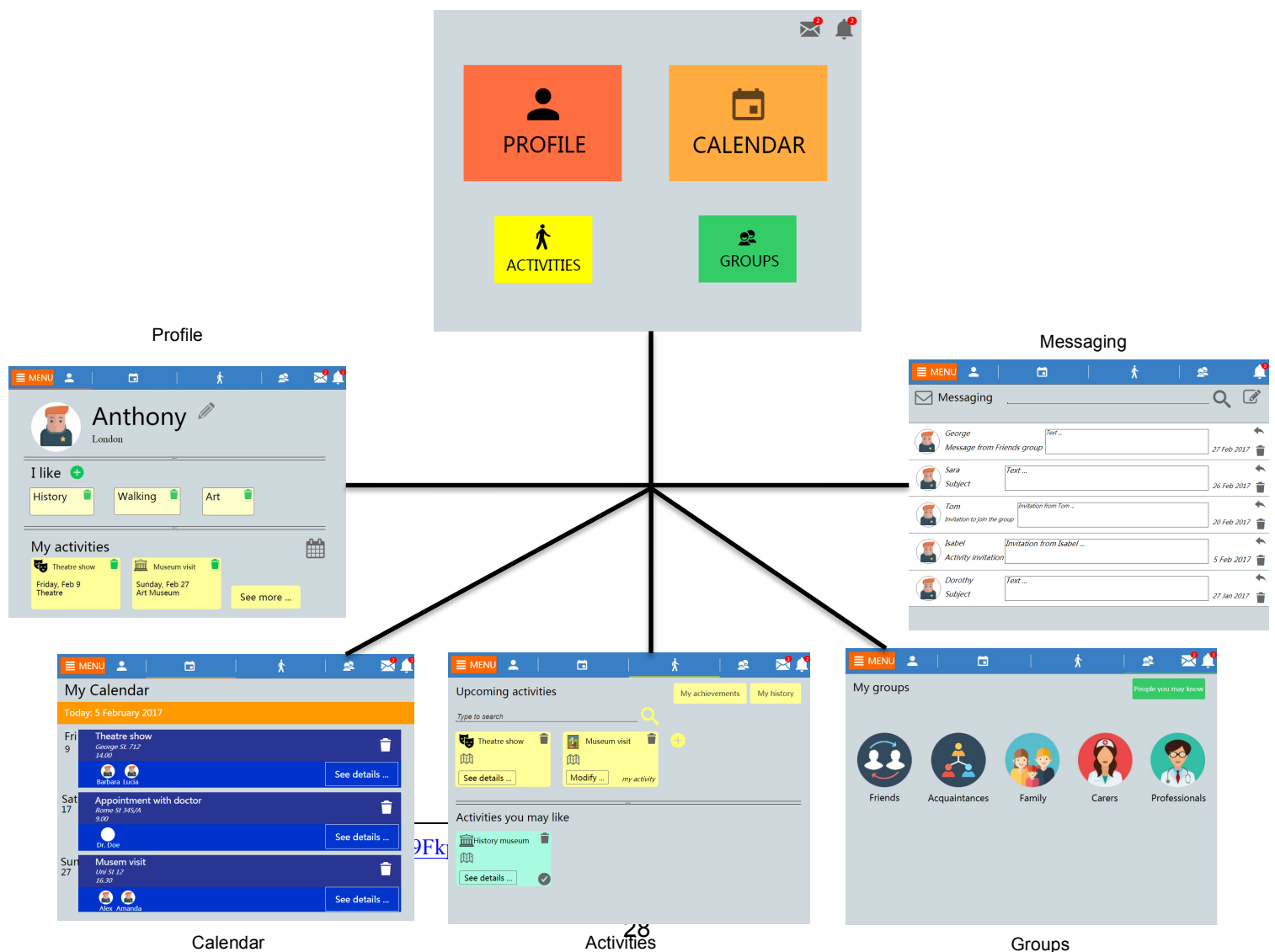


Figure 38: Diagram of UI for pilot testing

Procedure

The user evaluation of the mockup started with a brief introduction of the project to the participant, and the signing of the consent form. Each participant is then presented with a sequence of questions about themselves and their habits.

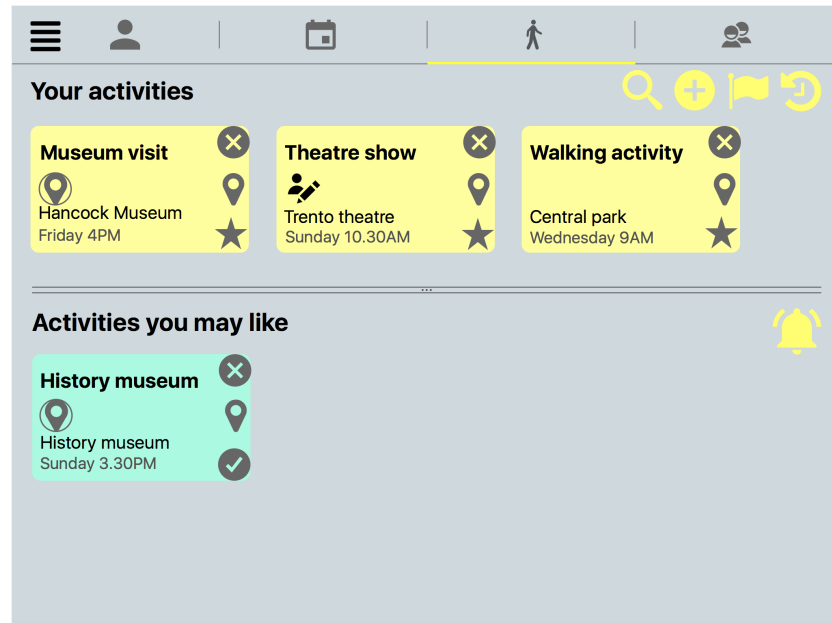


Figure 39. FriTab pilot study – Activities view.

The most important queries were the ones about whether they knew what a social network was and if they had ever used one, along with their understanding of basic social network functionalities. This builds a foundation for the understanding of how clearly the implemented interface could communicate its functionalities and the affordance of its elements, in relation to each person's experience with similar software applications.

Each of the four components is composed of different feature-sets (e.g. Figure 39). For each component, we established a set of tasks for the user to carry out. Each task is in turn divided into subtasks.

For each view of the FriTab we developed a series of questions to discuss the user's opinion about the design aspects, covering every section presented on the screen. Since the number of questions was very high, because of the many interaction categories the system offers, it was decided to limit the initial interactions to the main ones, namely Activities and Groups. These two sections are probably the ones that will be used most frequently. To help with the analysis of the data, a checklist was prepared to take notes during the evaluation. While doing the evaluation, the researchers were instructed to complete the checklist to record which task was completed successfully, whether the user needed help, and any comments made while performing the tasks. Each session lasted for about 2 hours.

Results

The Activities view consists of 7 major tasks, and the Groups element contains 6, each of them divided into subtasks. Figure 41 and Figure 42 show the percentage of help needed for each task of Activities and Groups, respectively.

The percentage of help needed for a task was calculated by summing the number of people who needed help for every subtask, and dividing it by the number of subtasks for that task multiplied by the number of the participants. The result was then multiplied by 100 to obtain the percentage. Given T the set of tasks, $\tau \in T$ being a task, and S_τ the set of subtasks of T :

$$\text{Help needed with } \tau = 1/S_\tau \cdot \# \text{participants} \cdot (\sum \# \text{people needed help with } s) \cdot 100$$

The complete list of tasks and subtasks is present in Figure 41 and Figure 42. The most problematic interface from the two views was the ‘Activities Dashboard’ (Figure 40), where users were overwhelmed by the clustered elements.

The component that attracted the users the most was the photo album in the Activities, where they could upload and share photos and comments about the activity they participated in with their friends.

Positive comments about the photo album on Activities were: *“The photo part definitely is the most interesting thing, I would use it”*, and *“I find it a good way to keep in touch, it’s fun”*.

The main suggestion we received unanimously from the participants during the mockups evaluation was to write a legend explaining the meaning of the icons for the users to consult before or while using the system.

Examples of such comments were: *“I would put the written text, this icon doesn’t tell me anything”*, *“Less icons and more text is better in my opinion”*, and *“You need to have imagination for these icons”*.

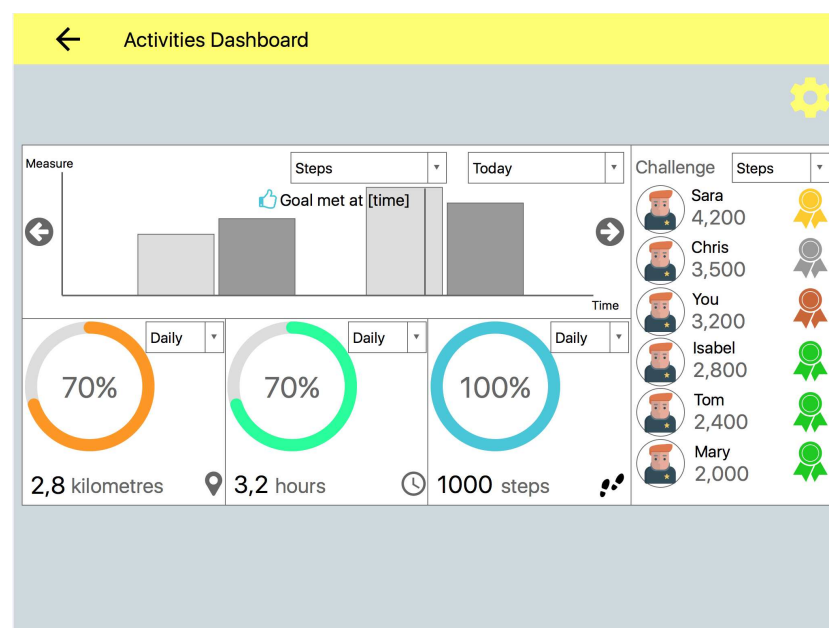


Figure 40. FriTab pilot study – Activities dashboard view.

Contrary to our intentions, not all the icons are as intuitive as hoped for a person that has been only recently introduced to technology, as opposed to someone that grew