AMBIENT ASSISTED LIVING, AAL

JOINT PROGRAMME

ICT-BASED SOLUTIONS FOR SUPPORTING OCCUPATION IN LIFE OF OLDER ADULTS

D2.3 User Evaluations Report

Final Version

Project acronym:	**ProMe**
Project full title:	**ProMe – Professional Intergenerational Cooperation and Mentoring**
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1. EXECUTIVE SUMMARY

In this final user evaluation report, we provide an overview on the activities that were part of the iterative evaluation process that aimed at supporting the development, following a user-centred design approach (see also D2.1 User Study Framework). Hence, potential end users and usability experts were continuously involved within the development process. This report provides results and implications from overall six (user) studies have been carried out by PLUS in cooperation with the end user organizations EURAG, NFE, and AGIR:

1.) **Design Workshops** that were carried out in February 2015, in the Netherlands, Romania, and Austria
2.) **The 1st Heuristic Evaluation** that was carried out in June 2015 at the Center for Human-Computer Interaction (CHCI) at the University of Salzburg
3.) **The User Evaluation** that was carried out in December 2015, in the Netherlands, Romania, and Austria
4.) **The 2nd Heuristic Evaluation** that was carried out in March 2016 at the CHCI in Austria
5.) **The User Studies in the Laboratory** in August/September 2016 at the CHCI in Austria, and
6.) **The 3rd Heuristic Evaluation** that was done in December 2016 at the CHCI in Austria.

1.1 Link with the objectives of the project

The iterative user evaluations aimed at keeping focused on the needs of potential end users throughout the whole development process. Users were asked to provide their feedback already in an early stage of the development process. As the project addresses two target groups, we included older and younger adults. Additionally, experts in the field of human-computer interaction were involved in the evaluation phase. Since there were huge delays in the development of the platform, the user studies in the laboratory took part later than originally planned and an additional heuristic evaluation was carried out in December 2016. Moreover, the end user organizations were involved in the 2nd and 3rd heuristic evaluation and tested the platform from an end user perspective, based on the tasks that were developed.

2. DESIGN WORKSHOPS

The design workshops were the first step within our evaluation process. On basis of the requirements analysis (see also D2.2) first mock-ups of the ProMe platform have been developed that were evaluated with end users in Austria (EURAG), the Netherlands (NFE), and Romania (AGIR).

2.1 Research goal & Research Questions

The goal of the design workshops was to evaluate the first mock-ups with regard to the overall navigation architecture, i.e., if users could successfully navigate on the platform and if designs were easy to understand. Three main areas of the platform were addressed: (1) Home Platform (i.e., public & personal home platform), (2) Log-in/Sign up, and (3) Profile (setting up a profile, matching process, public profile, personal profile).

2.2 Methodological Approach

In this early stage of the development process, only first sketches of the platform were available. We carried out workshops to discuss first ideas with potential end users and to reflect upon possible improvements. As Dickson et al. (2007) pointed out, when working with older participants it is a challenge to elicit high quality results. The study set-up highly influences, for example, participants' engagement. Discussing in a group of people can help to avoid feeling uncomfortable and reduce the fear of stating something "wrong" when being asked questions about an unfamiliar system. Within the workshops, we discussed the mock-ups and identified potentials for improvement. Mock-ups were presented by means of a slide show to the participants and we reflected about the navigation and the graphical illustration of information (e.g. icons). Thus, we did not focus on usability issues but rather aimed at supporting users to become active on the platform.

2.3 Results

In this section, we describe the central results of the design workshops. In the beginning, we will provide an overview on the workshop procedure and about the participants. Afterwards, we outline the findings according to the different areas of the platform. Altogether, three design workshops took place, one in Austria, one in the Netherlands, and one in Romania. Overall 20 participants, aged between 25 years and 76 years (Mean= 56.25 years/SD= 16.50 years), took part. Participants were recruited accordingly to the two target groups of the project, i.e., participants, who could imagine taking over the role of a Coach or Mentor and participants, who could imagine taking advantage from the service by acquiring support from an experienced professional[1].

[1] In Austria only "providers" of support took part in the workshops because it was not possible for the end user organization to recruit potential "receivers" for the workshops.

In Austria, four participants, three males and one female, joined the workshop. Their age ranged from 60 years to 71 years (Mean=65.5 years/SD=4.93 years). Three participants were married, one participant was living in a partnership. All participants were retired, however, one of them was still working besides retirement. In the Netherlands, eight participants, six males and two females, took part in the workshop. The participants were aged between 35 years and 75 years (Mean=58.38 years/SD=15.47 years). Six participants were married, one was living in a partnership, and one was single. Two participants were currently working, three participants were retired, two participants were unemployed, whereof one participant was mainly doing housework. Seven of the participants indicated that they were doing voluntary work. In Romania, eight participants, seven males and one female, attended the workshop, with an age ranging between 25 years and 76 years (Mean=49.5 years/SD=19.58 years). Seven participants were married, one participant was living in a partnership. Seven participants were currently working, two participants were already retired, whereof one participant was working anyway. Two participants specified doing voluntary work. In the following section the central results of the workshops will be presented accordingly to the different areas of the platform for which first mock-ups have been developed.

2.3.1 Homepage

Regarding the ProMe Homepage, we were interested (1) if the information given was sufficient, (2) if it was visually appealing, and (3) if they knew how to navigate on the homepage.

Figure 1: Sketch from the Homepage

Starting from the homepage participants were asked about their expectations, i.e. if the given information was sufficient. The discussion revealed that there was too much text on the platform and also that step-by-step information for the participants was lacking. Moreover, the provided was not clear, in particular, the success story, which is well illustrated with the following quote: *"Does this guy need a Mentor or something?"* Participants discussed that it was not possible to change the language and that the homepage lacks meaningful pictures that accompany important statements. Furthermore, information about the ProMe project itself was missing/not sufficient. This issue can be illustrated by the following quote: *"I´d like to know what ProMe is. I think that should be more prominent."* Finally, the log-in icon was hardly visible (blue background and blue-coloured button) and participants stated to prefer a more prominent solution (e.g., choosing a different colour for this button). The calendar was considered unnecessary on the homepage but useful on an inside level of the website for members on the condition that it contains the year date (missing in the first mock-ups).

2.3.1.1 Suggestions for improvement

A variety of suggestions for improvement were discussed, for example, to show areas of activities (e.g., technical sciences, medical sciences) in the task bar to ensure that users can easily find basic information. Moreover, the purpose of the section "Workshops" was not clear, and therefore it was suggested to remove it from the homepage to an area on the website that is only accessible by registered users. Moreover, it was suggested to provide success stories about users, who were already a Mentor or a Mentee on the platform instead of providing a success story of someone, who has nothing to do with mentoring. Another suggested idea was to provide a search function (e.g., search for providers of support according to, for example, skills).

2.3.1.2 Design issues

The design in terms of colours was considered as pleasant, however, some issues concerning the visual design were raised. For instance, participants pointed out that there was too much text and they recommended reducing the amount of text by using some sentences as a teaser, such as a "more" button allowing to retrieve additional information if required. The provided pictures were considered as too small and hardly visible.

2.3.2 Register to the platform

Regarding the register process, participants pointed out that (after indicating their name, etc.) they expect being forwarded to a page where they can register as a provider (e.g., Mentor) or a receiver of support (e.g., Mentee), and where one has to fill in personal data to generate an account. Moreover, they would have expected being asked to sign a "licensing agreement" before being forwarded to another page. In general, participants understood the registration process.

Figure 2: Sketch for the Registration/LogIn

2.3.3 Edit a profile

Participants' first impression towards the profile was mainly positive. One participant stated, for example, *"The first impression is good."* However, we could identify potential for improvement, for instance, providing more information about the ProMe project itself and the opportunities the platform offers to its members. Moreover, participants would have expected explanations for the privacy/cookie policy (*"What are cookies? I don´t want cookies.").* Finally, they had some

Figure 3: Sketch for Edit the Profile

remarks with regards to the design of buttons (e.g., participants were wondering why the "upload" button is red like the design of the "delete" buttons).

2.3.3.1 Suggestions for Improvement (add/remove information)

Participants pointed out that they would have liked to add more skills and interests. Moreover, concerns with respect to information on the platform were raised, i.e., that the link between time of employment in a certain job position and skills of a person should not be overrated as this might not always correlate. Accordingly, the declaration of the duration of employment was not considered necessary. It was suggested that the information regarding duration of employment in a certain position should be rather discussed in a personal conversation with a Mentee than being indicated in the profile. Another point of discussion was the personal and public profile. Participants did not understand why certain information should be visible only in the personal profile and not in the public profile (*"Why would you want information that is only visible to you? That makes no sense. I would remove that possibility."*).

2.3.3.2 Comprehensiveness of information

The discussion revealed that participants did not understand why it was required to add "skills" and "experiences", indicating that experiences in a certain field might not correlate with adequate skills. Moreover, participants were wondering about the purpose of the "role recommendation" service, and were asking on what kind of information the recommendation is based and if there were any obligations to take over the suggested role. In general, it was clear to all of the participants that the fields marked with a red star are mandatory fields, and that it is necessary to use the "save" button after editing the content on this page. However, participants raised concerns regarding the number of mandatory fields (e.g., name, language) and were wondering how the system could create a role recommendation based on that limited amount of information. Moreover, the terms "public", "network", and "private" in connection with the profile were confusing, and therefore, participants were not sure who could actually assess certain information (*"Who is in your network?").*

2.3.3.3 Privacy issues

Privacy issues were a prominent topic within the workshops. Participants indicated that they would like to reveal only basic information about skills (no details, which could be looked up in the CV) in the public profile and that they would prefer to talk about details in a private conversation with their Mentor/Mentee. Moreover, it was considered important to reveal more detailed information about oneself (e.g., name, language, country, area of expertise, experience, CV) in order to facilitate potential Mentees of support in their choice of a provider of support: *"You have to show all your information, especially as a Mentor, so Mentees have a wide range of Mentors to choose from."*. However, a personal photo, the personal address, and age were rather considered as "sensitive information", which should not be visible in the public profile.

2.3.4 Role recommendation

The idea of the role recommendation was not clear for the participants. They were wondering if the suggested role was mandatory or if it was possible to change the role over time. One participant asked for example: *"Is it possible to pick up more roles? To be a Mentor as well as a Coach?"* Moreover, participants were wondering how the recommendation was generated and some participants explicitly said that they refuse to receive role suggestions in any form. Further, participants did not understand what kind of expectations or obligations are bound to a certain role (e.g., *"The terms can all be used for the same thing.")* and pointed out that differences between the roles are not clear and that it might be difficult to select a certain role, because a role someone takes over on the platform is developing over time. If a role recommendation service was implemented, participants would prefer to receive the recommendation in form of, for example, instant messages.

2.3.5 Profile of a registered user

Regarding the profile of a registered user, participants were asked to indicate if they were able to extract information about personal skills and the groups in which a user is enrolled. All of the participants could extract the relevant information. Some services and functions on the platform caused confusion among the participants. This concerns the role recommendation, the necessity to indicate specific kinds of information in the profile (e.g., gender), and the design of the buttons (e.g., delete buttons are red but the upload button is also red).

Figure 4: Sketch of a profile from a registered user

2.3.5.1 Interest to get active

Besides participants' general impression and the comprehensiveness of the given information, we were interested if the profile was appealing and if it would encourage user to get active on the platform. Overall, participants were positive towards the profile, which is well illustrated by means of the following quotes: *"It´s visually strong, as there are a lot of boxes. The design is good.", "Yes, it encourages me."*. Moreover, they were positive because the profile seems to be similar to profiles they know from other social network sites. Participants were only wondering if it was necessary to indicate the number of people in one's own network, since they perceived this as very negative in terms of being stigmatized when having only a small amount of people in the network.

2.3.5.2 Navigation

Regarding the navigation, ways of getting in contact and sharing information with other users on the platform (e.g., via a blog) were discussed. In general, participants would prefer to get in contact via instant message services on the platform, via E-Mail and in face-to-face meetings. Within the network, they would have expected to have a list with members of the platform, who are/were working in the same field of expertise,

and to have the possibility to send another member of the platform an invitation to join one's own network. The service "Join one of my groups" caused confusion among participants. The workshops revealed an uncertainty when clicking on "Join one of my groups". As one of the participants stated: *"I don´t understand what these groups are."*. With regards to the messenger system, participants expected being forwarded either to an instant message service or to an email service on the platform when clicking on the button "send message". Participants understood how to navigate in order to get in contact with other users on the platform.

2.3.6 Log-in from existing profile

Participants who already had a LinkedIn or Xing account were positive towards the possibility to use an external profile to access the ProMe platform. Participants who did not have an account did not know what to expect when clicking on the symbols and stated that these additional buttons are not necessary.

Figure 5: Sketch from log in from a registered user

2.3.7 Personal Home Screen

With regards to the personal home screen, we discussed with participants how they would have expected to get in contact with other users (e.g., Mentors), and if the provided information was sufficient and comprehensive.

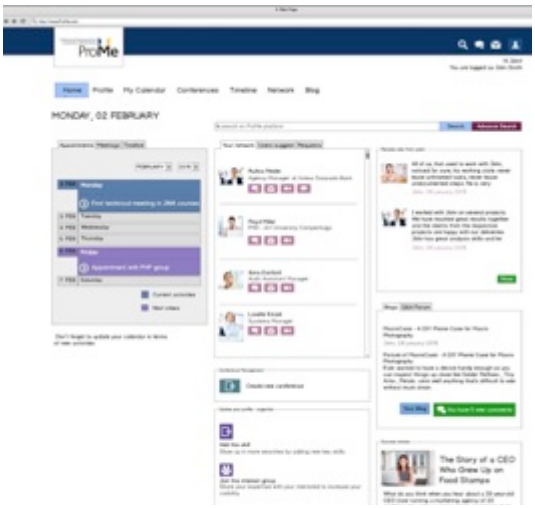


Figure 6: Sketch from the Personal Home Screen

2.3.7.1 Navigation on the Home Screen

How to get in contact with another Mentor, i.e., how to search for another Mentor, was not clear for most of the participants. Some participants could not anticipate what to do, suggested to try the "Search" function to retrieve a list of other Mentors, and to select "Join my network" or "Join my group" in order to find other Mentors. A few participants suggested a difficult workaround, i.e., logging in themselves as a Mentee and looking for other Mentors that way. Participants had also difficulties to understand why someone should set up a conference with a protégé because it was predicted as being a lot more complicated than just using Skype or E-Mail to get in contact with somebody else.

2.3.7.2 Comprehensiveness of information that is provided on the Home screen

The Home screen provides a variety of different information (e.g., reviews from other users, "my network"). Within the workshops, it was discussed that reviews would have to be controlled by a third, neutral party, to

avoid that fake reviews (either positive or negative) or even mean reviews are given. Moreover, they felt that reviews on such a platform would have to be reasonable, i.e., a guideline should be provided that describes how to properly write a review. The whole process of reviewing was mostly positively connoted because many participants have had positive experiences when relying on reviews of others regarding restaurants or hotels, however, participants were aware of the possibility that some people might want to write something mean on purpose. The service "your network" was not clear for the participants, and therefore it was discussed that it could either contain users who are interested in the same area of expertise or who are currently a provider for somebody else. A few participants pointed out that they would not need such a service, as they would prefer focusing solely on their current Mentee instead of keeping in touch with other Mentors.

2.3.7.3 Suggestions for improvement

Participants pointed out that they would have liked to see a list of all members of the platform as well as short summaries of members: *"I would like to see a short summary of every member. What their role is, what they are here for. What they specialize in. Just some sentences and a short résumé or something like that."* Moreover, they would have expected support/more information about how a Mentor can find other Mentors on the platform. Language and skills were considered as important information in order to get in contact with other providers of support (e.g., Mentors). Therefore, participants suggested adding this information. Overall, participants were satisfied with the way information was arranged: *"The information is well arranged and the graphic looks good."* Some participants felt that the search function should be more prominent as they considered it a very important feature of the page.

2.3.8 Public profile

Figure 7: Sketch from the public profile

With regards to the public profile, it was discussed that visitors of the platform, who are not members (i.e., people who do not have an account), should not be able to access the same information than members. We identified a discrepancy between information someone would like to reveal and information someone would like to retrieve from others. Most of the participants would have liked to retrieve more information than they would be willing to reveal. The following information was considered important for the public profile: name, language, and location (including time zones).

Due to the limited information provided in the public profile, it was discussed that the profile would need to be aesthetically more pleasant in order to encourage users to get in contact. In particular, information about the skills one has to offer should be more prominent, and a kind of classification for Mentors like recommendations from others would help when deciding to join a specific provider of information. As already mentioned above, participants considered some information with regards to the profile as sensitive and were not willing to reveal the following details in a public profile: age, marital status, information about personal health, salary, and

anything that can be considered frivolous. Most of the participants stated that they didn't have any concerns when uploading a profile picture, although it was mentioned that this possibility should be up to each member individually (e.g., it should not be mandatory). When talking about personalizing the public profile, participants stated that they would appreciate such an option, however, it should not be mandatory.

2.4 Implications

Based on these results, major implications for the platform development have been derived, which concern major topics, i.e., the homepage, setting up a profile, and the personal home screen (see Table 1).

Results	Implications
Homepage	
• Content on the home page is not clear (Workshops? Success stories?) • Insufficient information regarding the project (description is missing) • Log in is not prominent enough • Too much text and too little pictures	• Remove the section "workshops" on the homepage • Success Story – report about successful coaching relationships; work with quotes and big pictures • Provide information about the project • Provide a motto to support users to "grasp" the central idea of the platform (e.g., ProMe helps you to share your knowledge with others) • Provide a prominent log in/register area (see examples from LinkedIn or Facebook) • Provide a "see more" button instead of too much text at once, increase pictures
Set up profiles	
• Difference between skills and experiences? • Purpose of the role recommendation? • Why should information be only visible in the private profile? • The areas public, network, private are not clear • Similar buttons are differently designed (e.g., delete button in the CV area, general delete button)	• Instead of skills and experiences provide interests and expertise (provide a possibility to add more skills) • Remove the role recommendation – roles are developing within a relationship • Provide only one profile (no difference between personal and public profile) • Pay attention of consistent design • Provide information about roles – could be provided on the homepage • Allow role selection based on different criteria (e.g., amount of time one is willing to invest) • Make expectations and obligations visible (e.g., as Coach on this platform you agree to invest 1-2 hours a week, your Coachee expects…) • Encourage participants to provide a "full" profile • Work with "see more" button to avoid too much text at one spot
Personal Home Screen	
• How can users get in contact? • How to set up conferences? • Meaning of network/my network?	• Develop a clear structure that supports users getting in contact with other users • Develop a clear structure that allows users to understand how the process is managed – clear navigation – work with sub-menus • Provide a calendar and a news feed • Provide a task bar with the most important areas (home, profile, ProMe network) instead of too much content (home, profile, calendar, conferences, timeline, etc. …)

Table 1: Implications

2.5 Summary

The major goal of our workshops was to identify if the navigation (based on the mock-ups) on the platform is easy to understand. Based on our results, major issues were raised concerning the process to establish a first contact with a mentor or a mentee. In this context, it was not clear how to make first contacts (Mentor-Mentee) but also how to get in contact with other providers (e.g., other Mentors). Another point of discussion was the “role recommendation”. The issue was raised that it would be important to understand in which way recommendations are given, i.e., based on what kind of information, or if only little data entries (e.g., name, language) are mandatory. Additionally, to the navigation, we identified some suggestions for improvements concerning the design of the platform. Specifically, the small font size and too much text were considered as a problem with respect to the orientation on the platform. Instead, more pictures with less running text were suggested as one possibility for improvement.

3. 1ST HEURISTIC EVALUATION WITH EXPERTS

Based on our first evaluation, the mock-ups were further developed and evaluated within a heuristic evaluation. No functionalities had been implemented at this point, thus, for the tests mock-ups were used. In the following the tasks that were carried out by the experts are briefly described and the mock-ups are presented.

1. **Sign up/log in as a Mentor/Mentee**

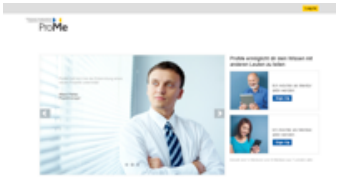


Figure 8: Mock-up for the sign-up area

2. Set up a profile

- Upload of profile picture and CV as Mentor/Mentee
- Set language as Mentor/Mentee
- Define interests and expertise as Mentor/Mentee

Figure 9: Mock up for the profile

3. Communication

- Search for Mentor/Mentee
- Add a new Mentor/Mentee to the network
- Communicate via chat, phone call, and video call with a Mentor/Mentee

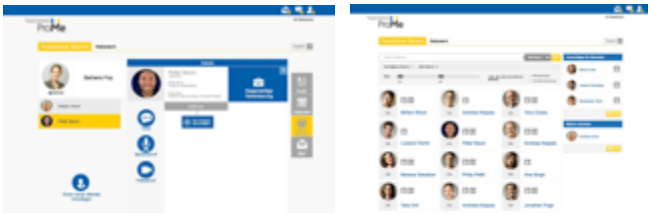


Figure 10: Mock-ups for the communication area

3.1 Research Goal & Research Questions

The main goal of the heuristic evaluation was to identify usability problems. Four usability experts with different scientific backgrounds (i.e., Computer Science, Psychology, Design, Human Computer Interaction (HCI)) were invited to carry out several predefined tasks. According to the central goal, the following research question was defined: ***Which problems regarding the usability emerge, while the experts accomplish the predefined tasks?***

3.2 Methodological Approach

A heuristic evaluation is a valuable method for evaluating an interface in an easy and cheap way (Nielsen 1994). This method involves usability experts inspecting an interface in order to find any violations of the usability. A set of heuristics is used, that guides the experts through the evaluation process (see Annex

Annex A). The experts rate the problems concerning their severity for the application (4=usability catastrophe, 3=major usability problem, 2=minor usability problem, 1=cosmetic problem, 0=no usability problem). The main advantage is that this method can be applied in an early phase of the development process in order to identify usability problems.

Overall, four experts took part in the evaluation (aged between 27 and 34 years) with at least 3 years of experience in user interface design, usability engineering, and/or HCI. They were introduced to different tasks by means of a short scenario. Two experts carried out the tasks from a Mentor's perspective and two from a Mentee's perspective[2]. Hence the perspectives of both target groups were considered (provider and receiver). In the run-up phase to the heuristic evaluation, experts were informed about the general idea of the project, received information about the personas that had been developed (see D2.2), i.e., Maria (Mentor) and Sarah (Mentee), and received the heuristics. During the actual evaluation, the experts carried out the tasks, noted the identified problems, and assigned them to the respective heuristics. Afterwards, the test leader summarized all identified problems and asked the experts again to rate the severity of the identified problems. Based on the list of usability problems, suggestions for improvements were developed by the experts.

3.3 Results

The following table (see Table 2) provides a list of identified usability problems and their severity. Additionally, expert´s suggestions for improvements are reported.

Usability catastrophe (4 – 3,5): imperative to fix this before product can be released		
Heuristic	**Problem Description**	**Suggestions for improvement**
4.1	There is no possibility for the user to log out	Place Log-out button next to the log-in button
Major usability problem (3,4– 2,5): important to fix, should be given high priority		
Heuristic	**Problem Description**	**Suggestions for improvement**
Log in /Register		
3.3	User can only select *one* role (Mentor or Mentee)	Allow users to select both roles (Mentor *and* Mentee)
4.1	Terms of use: there is no information given about purpose and consequences *(apparently, there was no information given so far)*	Provide adequate information about purpose and consequences

[2] For the Sign up/Log-in unfortunately no mock-up from the Mentee perspective was provided, thus, this task was only carried out from the Mentor perspective.

4.1, 5.2	The Pop-up window that appears when users do not fill out all fields (e.g., do not accept the terms of use) is problematic. Users need to switch between different windows, which makes the navigation complicated	Pop-up windows are not state of the art anymore. Use real time parameter validation, which is available through JavaScript/AJAX Provide feedback directly in the erroneous fields (background colour: red, textually describe what is wrong – in or next to the corresponding field)
Profile		
1.1	It is not clear *"which language"* is changed when pushing the language button on the right upper corner, i.e., the language on the platform or the language the Mentor or Mentee is speaking Why isn't the language a Mentor or Mentee is speaking already pre-selected?	Clearly differentiate between the interface language and the language a user on the platform speaks A drop-down menu should be placed next to the log in, in order to clearly separate it from the profile
2.2	The DE/EN button to select the language one is speaking is not self- explanatory	Use flags instead of codes (DE, EN)
3.3	It is not possible to select more than one language	It should be possible to select more than one language and possible to add additional information regarding the language skills (e.g., native, fluent)
4.1, 5.1	It is not possible to directly type into the expertise/interest field, additional pop-up windows make the navigation on the platform more difficult	Avoid additional pop-up windows and allow users to directly type information in the corresponding fields Keep all interaction inside the field and provide suggestions with autocomplete while typing. Each added interest/expertise should then appear in a box, with the possibility to delete it appearing on hover/click
4.2	There is no consistency regarding the provided "buttons" on the platform – uploading a CV and selecting a language is totally different to the interest and expertise area	Keep consistency with respect to the provided buttons on the platform
Communication – search for a Mentor/Mentee		
5	The overall navigation is not clear – there are different levels – personal space, network (navigation bar on the left upper corner), my Mentees, calendar, etc. (right hand side)	Think of an overall site structure and redesign the navigation accordingly and clearly visualize the different levels and keep the hierarchy as shallow as possible
4.1, 4.2, 5.2, 6.2	There is no "searching button" below the searching criteria How is the search according to the selected criteria "activated"?	Add either a search button below the selected criteria or an "ok" button Show and update results simultaneously (real time) and accordingly to the selected criteria
4.2	The profiles on the results page show a picture, below the language, and the name on the right-hand side – not consistent to the visualization of one's own profile	Strive for minimalistic and consistent design
4	The list of Mentees changes from the left-hand side (overview) to the right-hand side (searching for Mentees)	Strive for consistent design (either on the right or left hand side)
5.2	The buttons on the right-hand side (my Mentors/Mentees, calendar, etc.) disappear when	Keep the buttons visible

	searching for another Mentor/Mentee	
6	The “add Mentor/add Mentee” button does not trigger searching for a Mentor/Mentee	Distinguish between searching and adding
6.1	The grey font is hardly readable on yellow background (e.g., my Mentee button)	Adopt colours and allow more visibility
Mutual Agreement		
3.3, 5.2	It is not possible to directly type information into the mutual agreement field - users need to switch between different windows, which makes the navigation complicated	Avoid additional pop-up windows and allow users to directly type information in the corresponding fields Keep all interaction inside the field
Communication via Chat, Audio, Video, etc.		
1.1	No user feedback when calling somebody	Provide user feedback
3	It is not possible to directly work on the schedule	Allow users to easily work on the schedule
4.2	The chat button switches from the left to the right-hand side when starting the conversation	Strive for consistent design
4.1	Video call: the camera captures the picture in landscape format; the picture is displayed in portray format	Rework the illustration of the communication partner in the video call
2, 4.1, 6.1	Communication elements should be similar to what users already know (e.g., Skype) Design/labelling of calling button is confusing (yellow telephone receiver to hang up)	Reiterate the buttons considering consistency (e.g., use a green telephone receiver for starting a call and a red telephone receiver for hanging up)
4, 6	The button for the call (microphone) is confusing – the microphone symbol is normally used for “recording a voice message”	Better use the telephone icon
3.3	There is no possibility to switch between video call/audio call (two buttons)	Follow existing standards (e.g., Skype)
3.3	No possibility to delete entries from the timeline	Offer a delete/edit function
3.3, 4.1, 5.1	“active elements” should be more prominent (e.g., when being in a call, etc.)	The current function used should be made more prominent – maybe labels could help and think about a flexible grid that allows to adapt to the current situation
Minor usability problem (2,4– 1,5): should be fixed after the major usability problems have been solved		
Heuristic	**Problem Description**	**Suggestions for improvement**
Log in/Register		
1.1	There is only a message provided that a link has been sent to an email address but the information, *which* email address is missing	Provide information about the email address Add a simple textual feedback: "Congratulations! You're just one click from beginning with your Mentoring activities at ProMe. Please check your email inbox name@domain.com for the activation of your account.”
2.2	The “close button” is confusing in this context	See also comments regarding pop-up windows

4	The log in button could be more prominent	Log-in is one of the two central functions on the first page, it should be put center stage (similar to Facebook)
4.1	There is no information about the different roles, what Mentor and Mentee means, and if someone can take over more than one role	A “question mark” icon could offer tooltips with further explanations. Could be generally used to explain the meaning of terms and the purpose of functions
4.1, 5.2	There is no possibility to fill in user name and password directly on the homepage - the log in triggers another window - too many steps are required to log in	Place the input fields directly next to the log in button. Also an "I forgot my password/username" link should be placed on the right-hand side of the log in or beneath the inputs Avoid additional pop-up windows and allow users to fill in the required information directly on the homepage
4.1, 5.2	Pop-up window “sign up”: Information is not logically arranged (i.e., reading flow from left to right is not considered); the last name should be placed on the right-hand side of the name, etc. Too many steps are required to sign up	Group similar items together, add white space (or borders) between different groups Simplify the registration process
4.1, 5.2	After the log in it would be good to be forwarded to the personal space area	Allow users to be forwarded to the personal space area after they have confirmed their account
1.1, 5.2	After the sign up there is no welcome site	Provide user feedback
6.2, 6.3	Buttons are for older adults partly too small and font is hardly readably	Rework the size of the buttons and font
Profile		
1.1	The difference between CV and expertise is not clear	Offer tooltips to explain the meaning/difference of/between CV and expertise
5	The difference between interest and expertise is not clear	Offer tooltips (i.e., question mark icons with further information) Add a short description and a list of examples
1.1	Rather say "please select a picture/file" than "you haven't uploaded a picture/CV yet"	Change the text accordingly
3.3	It is not possible to crop a picture	Allow to crop the picture (see, for example, Facebook)
3.3, 4.1	There is no possibility for drag and drop when uploading documents or a picture	Allow drag and drop for the upload
4.1, 4.2	The CV can be uploaded but there is no possibility to directly provide the information on the homepage	Provide a template to type in the CV (optionally)
4.1, 5.1, 6.3	The “more button” is confusing	Remove the “more” button and display all information
4.2	The selected language is displayed with an abbreviation (e.g., DE), however, the selection of the language happens via flags	Drop the usage of country codes, use flags and the language name instead
6	The buttons on the right side (i.e., profile, calendar, etc.) are not in line with other elements on the platform (i.e., interests, expertise)	Develop a grid and stick with the mobile first approach!

6.3	The design of the buttons is varying - some are quite detailed and some not	Redesign clickable items to be more consistent and simplify the icons
Communication – Searching for a Mentor/Mentee		
1.1	There is no feedback when a Mentor or Mentee is added to the network	New entries could be highlighted as "new" or in a different colour after adding them New added contacts should appear at the bottom of the list (probably with a grey background until the other person accepts the connection)
6	The arrangement of photo, name, and labelling is not appealing	Create a more appealing business card Mentors and Mentees should be shown differently
2.2	The "friend request" when a Mentee sends a contact request appears unprofessional - it is not about a friendship but a professional collaboration	Change the text (e.g., xy asked for a first contact ….)
2.2, 5.1	The "add new Mentor/Mentee" button appears separated from the list	The "add new Mentor/Mentee" button should be placed directly below the list of Mentors/Mentees The list should have a maximum length before the user has to start scrolling; button should always be accessible
4.1, 5.1, 5.2	New users should be supported when navigating the first time on the platform (e.g., in order to get started with your Mentor/Mentee you need to work on the mutual agreement ...)	Use tooltips (i.e., question mark item) Provide a step-by-step tutorial for the first use (with the possibility to switch it back on anytime later and an automatic request for switching on in case the user is idle for more than 30-60sec) Overlay the rest of the interface with a semi-transparent darker plane to focus the currently important input; add a description overlay next to it
4.2	Some buttons are angular, some are circular	Reiterate the design of the buttons with a focus on affordances (“it looks clickable”)
5	There is no header "my Mentees" above the list of the Mentees	Clearly label lists. If a list is empty, how should a user know that there could be some content?
5.2	It is not clear how the suggestions for Mentors/Mentees are displayed	Display the suggestions for a Mentor/Mentee in a certain order (e.g., alphabetically, based on language, experience, etc.)
6.3	The button next to the “add Mentor/Mentee” button (i.e., suggestions for Mentors and Mentees) is not meaningful – What is it for?	Use icons that are easily recognizable by users
Mutual Agreement		
4.1, 5.1	When working on the mutual agreement avoid a new pop-up window and information that is not required can be minimalized	Avoid additional pop-up windows
6	The suitcase icon is confusing	Use a handshake icon for the mutual agreement
Communication via chat, video, etc.		
1.1	There is no feedback if a user is online or offline	Follow semi-standards (e.g., Skype) to indicate if a user is online or offline

4	The chat symbol implies live-communication	Also allow to send messages (similar to Facebook)
5.2, 6	The elements when calling somebody are placed on the right lower part and the rest of the page is quite empty	Integrate chat/audio/video into one single chat tool with different levels of communication
6	The colours in the chat are not good readably	Reiterate the colours
4, 6	The size of the fonts is not consistent	To avoid resizing, use semi-standards to load older messages
Cosmetic problem (1,4– 0,5): needs to be fixed when extra time is available		
Heuristic	**Problem Description**	**Suggestions for improvement**
Log in/Register		
6	The visual design of the button to accept the terms of use seems to be optionally	Make the button more prominent
Communication – Searching for a Mentor/Mentee		
3.3	There is no button to select “all days” when setting the filter criteria	Add an “all days” button
Communication – chat/audio/video		
6	The headline is confusing	Remove the headline

Table 2: Identified usability problems

3.4 Summary

Overall, the experts had a positive attitude towards the system. However, the heuristic evaluation revealed a variety of major and minor usability problems that need to be solved within the next iteration. Most of the problems concerned consistency standards, information architecture, and the visual design. From the experts’ point of view a lot of issues can be easily solved by using state of the art solutions (see for example Skype or Facebook). Moreover, the experts recommended avoiding additional pop-up windows to simplify the navigation on the platform, specifically considering that our target groups also include older adults. Finally, a variety of design issues were identified, which can be easily solved by following a consistent design and by considering older adults’ needs (e.g., readable fonts, large buttons, user feedback).

4. USER EVALUATION

The user evaluation studies are part of the iterative evaluation circle, and aim at supporting the development of the ProMe platform by gathering feedback from potential end users. Within these studies, first functionalities that have been already implemented on the platform, i.e., the ProMe homepage, the register/log in area, and the profile area, were tested. Additionally, the collaboration tools (i.e., calendar, mutual agreement, my progress) were illustrated to participants by means of mock-ups showing how the tools could support the collaboration process. User studies were carried out by the end user organizations EURAG, NFE, and AGIR in Austria, the Netherlands, and Romania.

4.1 Research Goals and Questions

Within the study, we address two major research goals. First and foremost, we aim at evaluating the ***usability*** of the system, i.e., how effective (accurate, complete) and efficient users can fulfil the defined tasks, and to what extent they are satisfied/unsatisfied when completing a certain task. Moreover, we aim at identifying suggestions for improvement. Second, we focused on ***exploring participants' overall impression regarding the platform,*** *i.e., with respect to the different tools that are provided.*

RQ1 What is the overall usability of the system?

RQ1.1 How do users rate the overall usability of the system?

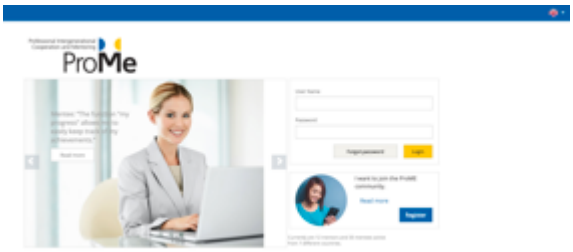
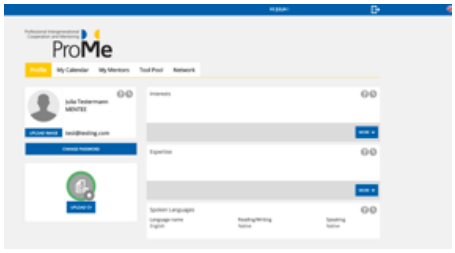
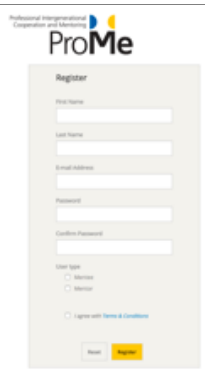
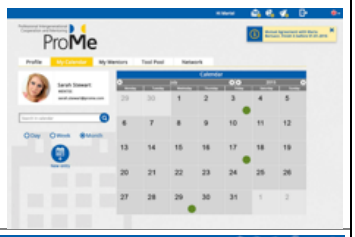
RQ1.2 What kind of usability problems can be identified?

RQ2 What is users' overall impression towards the idea of the platform and the tools that are provided (i.e., mutual agreement, calendar, and my progress).

4.2 Methodological Approach

The ProMe platform was evaluated by potential end users (Mentors and Mentees). Participants were invited in pairs, i.e., one potential Mentor and one potential Mentee took part per test round. After they had been introduced to the overall idea of the project, participants were interviewed about their pre-experiences with regard to mentoring and coaching, and were asked to indicate their expectations towards the platform. Afterwards, users completed several pre-defined tasks on a desktop PC (see Table 3), i.e., exploring the home page (gain basic information about the project, services that are provided, and the roles users can take over on the platform), to sign up, and to set up their personal profile. As not all functionalities have been implemented yet, participants were introduced to the collaboration tools by means of mock-ups, i.e., the Mutual Agreement, the Calendar, My Progress and the Tool Pool were illustrated to the participants. Small scenarios supported the participants imagining a certain "use case" considering the perspective of the Mentor or the Mentee. At the end of the evaluation, participants were asked to fill out the SUS questionnaire (system usability scale) and

were interviewed about their experiences when using the platform. In the following, we briefly describe the tasks that were carried out by the participants and provide some examples of the mock-ups that were used.

Tasks
Task 1: Homepage Participants were asked to have a look at the ProMe homepage, to explore, how they can get active, to find out what kind of different roles they can take over and, which services are provided on the platform. 
Task 2: Sign-up & Personal Profile Participants were asked to register on the platform, to sign in, and to set up their personal profile.    
Task 3: Calendar (mock-up) Participants were asked to look up pre-defined appointments and to add a new appointment with their Mentor/Mentee. 
Task 4: Mutual Agreement (mock-up) Participants were asked to look up the mutual agreement section, to explore the trigger questions, and how they can edit and save content. 
Task 5: My Progress (mock-up) Participants were asked to look up the “My Progress” tool, to explore the different topics that have already been defined, to create a new topic, and to create a comment (Mentor). 

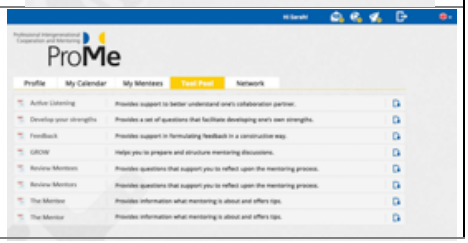
Task 6: My Meetings (mock-up) Participants were asked to look up defined appointments, to accept one appointment, and to deny one appointment.	
Task 7: Tool Pool (mock-up) Participants were asked to explore the tool pool and to look up the G.R.O.W. model.	

Table 3: Tasks and Mock-ups used for the user evaluation

4.3 Results

In this section, we describe the main results of the evaluation study. We will start with information about the participants, and will give an overview on the usability of the system pointing out the identified usability issues. Afterwards, we provide insights on participants' overall impression of the system, which are based on the interviews that were carried out at the end of the evaluation.

Overall, 22 participants took part in the study (54,55% female, 45,45% male), aged between 26 and 82 years (M=54,91, SD=16,84). They were recruited according to the profile of our personas Maria and Sarah. Twelve participants took part as potential Mentors, and ten as potential Mentees. Participants, who took part as Mentees were on average 42,40 years old (SD=15,42), participants, who took part as Mentors were on average 65,33 years old (SD=9,29). Almost one third (31,82%) has finished a Professional School, almost one third (31,82%) a qualification for University Entrance, and more than one third (36,36%) has finished University. More than half are still working (54,55%) and almost one fifth (18,18%) are unemployed, whereof 13,64% are doing voluntary work. Almost one third (27,27%) is already retired. A minority of 9,09% has already been active on a mentoring platform; the majority (90,91%) has not been active so far. All participants except one agree that coaching/mentoring is a mutual beneficial relationship, thus we can assume that our participants are rather positive that both parties can gain benefits out of a mentoring/coaching relationship. However, two thirds of our participants (86,18%) agree that being a Mentor or Coach for somebody else requires a lot of professional knowledge (see Table 4). Most of our participants indicate that they could imagine being active as a Mentor/Coach (40,91%). Almost one third (27,27%) would like to be active as a Mentee/Coachee, and also one third (27,27%) indicated that they could imagine taking over both roles, i.e., Coach/Coachee and Mentor/Mentee.

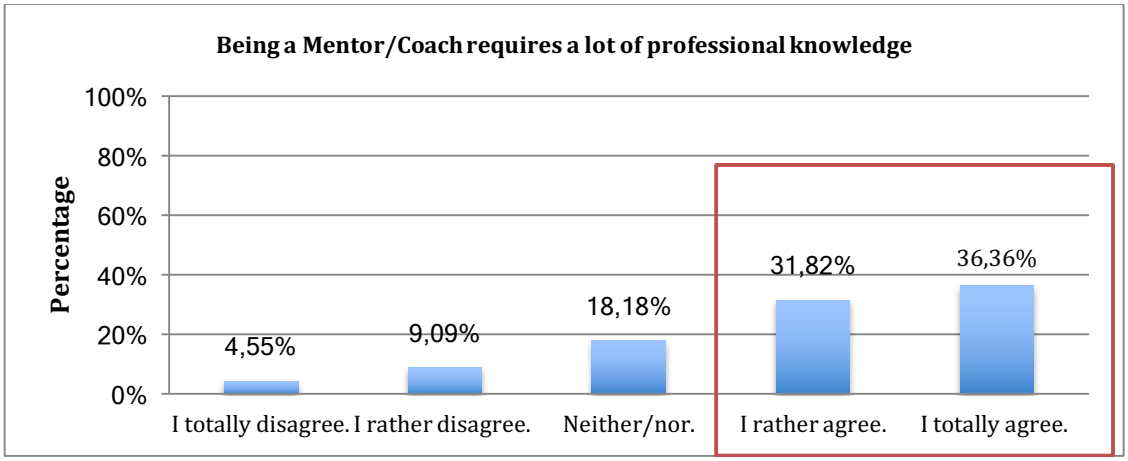


Table 4: Preconditions for being a Mentor/Coach

The majority of participants are technology affine. Also, 95,45% agree that technologies (e.g., mobile phone) enrich their everyday life, and the majority indicated having at least a smart phone and a laptop (see Table 5).

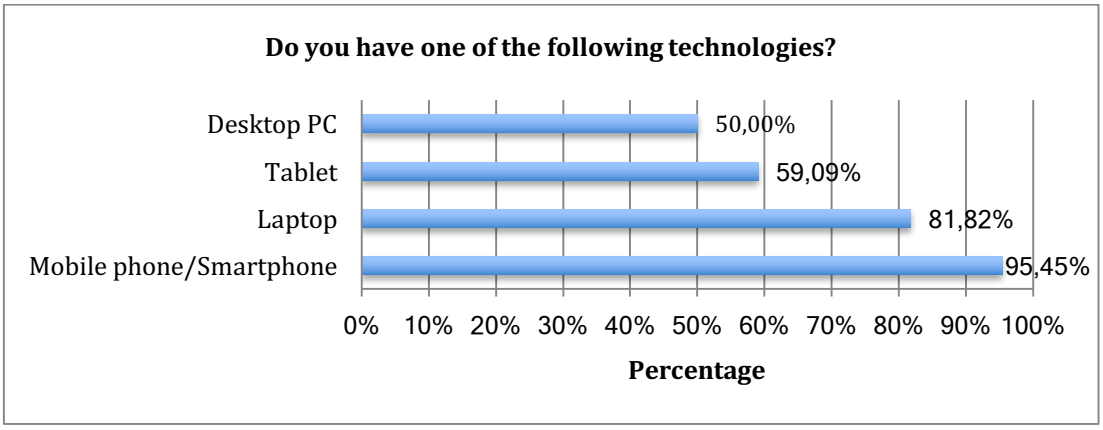


Table 5: Technologies participants own

4.3.1 Overall usability of the system (RQ1)

The usability of the system was assessed by means of interview questions during the evaluation and the SUS questionnaire (Brooke 1996). After each task, participants were asked to indicate how easily they could solve the task, if they experienced any problems, and if they had any suggestions for improvement. The SUS questionnaire was filled out after the participants had completed all seven tasks. Thereby, their subjective experience of the usability of the system was evaluated by means of ten items. Scoring the questionnaire yields a usability score in the range of 0–100, i.e., 80 to 100 users like the system, 60 to 79 users accept the system, and 0 to 59 users dislike the system.

The overall usability score with regards to the user evaluation revealed a score of 63, indicating that participants accepted the system. However, we identified a variety of usability issues that need to be addressed in the further development of the system.

In the following, the central results are presented, structured according to the seven tasks[3]. At the end of this section, we summarized the main usability issues that were identified and provide suggestions for improvement (see Table 6).

4.3.1.1 The Home Page

In general, the first impression participants had when exploring the ProMe Home page was good. Some participants explicitly said that it was clearly structured (N=6), that the layout looks professional (N=2), and visually appealing (N=1). A few participants indicated that they did not like that the pictures were moving (N=4), that the "read more" buttons did not provide the expected information (N=2), and one participant pointed out that the success stories were too long and that it would be good to provide quotes instead. The majority of participants indicated that the platform would encourage them to get active (N=12), however, one participant explicitly pointed out that the platform does not encourage him/her to get active.

Regarding the information content, the overall purpose of the platform seems to be clear (N=7), however, some participants missed information regarding the services (N=6) and the provided roles (N=3) (e.g., *"It was really hard to find more information" (P15)*). Observations from the test leader showed that some participants did not look up detailed information (e.g., success stories) and, thus, could not find any information about roles or services. The navigation on the platform was perceived as easy by most of the participants (N=14), however, it was also pointed out that there was not that much to navigate so far (N=2). One participant said that the font size had been too small, so that s/he could hardly read the content.

Participants provided the following suggestions for improvement: to Increase font size, to provide quotes instead of too much text, and to avoid "moving" images.

4.3.1.2 Sign up & Personal Profile

All participants could manage to sign up, however, they mentioned that the confirmation took some time. Half of the participants (N=9) indicated that it had been confusing that the email address was automatically used as "user name", and pointed out that they would have required more information. Some participants (N=3) tried to log in before having registered, and one subject failed to log in because s/he accidentally pushed the "reset" button, which was positioned just next to the register button. This participant explicitly stated that the buttons should not be placed next to each other.

With regards to setting up a profile, we could identify a variety of issues that made it difficult for the participants to complete the tasks. Half of them (N=9) indicated that the difference between the "save" and "add" button was not clear, and that they missed a "remove" button in the interest and expertise section (N=6). A few participants had difficulties editing content (N=3), i.e., it was not clear to them that they needed to push the "edit" button before they are adding content. Two participants experienced difficulties when editing the language section, as too many fields needed to be filled in, and two participants raised concerns

[3] The frequency of mentions by our participants is indicated in brackets. This does not say anything about the importance or severity of a certain usability issue, however, provides additional information how many participants were aware of a certain usability problem.

regarding “drag & drop”. It was not clear for them in which direction objects should be moved in order to be added. Moreover, some participants (N=7) raised concerns regarding the “question-mark-button”, indicating that the tool tip was provided at the wrong place (instead in connection with the edit button a separate question mark button was provided). Also, the meaning of the “refresh” button was not recognized.

Participants suggested the following improvements: to provide information that the email address is the user name, to provide only a save button, to add a remove button for the interest and expertise section, and to provide the tool tips at the right place.

4.3.1.3 Calendar

In general, participants could easily find the required information, i.e., an appointment in the calendar (N=20). Only two participants pointed out that *“everything looks disordered”*, and that they needed to search for a while until they could find the required information. Adding a new appointment caused difficulties for some participants, which is illustrated by the following quote of one participant: *“Normally, I can easily add new entries on my iPhone without any additional button” (P8).* The button at the left-hand side was not easily recognized (N=2), and some participants pointed out that it was not clear that they needed to select a Mentor when creating a new appointment (N=4). One participant suggested that it would be nice to have the possibility to search for certain entries (e.g., an appointment with a certain person).

Participants suggested the following improvements: to provide a possibility to search for entries in the calendar, and make it easier to add a new appointment - no extra button is required, however, allow to directly add a new appointment in the calendar field (similar to Google Calendar).

4.3.1.4 Mutual Agreement

With regards to the mutual agreement, half of the participants (N=10) reported about difficulties to find the required information (mutual agreement) because the symbol was not clear for them. Moreover, some there had difficulties to find the trigger questions (N=4). Some participants expected to find the mutual agreement (N=6) or the trigger questions (N=3) in the tool pool. One participant pointed out that the “disk symbol” seems *“odd”* to him/her as it is out-dated. Furthermore, one participant experienced the font as too small and hardly readable. However, participants generally appreciated the idea of the mutual agreement and considered the trigger questions very useful (14).

Participants suggested the following improvements: to provide tool tips to easily find the required information, and to increase the font size.

4.3.1.5 My Progress

Participants reported difficulties to find the required information because of the navigation being too difficult (N=2) and the structure not logical/unclear (N=4). In particular, the subtopics could hardly be found. When adding a comment, participants in the role of the Mentor expected to have some kind of save/add button to be

sure that the information was actually saved. Again, the issue was raised that the font size was too small and, thus, information was hardly readable.

Participants suggested the following improvements: That it would be good to show those columns with finished topics greyed out, that instead of the green point a "✓" icon could be used, to provide a possibility to add or save a comment, to provide a labelling for icons/buttons, and to make information all at once visible (do not only show main themes).

4.3.1.6 My Meetings

All participants said that it had been easy to complete the task. However, half of the participants pointed out to be confused and it *"does not make any sense"* providing the meetings in an extra section instead of the calendar part. A few participants (N=3) reported about difficulties to recognize the meaning of the "my meetings-icon", and one participant felt that the font size was too small, and, therefore, information was hardly readable.

Participants suggested the following improvements: To provide tool tips to find the required information, and that it would be good to have notifications in the calendar instead of an extra section with appointments.

4.3.1.7 Tool Pool

With regards to the tool pool, all participants pointed out that it was easy to find the required information. The descriptions were considered useful (N=3), however, one participant pointed out that s/he would prefer an *"article-format"*, and one participants had concerns using the G.R.O.W. model in the context of mentoring as it is a coaching model.

Participants suggested the following improvements: To add the following information: smart model, KPIs, that the back button should always be the same, and to avoid, mixing up the terms coaching and mentoring.

The following table (see Table 6) provides an overview on the usability issues.

Problem		**Suggestions for improvement**
Task 1: Home Page		
1.1	Font size is too small - difficult to read content	Increase the font size
1.2	Detailed information about roles and services are difficult to find	Make information about services and roles more visible (e.g., "read more about roles", "read more about services")
1.3	Success stories are too long	Shorten the success stories, highlight the most important information
1.4	"read more" buttons do not provide the expected information	Link the picture with one success story behind that fits the content in the foreground

Task 2: Register/log in & Set up the profile		
2.1	Email address is automatically used as user name	Provide information that the email address is the user name
2.2	Register was not prominent enough	If users try to sign before having registered, provide a question “Have you already registered?”
2.3	The reset button was too prominent next to the register button	Remove reset button in the register area
2.4	Some participants did not recognize the meaning of the button provided in the expertise and interest area – “refresh”?	To be discussed
2.5	No delete button in the expertise and interest section	Add remove/delete button
2.5	Difference between “add” and “save” button is not clear	Remove the add button
2.6	Difficulties to edit content	Provide tool tips at the right place – the tool tip is provided when moving the mouse over the question mark and remove the question mark as it is redundant when providing the tool tip for the edit button
2.7	Difficulties when editing the language section – too much content needs to be provided	To be discussed
Task 3: Calendar		
3.1	Adding a new appointment would be expected directly in the calendar (see Google calendar)	Provide the possibility to add a new appointment in the calendar without any extra button
3.2	Confusing that a Mentor/Mentee needs to be added when creating a new appointment	Support users in adding a Mentor/Mentee when creating a new appointment
3.3	Lack of clarity how to manage appointments with different people	Provide a search function for appointments
Task 4: Mutual Agreement		
4.1	Icon is not easily recognizable	Provide tool tips for the buttons, modify design
4.2	Trigger questions could not be easily found	Support users to find the trigger questions (e.g., by a notification)
4.3	Font size is too small	Increase font size
Task 5: My progress		
5.1	Structure is not logical, navigation is not easy	Simplify navigation (e.g., show the overall structure of the progress not only the main themes)
5.2	Font size is too small	Increase font size

5.3	Difficulties to recognize, which topics are already finished and which are still open issues	Work with colours – topics that are already finished could be in shown greyed out; Instead of the green dot an "✓ icon could be used
5.4	There is no save or add button when adding a comment – not sure if information is actually saved	Provide feedback/information for the user by providing, for example, a save or add button
5.5	It is difficult to find the progress	Provide tool tips to support users to find the required tool/information
Task 6: My meetings		
6.1	Icon was not clear/easily recognizable	Provide tool tips to support users to find the "My Meetings"
6.2	Unclear, why "My Meetings" are not included in the calendar	Include the "My Meetings" in the calendar section
Task 7: Tool Pool		
	No usability problems were identified	

Table 6: Usability Problems

4.3.2 Users' overall impression towards the platform (RQ2)

Information regarding participants' overall impression of the platform mainly stems from the interviews at the end of the studies. Thereby, participants were asked if they could imagine getting active on the platform, what they consider important for the success of the platform, and what are likes/dislikes with regards to the platform idea. The interviews show that the willingness to get and stay active as well as the success of the platform is related to user's experience with regards to the usability of the system. As we did want to investigate the overall impression, the EUOs made notes on the interviews.

4.3.2.1 Getting active on the platform

In general, participants were positive towards the idea, they could imagine it to be useful for older as well as younger adults, and they could imagine using the platform themselves. Participants overall impression of the platform was highly influenced by their subjective experience of the usability of the system. With regards to some services on the platform (e.g., my progress, mutual agreement), participants could not recognize the meaning of icons, thus, had the impression that they needed to search a lot before finding the required information, and this can have a great impact on the willingness to stay active. Another issue concerns the lack of *"common used practices"*, which is illustrated by a quote of one participant: *"In general, I like the idea of the platform, however, I think a lot things could be simplified by implementing common used practices, for example, how to add a new appointment in the calendar." (P2)*. Finally, an issue that was raised several times during the evaluation and also at the end of the interviews - the font size. Some participants had difficulties to

find, read, and recognize information, because the font size was too small. *"It is exhausting to use the platform as the font size is too small and the contrast is bad" (P5).*

4.3.2.2 How to ensure the success of the platform

In order to ensure the success of the platform, one issue concerned doubts and fears with regards to data abuse. One participant, for example, pointed out that it was important to allay older adults' doubts and fears towards the internet. S/he would prefer if everything rather stays *"anonymously"*. Moreover, the importance of some kind of help area was raised explaining all functionalities of the platform. Supporting the user to navigate on the platform and in using the different services was considered as a major issue for the platform´s success. One participant suggested a kind of administrator that could support users in terms of any problems that might occur. Finally, focusing on specific areas instead of being *"too broad"* and promoting the platform through various channels (e.g., Social Media) was also considered important for the success of the platform.

4.4 Summary

Overall, participants were positive towards the platform, however, a variety of usability issues were identified, which might not only influence participants' willingness to get and stay active but were considered as having an impact on the success of the platform. Most of the issues concerned the design, in particular, the design of icons, which sometimes caused difficulties for the users when trying to find the required information. Moreover, the lack of common used navigation practices (e.g., how to add a new appointment in the calendar) caused problems for the participants during the evaluation. A lot of participants raised concerns were in field of overall navigation, for example, being not logical, clear, and consistent. Thus, one important issue that needs to be addressed is to simplify the navigation and to stick to common used navigation practices. Finally, in particular for the older adults in our evaluation study, the font size was actually too small and impeded the navigation on the platform.

5. 2ND HEURISTIC EVALUATION WITH EXPERTS

5.1 Introduction

The second heuristic evaluation was carried out from the 29th until the 30th of March 2016 and aimed at supporting the development of the ProMe platform by gathering feedback from usability experts. The basic ProMe platform containing the three main collaboration tools (calendar, my progress, mutual agreement) was evaluated. Additionally, the three end user organizations EURAG, NFE, and AGIR in Austria, the Netherlands and Romania evaluated the system in order to bring in the end user perspective. In the following report, we describe the main results and provide suggestions for improvement.

5.1.1 Research Goals and Questions

The major goal of the study was to identify usability as well as accessibility problems, while accomplishing some predefined tasks. Based on this, we aim at developing suggestions for improvement, which we considered crucial with regards to the preparation of the user studies in the lab and the field. Additionally, we aimed at gathering feedback from the end user perspective in order to keep focused on our target groups.

5.2 Methodological Approach

The platform was evaluated by means of a heuristic evaluation (see Nielsen 1994). Six usability experts inspected the interface in order to identify violations of usability. Thereby, they used a set of heuristics to assign the identified problems (for a detailed description of the methodological approach see also the concept). The system was evaluated from the mentors' as well as the mentees' perspective, i.e., three experts evaluated the system from the perspective of the mentor and three experts evaluated the system from the perspective of a mentee (see Table 7).

Tasks for the Mentee		Tasks for the Mentor	
Task 1	Create a personal profile for the mentee	**Task 1**	Create a personal profile for the mentor
	1. Upload a profile picture 2. Set that you're available each day in the week 3. Upload your CV 4. Set the languages you speak 5. Fill in further interests 6. Fill in your expertise		1. Upload a profile picture 2. Set that you're available each day in the week 3. Upload your CV 4. Set the languages you speak 5. Fill in further interests 6. Fill in your expertise
Task 2	Search for a mentor	**Task 2**	Create an appointment for a video conference
	1. Search for registered mentors who are between 25 and 49 years old, available every working day		***1.*** Open your calendar Add an appointment with Sarah for 2016-06-01 in the afternoon

	2. Add Maria to your network		
Task 3	Update your temporal availability	**Task 3**	Make arrangements with the mentee
	1. Limit your temporal availability to the weekends		1. Fill in the Mutual Agreement: • Relevant Context Information (sharing & mutually challenging) • Expected Outcomes & Professional Impact (sharing & mutually challenging) • Needs & Expectations for the Collaboration (sharing & mutually challenging)
Task 4	Make arrangements with the mentor	**Task 4**	What's new in your network?
	1. Fill in the Mutual Agreement: • Relevant Context Information (sharing & mutually challenging) • Expected Outcomes & Professional Impact (sharing & mutually challenging) • Needs & Expectations for the Collaboration (sharing & mutually challenging)		1. Look around the website. Are there any news in your network? Are there any other notifications? 2. React to the notifications
Task 5	Send the mentor a mail/message	**Task 5**	Make a comment on the progress of a mentee
	1. Write a mail to Maria • Enter a subject "Mutual Agreement" • Enter a short text		1. Please add a comment to a topic that the Mentee has created
Task 6	Getting familiar with the Tool Pool	**Task 6**	End the mentor-mentee-relationship
	1. Look close at the website and search for an area where you can find documents or help for the general running of a mentor-mentee-relationship. • Dig into it. Could your questions be answered?		1. Remove Sarah from your network
Task 7	Document your progress		
	1. Add a new topic and give it any title 2. Enter a short text 3. Close the topic 4. Open the topic again		

Table 7: Tasks for the experts

5.2.1 Participants

Overall, six usability experts took part in the heuristic evaluation, who had at least three years of experience in user interface design, usability engineering, and/or HCI. Experts were aged between 28 and 35 years (mean= 31,3). Four experts indicated that they are experienced in mentoring. Two experts indicated that they do not have any pre-experiences. Four experts were male and two were female. As mentioned before, the system was evaluated from two perspectives, i.e., three experts evaluated the system from a mentors' perspective, three from a mentees' perspective.

5.2.2 Overall Procedure

All experts received in advance the respective Personas (either the persona of Maria or Sarah). Additionally, the heuristics were sent out in advance, so that the experts could make themselves familiar with the specific perspective we aimed to apply (see Annex). During the evaluation, participants were asked to solve the given tasks (see Table 7). In advance, the test leader read out a short scenario in order to support the experts to imagine a certain situation. The experts noted all usability violations during the evaluations, assigned the identified problems to the specific heuristic, and finally made suggestions for improvement. The test leader summarized all identified problems and finally all experts rated the problems/violations with regards to the severity.

5.3 Results

In the following section, we describe the main results of the evaluation study. We will first provide an overview of the results from the system usability scale (SUS) and will afterwards point out the different usability issues that were identified with regards to different tasks and will provide suggestions for improvements (see Table 8 and Table 9). Finally, the outcome from the user evaluation will be presented.

5.3.1 Overall Usability of the System

The usability of the system was assessed by means of the SUS questionnaire (Brooke 1996). The SUS questionnaire was filled out after the participants had completed all tasks. Thereby, their subjective experience of the usability of the system was evaluated by means of ten items. Scoring of the questionnaire yields a usability score in the range of 0–100, i.e., from 80 to 100 users like the system, from 60 to 79 users accept the system, and from 0 to 59 users dislike the system. The overall usability score with regards to the user evaluation revealed a sore of 63. This indicates that participants accept the system, however, it also shows that there is still a need for improvements.

5.3.2 Heuristic Violations – Mentor's Perspective

Major usability problem (3,4– 2,5): important to fix, should be given high priority		
Heuristic	**Problem Description**	**Suggestions for improvement**
Create a personal profile for the mentor		
1	In "Edit Profile" and "Availability" the save button is always active and clickable so one cannot recognize if information was saved successfully.	Should be uniformly to other solutions on the platform. The provided solution in the personal profile and the Mutual Agreement is different.
1.1	Interests: if a user does not save the entries dragged from the tag cloud the entries get lost when entries	Adding own tags should not undo drag & drop, saving should be required only at the end of a task.

	are added through the text field	
3.3	Availability - intervals during days cannot be indicated	Make daytimes specifiable or provide division morning/afternoon/evening
1.1, 1.2	When a user indicates his/her availability in text-form (four hours) only after the second try an error message occurs that says that only natural numbers are allowed (first, the field is only highlighted in red)	Error message should appear already the first time
1.1	After deletion of an entry in interests or expertise, no feedback is provided	Provide feedback. Needs to be discussed further.
4.1	"Interessen hinzufügen" (add interest) doesn't work? Tried to add a "csv file". It was not recognized as form field	Add default text in input
4.1, 5.2	Interests – JavaScript alert after each deletion	Remove (inconsistent with deletion of mentor-mentee relationship)
4.1, 6.1	Edit interests - help text is hardly readable (light grey and font too little)	Bigger font, better colouring
1.1, 4.2	Information about supported image formats is missing	Show supported image formats (similar to cv upload)
Create an appointment for a video conference		
3.3, 4.2, 5.2	When switching the calendar view (e.g., from month to week) there is a jump back to the current date instead of displaying the previously chosen	Keep date previously chosen by the user
4.1	It is not clear why a four-minute interval is chosen	Choose a proper time picker
2.1, 4.1	Time has to be set using AM and PM even in German	Adapt the time picker to country-specific standards
4.1	End point of the appointment is always the current date	End point is date and time of start plus standard interval (e.g., 1 hour)
3.3, 4.1	No year view	Add year view
Make arrangements with the mentee		
4.2	Shared form field "mutual commitment" unclear	A solution needs to be found. Provide tool tips or similar. Needs to be discussed
5.2	The mutual agreement is hard to find	Make it easier to find the mutual agreement
5.1	Mentees - A click on the left (mentee's toolbar) opens the list with the collaboration tools. A click on the right opens the personal profile of a mentee. The navigation is not clear.	Must be predictable where a user will be redirected
What's new in your network?		
4	Notifications – buttons (to mark as (un)read and delete) on the bottom	Newest message on top therefore buttons should also be there (mail standard)

4.1	Chat title bar (collapsed) shows number of (online) contacts	The chat title bar in a collapsed state should show the number of new incoming messages (chat standard)
4.1	Two clicks necessary to see chat window	Chat window should appear after click
6.1	The white number on yellow background (next to the bell and the globe) is hardly readable	Change colour for more contrast
1.1, 4.1	Notifications and network – messages do not contain any time stamps	Add time stamps
End the mentor-mentee-relationship		
1.1	After deletion of mentee no feedback	Provide feedback (e.g., you have removed xy from …)
4.1, 5.1	If a user is not yet connected to a certain mentor or mentee one can send him multiple requests from which only one can be accepted	Accept multiple requests but after acceptance/declining delete all requests out of queue
3.2, 3.3, 4.1	After removing a relationship/connection all information that has been shared within the relationship (posts, progress, etc.) is also deleted	Allow users to choose if they would like to store information or if contents should be deleted
4.2	Remove mentee – no hint after mouse-over (inconsistent with colour coding in calendar)	Rethink whether we have mouse-overs or not and if so keep it consistent throughout the whole platform
6.2	Remove mentee	Icon too small
Minor usability problem (2,4– 1,5): should be fixed after the major usability problems have been solved		
Heuristic	**Problem Description**	**Suggestions for improvement**
Create a personal profile for the mentor		
2.1	Upload a profile picture – Warning: Are you sure? You will delete photo (Actually there is no photo for the first time)	Context sensitive tool tip
1.1, 4.2	Supported resolution unknown	Show supported image resolution (see cv upload)
6.1	Edit expertise – help text light grey and too little font	Bigger font, better colouring
4.2	It is not possible to delete all languages	Delete button for all or mark one as main language
2.1	Tooltip just says remove old image and add another one. When a user edits the profile area it should be “upload a profile picture”	Context sensitive tooltip
4.1, 6.1, 6.2	Upload cv - icon before and after upload too similar	Add green outline only after successful upload
4.2	Upload cv – nice to know which file formats are accepted but inconsistent with profile picture upload	Adapt image upload interface accordingly
2.1	Wording “Suchen” to select a picture is uncommon	Change into “auswählen”
4.1, 6.1	Edit interests – drag & drop with given elements is	Possibility to expand the tag cloud should be provided

	too tiny	
3.4, 5.1	No requirements for cv specified (e.g., sections in the cv, structure and so forth)	Perhaps provide a help page or pop-up
4.1	Interests – delete button very central and present	Make it smaller and place it in the upper right corner – interface standard
1.1	Image outline circular - not visible before upload	Show outline greyed out
Create an appointment for a video conference		
1.1, 5.1	Colour coding of an appointment only explained after mouse-over	Maybe provide a legend which is always visible
4.1, 4.2, 6.2	Calendar days – clickable area of button is smaller than icon (only the upper half is active)	Enlarge active part to the whole element
1.1	Calendar – Not clear at first sight that mentor-mentee relationship is a 1:1 relationship	
Cosmetic problem (1,4– 0,5): need to be fixed when extra time is available		
Heuristic	**Problem Description**	**Suggestions for improvement**
Create a personal profile for the mentor		
6.1	Languages – visual difference between heading and languages too small	Highlight headings better

Table 8: Identified usability problems from the mentor's perspective

5.3.3 Heuristic Violations - Mentee's Perspective

Major usability problem (3,4– 2,5): important to fix, should be given high priority		
Heuristic	**Problem Description**	**Suggestions for improvement**
Create a personal profile for the mentee		
4.2		Language change not working constantly
4.2	Different behaviour for interests and expertise section: interest closes after save, expertise stays opened.	Implement consistently
4, 5	Add interests – add and save redundant	Enable both ways or auto-save
4.1, 6.2	Upload cv – icon is not clickable (only the button below)	Provide a clickable icon
1.1, 5.1	Wrong format when entering time to be invested	Provide information on how to specify correctly

2.1	What does “time to be invested” mean?	Provide information: per day? Per week? …?
4.1	No HTTPS	HTTPS required
1.1	Inconsistent feedback	Show green bar for confirmation
1.1	Green bar “time to be invested“ shown after setting the temporal availability. Does not help the user.	Provide correct feedback, e.g.: “Your temporal availability has been updated!”
Search for a mentor		
1.1, 4.1, 5.1	After search request: No difference visible. Was search successful? What happens when you undo?	Show search results or ranking
4.2	Availability – only weekday and weekend available	Provide the same selection options as in the profile settings (daily)
2.1	Mixed language in “Network“ and “My Mentees“ section	Translate more carefully
Minor usability problem (2,4– 1,5): should be fixed after the major usability problems have been solved		
Heuristic	**Problem Description**	**Suggestions for improvement**
Create a personal profile for the mentee		
4.2	Uploaded image is displayed deformed	Show requested image format for profile picture; or provide image crop options
	No feedback when successfully uploading a cv (or not recognizable?)	Implement feedback or be consistent
4.2	Inconsistent design (choosing of availability)	Eliminate the save button or create own popup menu like e.g., CV, Profile, Edit Profile)
4.1	No drag & drop to upload a profile image or cv	Implement possibility to use drag & drop
6.1	Small area in "interests" and "expertise" section of edit profile; it is not directly visible that these areas are scrollable	Options fields of interests and expertise: better visibility that these fields are scrollable
4.2	Interests are displayed in inverted order of initial drag inputs – the order of the content is not clear	Provide, for example, an alphabetic order
Search for a mentor		
4.1, 5.1	No option to add a mentee when you open its profile – this is only possible on the search page	Provide an option to add a contact also when the profile has been opened
2.1	Difference between “My Mentees” and “Network” is not clear	Perhaps rename “network”
5.1, 5.2	Not found search at first	Search should be more prominent, maybe add a magnifying glass
5.1	What’s the difference between “interests” and “expertise”? Not quite selective	Maybe add some explanation
6.2	Suggested Mentor "Add“ button: Not sure what that button is for.	Add mouse over information

6	Inputs vertically shifted, because “Fachwissen und Erfahrungen“ does not fit into one row	Align the inputs
5.1	No preview option for found mentor	Add a tool tip with a short summary of the person when hovering over his/her name
Update your temporal availability		
4.2	Inconsistent design (choosing of availability)	Eliminate the save button or create own popup menu like e.g., CV, Profile, Edit Profile)
Make arrangements with the mentor		
6.1	Visual design mutual agreement (no save buttons)	Change colour of active small save button / or add big save button
1.1	“Information updated successfully“ after saving text in the Mutual Agreement – not clear what kind of information	Information type or whatever updated successfully, e.g., “The Mutual Agreement has been updated successfully!”
6.2	No mouse over effect on save button	Add save button mouse-over in mutual agreement
1.1	Why is Maria’s input grey and inactive?	Provide information that Maria has not entered anything yet. Shape more interactive in general to make agreements.
Getting familiar with the Tool Pool		
5.1	Display information more easily	Provide, for example, video tutorials
Document your progress		
5.2	Did not understand how to add a new topic	The topic option is hard to find; maybe a more direct approach is needed to create an easier accessibility
5.2	Navigation structure unclear (especially the Breadcrumb navigation)	Better visualization and a clearer structure is desirable
5.2	Progress/Topic vs. Text	Topic/subtopic/colours: closed = green? No option to save
2, 5.1	It is not clear how to save a comment in a topic	Turn out clearer
2.2, 5.1	Lock icon unclear	Provide an explanation
Cosmetic problem (1,4– 0,5): need to be fixed when extra time is available		
Heuristic	**Problem Description**	**Suggestions for improvement**
Create a personal profile for the mentor		
6	Is it necessary to have such a huge profile picture?	Perhaps use a shared profile picture symbolizing the relationship

Table 9: Identified usability problems from the mentee’s perspective

5.3.4 Other Problems

5.3.4.1 Bugs

- When logged in as a mentor, the “My Mentees“-section is translated into “Mein Mentoren“, so the English version is correct, the German is not. When logged in as a mentee, the proper “My Mentors“-section is translated into “Mein Mentoren” (where only an “e“ is missing, see 3.4 Translation issues) but the English version displays it as “My Mentees“, therefore the German version is correct, the English not. However, this might only be a matter of translation and cannot be investigated.
- After uploading a CV (when clicking the save button) the icon “upload CV” is shown double for a short time
- After clicking on “Send“ when trying to send a “quick e-mail“ the browser freezes/doesn’t respond
- When clicking on “Main“ in the “My Mentees“ section under “Progress“ one gets redirected to an error page “The requested page "/my_mentees" could not be found“.
- Sometimes the language settings reset back to English, e.g., after a click on a name in the toolbar in the “My Mentees/My Mentors” section

5.3.4.2 Typos

Section	Current	Translation
Profile	Update Image	Profilbild hochladen
My Mentors	Mein Mentoren	Meine Mentoren
My Calendar	Week	Woche
All Meetings – Status	Pendding	Ausstehend
Profile – Edit interests/expertise	Save	Speichern
My Calendar – New entry	The meeting has been saved and it is awaiting approval!	Das Meeting wurde hinzugefügt. Warte auf Bestätigung.
My Calendar – New entry	Video Conference	Videokonferenz
My Calendar – New entry	Audio Conference	Telefonkonferenz
My Calendar – New entry	Other	Sonstige
My Mentors/Mentees	Pending Connections	Warte auf Bestätigung
Network – Search	Age (from)	Alter (von)
Network – Search	to	bis
Network – Search	Interest	Interesse
Network – Search	Weekdays	Wochentag

Network – Search	Weekends	Wochenende
Network – Search	All users	Alle Benutzer
Network – Search	Pending	Ausstehend
Network – Search	Accepted	Verbunden
My mentors/my mentees Mutual Agreement	Translated	

5.3.5 Summary Heuristic Violations

Summing up, the major usability problems that have been identified by the experts concern the violation of consistency and standards. For example, when setting up the profile (e.g., indicating expertise and interests) the procedure for saving information is not consistent. Furthermore, information gets lost, when a user enters something in the text field without pushing the add button and afterwards use the drag & drop feature. Hence experts recommended an overall and consistent structure for saving information. Moreover, the overall navigation structure, e.g., when editing availability or new languages was confusing. Based on this also new sketches (suggestions for improvement) were provided (see Figure 11 and 12)

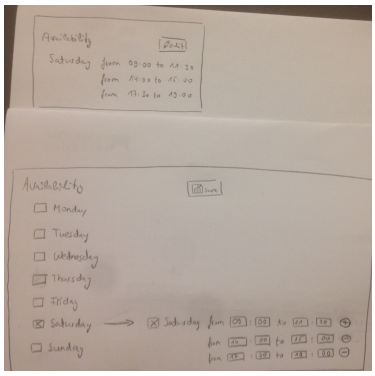


Figure 11: Indicate availability

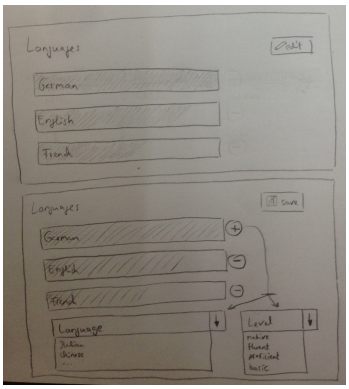


Figure 12: Indicate languages

Moreover, they suggested sticking to existing standards (e.g., when setting up an appointment to allow directly typing into the calendar field, instead of using the “add new” button). The experts also missed adequate user feedback and error messages (system status). Although, user feedback is provided, experts pointed out that the messages do not always support the users sufficiently. In particular, with regards to the network section (search for a mentor/mentee) and the “my progress” tool, the overall information architecture of the platform was considered difficult. It was, therefore, recommended by the experts to simplify the overall information architecture to allow an easy navigation that minimizes users’ memory load.

5.3.6 Results from the End User Perspective

Besides the variety of insights, we could gain from the expert, we got valuable feedback from the end user organizations, which evaluated the system from the user perspective. In the following, identified problems and suggestions for improvement with respect to the different tasks are provided. Table 10 provides insights from the mentee perspective, Table 11 from the mentor perspective.

Summing up, the results confirm the issues that have been identified within the expert evaluation. The end user organization in the project had in particular difficulties with regards to the overall navigation, e.g., in the tool pool, and when trying to get in contact with another mentor/mentee. It becomes clear that the overall navigation structure needs to be simplified. The end users also recommended sticking to existing standards (e.g., when adding an appointment in the calendar) in order to support users to easily use the system.

5.3.6.1 Tasks from the Mentor's Perspective

Tasks	Identified problems/suggestions for improvement
Task 1: Create an appointment for a video conference	
1. Open your calendar 2. Add an appointment with your mentee for 2016-06-01 in the afternoon	• It is not very intuitive that a user can start a meeting or a conference only from a mail. It should be possible to give a video call whenever a user wants to, also when s/he does not have a meeting scheduled. Additionally it should be possible to add a meeting directly from the meeting menu and not only from the mail. • The chat seems to work, but the menu that pops up should probably be bigger. • It is not possible to make an entry directly into the calendar (similar to Google – would make it easier to create a new appointment)
Task 2: Comment on the progress	
1. Please add a comment to a topic that the mentee has created	• Also for a mentor the progress part is not so clear. • Additionally, I am thinking now that even the section of My Mentees should change or even called differently: My Ongoing Mentor Activities or something. It is not clear that there are so many options below this menu when you only see two names on the side menu.
Task 3: End the mentor-mentee relationship	
1. Remove your mentee from your network	• OK, is easy. Maybe the icon could be bigger

Table 10: Identified usability problems from the mentor's perspective by EUO

5.3.6.2 Tasks from the Mentee's Perspective

Tasks	Identified problems/suggestions for improvement
Task 1: Create a personal profile for a mentee	
Please set up your personal profile and indicate the following information: 1. Upload a profile picture 2. Set that you're available each day in the week 3. Upload your CV 4. Set the languages you speak 5. Fill in further interests 6. Fill in your expertise	• Upload CV: it is not clear that the CV can be downloaded, neither in the profile nor in the network section → allow users to easily recognize the download function • The save button with regards to interests and expertise is not clear – where is the difference to drag and drop? → see the recommendations from the experts (consistency issue!)
Task 2: Find a mentor	
1. Search for registered mentors who are between 25 and 49 years old and are available every working day 2. Add a mentor to your network	• Suggested mentors on the side are not quite prominent → could be highlighted more by putting it under the search option above all the other users. • The search results section could be designed more interesting → Add a subtitle and a short description or title below the name that encourages the user to have a look at the profile. • Missing user feedback - It is not clear whether Maria has already received a request that has been sent → Provide user feedback after sending a request • When looking at Maria's profile it is not possible to download the CV → see comment above • The title "My mentees" is not correct and should be changed into "My Mentors". • Searching for a mentor is only possible via the network – this is a little bit confusing – network could also be understood as "my network" • Additionally, a good "search function" should be available
Task 3: Update your temporal availability	
1. Limit your temporal availability to the weekends	• OK, easy and clear
Task 4: Make arrangements with the mentor	
1. Fill in the Mutual Agreement: • Relevant Context Information (sharing & mutually challenging) • Expected Outcomes & Professional Impact (sharing & mutually challenging) • Needs & Expectations for the Collaboration (sharing & mutually challenging)	• It took some time for one participant to recognize that the mutual agreement has been suggested as part of the notifications → please make the notification more prominent • It is not possible to have a look at the mutual agreement if someone is not connected to a mentor → make it possible to have a look at the mutual agreement even if not connected to a mentor
Task 5: Send a message	

2. Write a mail to your mentor • Enter a subject “Mutual Agreement“ • Enter a short text	• It took some time to find the e-mail option, which is a bit hidden under “my mentors”. → support the user to find collaboration tools such as email • An email can only be sent if connected to a certain appointment → allow sending emails without making an appointment
Task 6: Get familiar with the tool pool	
1. Look close at the website and search for an area where you can find documents/help in terms of mentoring 2. Dig into it. Could your questions be answered?	• The text in the Tool Pool could be larger • It was not possible to download the documents **(bug?)**

Table 11: Identified usability problems from the mentee’s perspective by EUO

5.4 Summary

Overall, no usability catastrophes were identified, however, a variety of major and minor issues that need to be addressed for the further development. In particular, the overall navigation on the platform should be simplified, and users could be better supported by providing adequate system feedback as well as by following existing standards already known from online tools (e.g., Google Calendar). Many usability issues occurred in the personal profile, in the network (search function), and in the “My Mentors/My Mentees“ section.

6. USER STUDY IN THE LAB

As an important step towards the field trials, PLUS carried out user studies in the User Experience Lab of the Center for Human-Computer Interaction at the University of Salzburg. The studies took place in August/September 2016 and aimed at exploring ***how the mutual agreement tool supports the initial phase***[4] in the collaborative relationship between mentor and mentee and what kind of ***user experience factors*** (e.g., social presence) influence the success of the negotiation process. Moreover, we aimed at ***identifying usability issues and suggestions for improvement***. In the following we provide a brief overview on the methodological approach, central research questions, results, and recommendations for improvement. A detailed description is provided in the internal concept and results report.

6.1 Research Goals and Questions

Within the platform development our central focus lied on ***professional development and knowledge exchange*** through specific tools for collaboration among generations and, thereby, allow users to acquire benefits (i.e., social capital, intellectual capital). For this reason, the development of ***relationships*** that support each other's learning and experiences exchange was a prior intent. We particularly focused on the relational dimension of the theoretical model from Nahapiet and Ghoshal (1998) (for detailed information see D2.2) and, thereby, aimed at better understanding to what extent provided platform tools (specifically the mutual agreement) supported the ***negotiation phase***[5] ***in the beginning of a collaborative relationship***. In order to effectively support mentor and mentee in working together, the mutual agreement tool (MA) aimed supporting both parties by encouraging them to reflect upon their expectations as well as provide help discussing and defining the framing conditions of their relationship. The central goal of the study was to ***explore processes during this initial contact to better understand how this initial contact takes place*** (e.g., which communication tools work best for users, to assess influencing factors)***, and to identify potential for improvements with regard to the design of the platform.*** The main research questions are defined as follows.

- RQ1 How do users evaluate the usefulness and ease of use of the platform and the MA to successfully define the framing conditions of their relationship?
- RQ2 Which communication channels do users consider useful to develop the mutual agreement?
- RQ3 Do users who achieve common ground[6] experience higher levels of social presence than users who do not achieve common ground?
- RQ4 Do users who achieve a good common ground perceive higher usefulness and ease of than users who do not achieve common ground?
- RQ5 How do users evaluate the overall usability of the system?

[4] Due to a variety of delays in the technical development (GUI), only a small number of functionalities could be tested and instead of the platform's communication tool we made use of Skype.

[5] We consider negotiation as contracting between mentor and mentee.

[6] The term common ground is used to describe that users have successfully defined the MA.

6.2 Methodological Approach

6.3 Procedure

The user lab study comprised two phases, i.e., ***the run-up phase of the study*** (mainly encompassing the recruitment of the participants and some preparation activities), and the ***study implementation***.

In the run-up phase, participants were recruited via two major mailing lists (i.e., mailing lists for students of the and for employees of the University of Salzburg). The persons interested received a short questionnaire and were asked in which area they could imagine providing support for others (mentor's role) or in which area they could profit from support (mentee's role). Based on this information they were matched by the test leaders[7]. Approximately one week before the study started participants were further asked to complete three main tasks. (1) set up a personal profile on the platform, (2) establish a first connection with the selected mentor/mentee and (3) reflect on the trigger questions provided in the mutual agreement.

In the second phase of the user study participants were welcomed, and each participant was accompanied by one test leader and seated in different rooms. Both participants were introduced to the study, were asked to indicate demographic data and to sign an informed consent. After that introductory part, either the mentee or mentor[8] were asked to contact the collaboration partner in order to solve two main tasks. Namely, (1) discussing their expectations, and (2), defining mutual agreements. They could freely choose the communication mode (video, voice call, text messaging) as well as how to proceed. After participants had finished the tasks, they were asked to fill in the questionnaires (ease of use, usefulness, social presence and the system usability scale (SUS)). Moreover, they were interviewed about their satisfaction about the outcome of the negotiation. Finally, mentor and mentee were interviewed together assessing their experiences of the online negotiation but also to clarify open issues.

6.4 Participants

Overall 16 participants (8 mentors, 8 mentees) were recruited for the user lab studies (10 male (62.5%), 6 females (37.5%)). Participants age ranged from 25 to 75 years (M=42.8, SD=16.6) with an average age of the mentors of 50.8 (SD=17.7) and for the mentees 34.9 (SD=11.6) years. Therefore, mentors were on average older than mentees, yet still also younger participants took part as mentors and older as mentees. In general, the majority of the sample indicated that they could imagine taking over both roles (87.5%), i.e., mentor and mentee. Only 12.5 % explained to only be in favour of the mentee´s role. The role that participants took within

[7] At the moment, the matching system of the platform that would automatically match users according to their interests and expertise was not yet implemented.

[8] In the user lab study, two different study conditions were implemented, namely, (A) the mentor should contact the mentee to start the conversation and vice versa (B).

the study was strongly influenced by the expertise participants have been indicated, since this was the main criterion on which they were matched.

More than half of the participants (56.3%) indicated that they have finished University, almost one third (31.3%) of the participants had a general qualification for University entrance. Only 12.5% said that they had finished an apprenticeship. Furthermore, almost half of the sample (43.8%) was still full time employed, 43.8% were part time employed, and about one fifth (18.8%) had already been retired. Nobody was unemployed.

More than half of the participants (62.5%) explained not to have any prior experiences in the field of mentoring/coaching, however, more than one third (37.5%) had some experience. The areas in which mentees were seeking advice and mentors could provide support were project management (3 pairs), human resources development (2 pairs), information technology (1 pair), physics (1 pair), and freelance work (1 pair).

Concerning everyday technology usage, overall 10 participants stated to regularly use email communication and respectively 9 subjects used Skype and WhatsApp. Another 7 indicated to use Facebook and 2 FaceTime on a regular basis. Furthermore, respectively 1 participant declared to be in use of Twitter, Snapshot, Instagram or Telegram. Stated communication technology was used for private as well as business purposes, for the letter, mostly email (N=8) and Skype (N=8), and sometimes WhatsApp (N=3) was used.

6.5 Results

In the following, the most important results of the user lab study will be discussed (for a detailed description see the intern study report). For the analysis of the quantitative data (i.e., questionnaires) and the qualitative interviews, two subjects had to be excluded because while having been informed about the study's purpose, they did not seem to have fully understood the scope and purpose of the study. Therefore, 14 participants are considered in this analysis. Regarding the analysis of the communication partner´s interaction (i.e., the actual negotiation process of the MA and outcome) because of this process being a shared experience we had to exclude the respective pairs. Therefore, results of 6 pairs (12 participants) were considered for this analysis.

6.5.1 Ease of use and usefulness (RQ1)

With regards to **RQ1 (How do users evaluate the usefulness and ease of use of the platform and the MA to successfully define the framing conditions of their relationship?)** we investigated ***to what extent the provided trigger questions helped users to reflect*** upon their needs and expectations. As well we examined ***to what extent the MA supported them to successfully reach*** agreements and how ***useful the MA was considered***. We further investigated if users' subjective experiences and expectations matched the provided MA. In order to answer the research question, we considered on the one hand users' experiences of the overall platform (questionnaire data) as well as their particular experiences in discussing the mutual agreement (interview data, content of the conversation and MA).

6.5.1.1 Ease of use and usefulness of the overall platform

Ease of use and usefulness were assessed by means of a seven point Likert-scale (Davis, 1989). Both scales consist of 6 items, respectively, and participants indicated the extent to which they agreed/disagreed to given statements (1=*do not agree at all*, 7=*fully agree*) (see also section 0 and section 0). Participants generally considered the platform useful (M=5.9, SD=0.9) and easy to use (M=5.4, SD=1.2) (see Figure 13).

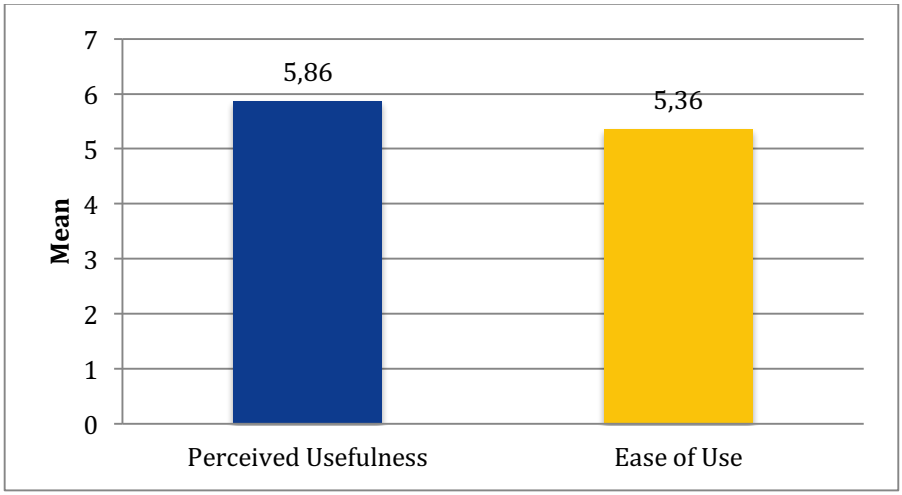


Figure 13: Mean scores perceived usefulness and ease of use

6.5.1.2 Ease of use and usefulness of the MA

Additionally to the questionnaires, we gathered further insights from the interviews and the conversations between the collaboration partners discussing the MA.

Regarding perceived **ease of use** of the mutual agreement tool, most of the participants could easily fill out the required information, however we also identified a view problem. Some participants had difficulties using the chat messenger, mostly because the chat window was experienced as *"way too small"*. At some point the chat became confusing (*"a little unclear"*) because it was not clearly enough displayed if or if not the counterpart was currently writing/answering a question. The presentation of the trigger question in the information area also seemed to be confusing because participants thought that they needed to answered all questions. Consequently, some uncertainty about how to answer the questions aroused, *"especially before having met the dialogue partner"*. This is well reflected in the great variety of users' actual replies that ranged from very detailed answers of every question over some notes/key points to no answers at all.

In relation to the **usefulness** of the MA, the trigger questions were stated as being useful (*"a good start"*). This is supported by the fact that all considered pairs achieved common ground in defining the MA over the course of their conversation, i.e., they discussed and defined at least 2-3 agreements. This is also reflected in the general satisfaction of the participants (N=13, one did not give information on that account) with the outcome of the negotiation. The participants were also asked to rate the process with help of Austrian/German school grading scale (i.e., 1=*very good*, 2=*good*, 3=*satisfying*, 4=*sufficient*, 5=*fail*). The mean rating was good (M=1.6,

SD=0.9, N=12) and all users (N=14) felt that the MA process was sufficient to start the mentoring process. Only two participants mentioned difficulties in the communication with their collaboration partner (experienced that the other part did not fully understand the purpose of the MA). Further analysis revealed that those two participants were paired with the two excluded ones. During the negotiation of the MA, more than half of the participants (N=9) did not identify any troubles (*"no points of criticism"*, *"everything trouble-free"*, *"great as a basis to build on"*). However, it was mentioned that in a *"real mentoring situation"*, more information about the respective communication partner would be beneficial. Most of the participants found their expectations met (N=11) however, it needs to be considered that 5 participants did not state any expectations in advance, mostly because they felt that it was necessary to meet the conversation partner first. Getting to know each other (e.g., *"the most relevant part is to communicate"*, *" important to get to know the other one"*) and figuring out what the purpose of/reason for the collaboration could be was considered most important.

A deeper analysis of the **interaction process** as well as its **outcome** (content of the conversations and MAs) showed that the way of discussing the agreements greatly differed among the participants: some couples used the entire course of their conversation to figure out what to settle for, others used the last minutes just to list key points, and with one couple it seemed that having been in line with the mentee´s suggestions the mentor simply agreed on them. Although, all pairs concluded the study with a settlement, we identified a wide disparity ranging from cooperation ground rules (e.g., honesty) to precisely defined first steps (e.g., next appointments, allocations of specific tasks for both sides). Experience in mentoring/coaching (N_p=5)[9] did not have an impact, neither on the discussion itself nor on the outcome of the MA. Furthermore, the extent of content matching between the conversation and MA similarly differed, i.e. users mentioned those points in their MA that they have been actually discussing. In this regard, we found the content at least partly matching/not matching at all for 3 pairs, respectively. This had been apparently independent from the level of concreteness of conversation, indicating that more detailed conversations were not related to more detailed MAs. However, this had no influence on the satisfaction of the outcome of the MA (see also above). Regarding the distance and closeness of the conversation, we found out that 4 pairs did not have any "small talk", while the rest of them interchanged at least some personal information before heading to the mentoring topic. Moreover, the wording participants used for addressing one another as well as defining the MA varied as well. We identified a range from being (1) highly distant (formal addressing, neutral formulation of MA, N_p=4) (e.g., *"contact principally via mail"),* over (2) medium level (informal addressing but MA in "first-person plural narrative", N=1) to (3) very close (informal addressing, MA in "first-person plural narrative", N_p=1), e.g., *"we have three appointments and we will meet with the team"*.

Answering **RQ1** (**How do users evaluate the usefulness and ease of use of the platform and the MA to successfully define the framing conditions of their relationship?**), we can summarize that the trigger questions initiated the negotiation process and were experienced to be a good starting point for defining the mutual agreements. However, there is potential for improvements making it easier to grasp the purpose of the questions. The study shows that the mutual agreements are quite diverse (ranging from general rules to quite specific definitions of procedures and goals). The actual individual interpretation of what content had been important or necessary as a starting point for a mentoring cooperation was independent from the satisfaction

[9] Note that in this section numbers of cases (N) refer to the numbers of pairs (N_p).

with the outcome (all participants felt to be satisfied). Hence, the MA tool is useful to provide a structure for the process and initiate the collaboration. Concluding, our observations make it hardly possible to identify a direct correlation between perceived ease of use/usefulness and the outcome of the mutual agreement.

6.5.2 Usefulness of communication channels for negotiation (RQ2)

RQ2 Which communication channels do users consider useful to develop the mutual agreement?

For about half the sample (N=8) the text-messaging tool was or would have been (depending on study condition[10]) the first choice for the initial contact. Influencing factors had been reasons of simplicity and politeness/carefulness insofar that participants felt that the chat was the *"most simple way"* for a first step, i.e., while still faster than sending an email both communication partners had enough time to think about questions and answers. They would like to ensure that their partner would actually like to have a telephone and/or video conversation (*"not to go like a bull at a gate"*). Other stated reasons were related to habits (i.e., generally preferring text-based communication), and 2 participants switched from chat to telephone/video-conference because of being "*faster"* and "*more direct"* after having made an initial contact, but also some troubles with using the chat have been identified (see also section 6.5.1.2). Overall, 6 participants thought that the telephone was/would have been the best option for mentoring purposes. Mostly because they felt that the voice was an important transmitter for non-verbal cues (e.g., intentions) and, therefore, also helping to easily build up trust, or because it was easy to understand reactions and answers, i.e., the voice call was direct but not too hasty (compared to a video call) for a first meeting. Finally, only 1 participant chose the offered video-tool for initial contact and stated it to be the best option to quickly get to know each other.

6.5.2.1 Influencing factors in relation to the choice of communication channels

Because of the small variance concerning the selection of communication channels for initial contact (half of the participants used the chat and only one used the video-call option), we did not have sufficient variation to separately look at the different channels.

Therefore, a Chi-square test of independence was calculated for an overall comparison of the initial selection of communication channels (audio call, video call, chat) in the different **age groups**. No significant difference could be found (χ^2=8.51 (6), p=0.21, Cramer´s V=0.74, Likelihood Ratio assuming that participants did not choose different communication channels depending on their age.

A second Chi-square test showed no significant difference (p=0.55, Fisher´s exact test, Phi=0.40) comparing participants' choice of communication channels in relation to whether they had any **previous experience in mentoring/coaching**. Consequently, participants with experience in terms of mentoring/coaching did not choose differently than those without.

[10] In the user lab study, we implemented two different study conditions, namely, (A) the mentor had to contact the mentee and (B) the mentee had to contact the mentor, to start the conversation.

6.5.2.2 Relation between choice of communication channel and outcome of the MA

It was hardly possible to identify a relation between the MA outcomes and the decision which communication channel to use. Particularly, because of the small variance concerning the actual choice compared to the great diversity of MA outcomes. We also need to take into consideration the technical difficulties with the text message tool (see section 6.5.1.2). Yet still, agreements could be settled (N_p=2) only using the chat. Therefore, taking into account that more than half the sample initially preferred the chat, it is reasonable to assume that with the suggested improvement (e.g., larger chat window) text messaging could be a sufficient tool to define the MA.

In order to answer the **RQ2 (Which communication channels do users consider useful to develop the mutual agreement?)** we can summarize that first of all, text messaging had been a preferable channel for initial contact for reasons of simplicity as well as politeness and habits. However, some improvements still need to be made concerning the chat to further support the MA process. Another sufficient choice had seemingly been the audio call option. Users described it be not too premature (compared to the video tool) for the first encounter. Furthermore, results showed that neither age nor experience in mentoring or coaching did have any impact on the choices. This refers to our further observations that there had been no differences in the choice depending on the role (mentor or mentee) within the conversation, i.e., mentors did not chose/would have chosen any differently than mentees. Putting all together, we conclude that evaluation of usefulness of a specific communication channel is predominantly depending on personal experiences/preferences but also on the perception of what would be most sufficient for the current situation.

6.5.3 Social presence and common ground (RQ3)

We aimed at understanding if users preferred a certain degree of "distance" when initially communicating with each other. Hereby, we investigated if users chose certain communication channels that are presumed to positively influence their experience of social presence (e.g., video call) and have a positive effect on the negotiation process, or if they rather decided to keep a certain degree of distance by communicating rather via text messenger or voice call. This would mean less social presence due to the absence of a great variety of non-verbal cues, which eventually makes it harder to reach common ground. Therefore, the main research question we aimed to answer was whether **users who achieved common ground experience higher levels of social presence than users who do not achieve common ground (RQ3).** To answer the research question, we investigated ***users´ general experiences of social presence*** while then having a closer look into ***different aspects of social presence***, such as the feeling of personal contact.

Social Presence was assessed at the end of the study using the ten-item scale of the SPGQ (De Greef & Ijsselsteijn, 2000) (statements were rated on a seven-point-scale; 1=*totally disagree*, 5=*totally agree*) (for a complete list of items see section 0). To get a deeper insight of users´ individual experiences, they were asked afterwards to describe their experience of personal contact and to which extent it was possible for them to assess their collaboration partner's intentions. Moreover, we wanted to know whether they felt understood as well as comfortable during the course of the conversation.

6.5.3.1 Experience of social presence

Overall, participants felt socially present during the communication (M=5.4, SD=1.1), whereby, the results show that the degree of social presence varied between participants, who solely used text message compared to those who used video/audio call. Participants who used text messaging only reported on lower scores of social presence (4.7, SD=0.5) compared to those participants, who used video/audio call (5.7, SD=1.1).

6.5.3.2 Different aspects of experiencing social presence

About half the sample had an **experience of personal contact** while communicating (N=8), especially when using video (e.g., *"like a personal conversation*). Other given reasons were related to personality traits, such as open-mindedness or shared experiences. However, predominantly because of *"insufficient time"* to build a personal bond, some participants (N=5) did not agree with that. In this regard, especially the chat seemed less sufficient in terms of personal contact (e.g., *"impersonal"*). No relation could be observed between the experience of personal contact and the degree of distance in the formulation of the MA (from formal to informal addressing) as well as whether the communication partners had some "small talk" or not. Overall, more than half of the participants (N=9) stated that it was easy to **assess the intentions/reactions** of their communication partner (*"very easy"*, *"due to the video not hard"*). Conversations were experienced as *"concrete/direct"* but also sympathy was mentioned to play a role in understanding each other. Although it was also stated that a video transmission can be distracting, especially the video option was experienced as being nearly as good as *"sitting right next to each other"*. Nearly all participants (N=13) **felt comfortable** during the discussion (one participant did not have an opinion on that account). Experiences of general sympathy and receiving efficient responses to questions seemed to be the most prominent factor. Nevertheless, it was stated again that the chat had been *"very impersonal"*, and that the other options had been more pleasant and effective.

6.5.3.3 Relation between experience of social presence and communication channel

In order to get a better understanding in which way the used communication tools (chat, voice call, video call) influenced the experience of social presence, we conducted biserial correlations for each option. Based on our observations, the usage of the video call option led to better experience of social presence compared to the other communication channels (chat and call) (also section 6.5.3). A significant negative correlation between the chat and social presence scores could be identified (r=-0.64, p=0.02). Therefore, participants who used text messaging during their conversation experienced less social presence. There was no significant relation between the social presence scores and the voice call (r=-0.11, p=0.72), indicating that using this communication channel did not have any effects on the experience of social presence. Social presence scores were significantly positive correlated to the usage of the video call tool (r=0.54, p=0.05). Participants who used the video call during conversation felt more socially present.

All considered pairs reached common ground and, therefore, it is hardly possible to give a straightforward answer to **RQ3** (**Do users who achieve common ground experience higher levels of social presence than users who do not achieve common ground?)**. Moreover, it was not possible to objectively assess the quality of

different MAs considering the huge differences in the way users defined their MA. While experiencing less social presence, participants who used the chat during conversation still came to a settlement. The outcome of the negotiation did not depend on the communication channels used. Participants felt more social presence, particularly, when using the video call option. Furthermore, both, the video and voice call were associated with higher levels of social presence compared to chat. This reflects the mentioned personal experiences with the text message tool. Using the voice call did not only promote experiences of social presence (see also section 6.5.3). All in all, this indicates that whether participants achieved common ground (or not) was not particularly influenced by the use of a specific communication channel. However, it had an impact on the experience of social presence during the course of the conversation.

6.5.4 Common ground and usefulness/ease of use (RQ4)

RQ4 Did users, who achieved good common ground, perceive higher usefulness and ease of use than users who did not achieve common ground?

Besides participants experience of social presence, we also assessed their experience of usefulness of the system and perceived ease of use to investigate ***to what extent this evaluation of had an influence on the negotiation process***. It was not possible to assess different levels of quality concerning the MA because despite the fact that all considered pairs reached common ground, i.e., they successfully defined their agreement, we observed a high diversity of the actual negotiation outcomes. Moreover, all participants experienced similar levels of ease of use and usefulness (see Figure 15 and **Figure 16**). This is well reflected in the users experience of the MA being sufficient for the negotiation process, despite the fact that they used the tool in different ways. See also section 6.5.1.2.

6.5.5 Usability of the system (RQ5)

RQ5 How do users evaluate the overall usability of the system?

In order to identify further potential for improvement with regard to the usability of the platform, the System Usability Scale (SUS), which is based on the works of Brooke (1996), was used for data assessment. We further asked participants to indicate likes and dislikes as well as suggestions for improvements. The following areas of the platform will be investigated 1) the registration/profile, 2) the mutual agreement, 3) the communication tools (chat, video, voice call) as well as 5) the overall navigation.

Generally speaking, participants accepted the system with a mean SUS score of 72.3, SD=19.2, N=13. Yet, the standard deviation and the broad range of scores, precisely, from 30.0 (min.) to 92.5 (max.) leads to the assumption that individual experiences of overall usability of the platform have been highly divergent.

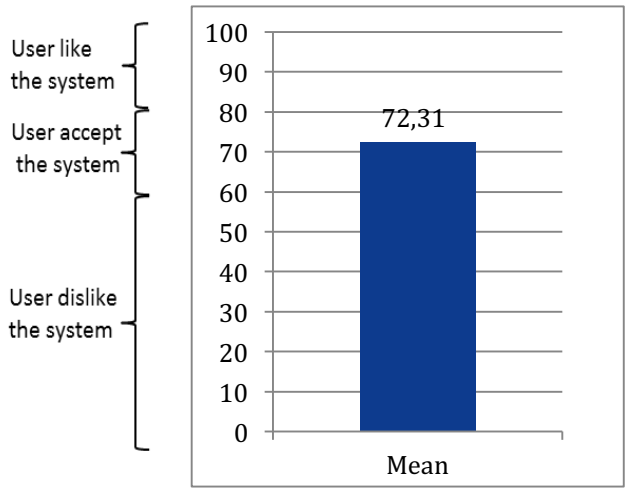


Figure 14: SUS mean scores

6.5.5.1 Registration/profile

Around two thirds of the sample (N=11) were able to register and set up their profile (*"very easy"*) from home. Although the registration process was generally described as fast and simple 4 participants could not complete the registration. While one of them cancelled participation in the study the other 3 participants used to the test profiles that have been set up in advance for the study. There had been technical issues concerning the registration itself (e.g., error messages, difficulties with Facebook log-in), but also some uncertainties about what kind of content was important for the profile, i.e., which specific information was needed for the mentoring process. At some point, it was stated that without the user guide it was hard to complete the profile, however, the guide was found to be *"very helpful"*. Finally, more additional explanations would have been preferable (e.g., why and for what purpose certain information was relevant for the mentoring process). Accordingly, at some point more personal details on the profile would have been beneficial, especially, regarding issues of trustworthiness.

6.5.5.2 Mutual Agreement

In general, users felt that the MA tool was sufficient to start the negotiation process and, were satisfied with the outcome of the MA. During the negotiation process some difficulties in saving information in the MA were identified, i.e., participants were at some point confused about the functionality of the saving/editing buttons. As a consequence, some information had been deleted from the MA and, therefore, participants felt that the edited information should be saved automatically (see section 6.5.1.2).

6.5.5.3 Communication Tools (Chat)

We need to consider that due to the variety of delays in the technical development, we needed to use Skype as alternative for the voice and video call s and, therefore, we will only discuss on the usability issues regarding the chat messenger (see also 6.1). Although, the chat would have been the first choice for half of the sample for initial contact there have been some difficulties (e.g., chat window being too small). Furthermore, some notifications on whether or not the counterpart was currently writing/answering a question were suggested. Participants also suggested to allow sending pictures/files via the chat (see also section 6.5.1.2).

6.5.5.4 Overall Navigation

Some difficulties concerning the simplicity of navigation could be identified. In some instances, the graphical set up of the platform seemed to be impractical (N=2) and the general organization of content on the platform was experienced at some point (N=4) as *"unintuitive"*. This might be a reason for the divergent SUS scores. The users also observed that the language settings on the platform seemed to change when clicking from side to side, causing some confusion. Moreover, the long loading duration was stated to be unsatisfying. However, experiences of different aspects of the usefulness/ease of use of the platform were consistently rated (i.e., individual item scores did not differ, see also section 0).

6.5.5.5 Further suggestions for improvements

As a further improvement for the MA process it was recommended to have two separate windows for defining the MA, one for a *"trial version of the MA"* (e.g., to write down notes) and one to define the final version. Moreover, participants suggested to implement accessibility features, such as text to speech input for the blind or further video tool functionalities for the deaf and hearing impaired (e.g., via providing subtexts). With regards to getting to know each other as well as considering the importance of trust as a basis of a good working relationship, a more detailed list of questions concerning personal interests and reasons for engaging in online mentoring on both sides was declared to be beneficial. With respect to mobility, questions and interest concerning an App version were also raised.

6.5.6 Summary

In general, the mutual agreement tool was sufficient to support the initial phase of the negotiation of mutual agreements, i.e., the MA tool helped to start the mentoring process as well as to establish the first personal contact for a mentoring relationship. This is well reflected in the overall good ratings of perceived ease of use and usefulness. However, participants accepted but did not especially like the system and some usability problems observed. First of all, there have been some difficulties with the registration process and as a consequence, a few participants could not complete the registration by themselves. The long loading time of the platform as well as the changing language settings were stated as being unsatisfying, too. In terms of ease of use improvements are required. For instance, the trigger questions should clearly illustrate that they are meant as a supporting function to start a mentoring relationship, however, that they are not mandatory to be

answered for the negotiation of the MA. Although the chat was considered as useful, it was experienced to be difficult in terms of operation. Results show that a standard chat messenger as it was initially implemented on the platform is not sufficient to support adequate communication in the context of mentoring. Therefore, necessary suggestions have been made by the participants, e.g., to clearly display whether the counterpart is currently writing (or not). Participants also discussed that a mobile version of the platform would be valuable, especially in terms of being well connected to the respective mentor/mentee.

Reaching common ground was not only dependent on the communication channel used but also on users perceived usefulness and ease of use of the MA as well as the experience of social presence during conversation. It could also be seen that former experiences in terms of mentoring/coaching had no systematic impact on either the conversation itself or the negotiation results. At the end of their negotiation, all considered pairs reached common ground and defined at least 2-3 agreements. Although, the participants were satisfied with the outcome of their discussions, the content as well as the phrasing of the actual agreements did greatly differ. This leads to the conclusion that the MA tool at this point leaves some apparently beneficial freedom in the interpretation of what was essential as a first step towards the mentoring process. This will be further investigated during the field trials.

The communication channels did not have any impact on users common ground but on their experience of social presence. According to the presumption that the video call channel should positively influence the experience of social presence, the study results show that those participants, who used the video call option during their conversation felt more social presence than those who did not. We could not identify an ultimate communication channel for a mentoring collaboration. Thus, another question for the long-term study is whether a specific tool (e.g., the video call) is particularly suited for more mature mentoring relationships or whether the choice will simply be a question of situation-dependent efficiency. These and other questions are considered in D2.4. Consequently, it seems again important to provide different alternatives for various users and different situations.

7. 3RD HEURISTIC EVALUATION

7.1 Introduction

The third heuristic evaluation was carried out from the 14th to the 15th of December 2016. The ProMe platform was evaluated in terms of the registration process and setting up a user profile. Other features/tools, such as the calendar, network, and my progress were integrated in the evaluation process. In the following, the results are presented as well as suggestions for improvements.

7.1.1 Research Goals and Questions

The major goal of the study was to identify usability and accessibility problems, therefore, experts had to solve predefined tasks. Based on the outcome of the evaluation, we then develop further suggestions for improvement with regards to the preparation and implementation of the field studies.

7.2 Methodological Approach

The platform was evaluated by means of a heuristic evaluation (see Nielsen 1994). Three usability experts examined the platform for usability violations and identified the problems using a set of heuristics (see Annex

Annex A and 3.2). The experts were asked to freely choose either the Mentor´s or Mentee´s perspective (2 times Mentee and 1 time Mentor) for the evaluation (see Table 12), with the test leader being the counterpart for relevant tasks (e.g., when using the chat). However, analysing the results we did not discriminate between the perspectives because of the main focus of the heuristic evaluation having been to identify further usability issues as well as to improve the overall interaction with the platform regarding the upcoming field studies. Searching for a registered mentor was not possible because the search function was not fully functional at the time of the evaluation.

Due to the repeating delays in the technical development, we did not especially carry out another test with potential end users in this step of the iterative analysis of the platform. However, the heuristic evaluation was conducted in close collaboration with the EUOs, i.e., they received the tasks (see Table14) and checked the system based on their experience with the end user perspective, and gave feedback.

Tasks for the Mentee		Tasks for the Mentor	
Task 1	Create a personal profile for the mentee	**Task 1**	Create a personal profile for the mentor
	1. Upload a profile picture 2. Set that you're available each day in the week 3. Upload your CV 4. Set the languages you speak 5. Fill in further interests		1. Upload a profile picture 2. Set that you're available each day in the week 3. Upload your CV 4. Set the languages you speak 5. Fill in further interests

	6. Fill in your expertise		6. Fill in your expertise
Task 2	Search for a mentor	**Task 2**	Create an appointment for a video conference
	1. Add Maria to your network		1. Open your calendar Add an appointment with Sarah for 2016-06-01 in the afternoon
Task 3	Update your temporal availability	**Task 3**	Make arrangements with the mentee
	2. Limit your temporal availability to the weekends		2. Fill in the Mutual Agreement: • Relevant Context Information (sharing & mutually challenging) • Expected Outcomes & Professional Impact (sharing & mutually challenging) • Needs & Expectations for the Collaboration (sharing & mutually challenging)
Task 4	Make arrangements with the mentor	**Task 4**	What's new in your network?
	2. Fill in the Mutual Agreement: • Relevant Context Information (sharing & mutually challenging) • Expected Outcomes & Professional Impact (sharing & mutually challenging) • Needs & Expectations for the Collaboration (sharing & mutually challenging)		3. Look around the website. Are there any news in your network? Are there any other notifications? 4. React to the notifications
Task 5	Send the mentor a mail/message	**Task 5**	Make a comment on the progress of a mentee
	3. Write a mail to Maria • Enter a subject "Mutual Agreement" • Enter a short text		2. Please add a comment to a topic that the Mentee has created
Task 6	Getting familiar with the Tool Pool	**Task 6**	End the mentor-mentee-relationship
	2. Look close at the website and search for an area where you can find documents or help for the general running of a mentor-mentee-relationship. • Dig into it. Could your questions be answered?		1. Remove the Mentor from your network
Task 7	Document your progress		
	1. Add a new topic and give it any title 2. Enter a short text 3. Close the topic 4. Open the topic again		

Table 12: Tasks for the experts.

7.3 Results

Altogether, 63 issues were identified, subdivided in 3 “cosmetic problems” without pressing urgency, 20 “minor usability problems” that should be fixed after the major problems have been solved, and 38 “major usability problems” with high priority. Furthermore, 2 “usability catastrophe” issues have been identified, with imperative need to be solved before the field studies. The heuristic type mostly violated referred to consistency and standards, for instance that changing the password possible even when logging in via Google/Facebook and, therefore, without having created a password, or the fact there have been inconsistent solutions for function buttons (e.g., “save”, “add”). The second most violated heuristic related to information architecture (N=12), e.g., that meetings from collaboration partners could not be deleted in the calendar tool. Other heuristic types were less often breached, with 7 violations for visual design, 6 for match between system and real world, 3 for user control and freedom, and last but not least 2 violations for system status.

Usability catastrophe (4 – 3,5): imperative to fix this before product can be released		
Heuristic	**Problem Description**	**Suggestions for improvement**
4	Changing the password possible, even if user has logged in via Google/Facebook and no password was created	Provide a temporary password and send it per e-mail, with the possibility to change it right away
6.2	Not clearly recognizable which elements clickable in the contact list	Provide information about the expertise of a user or about the area in which s/he is searching for advice
Major usability problem (3,4– 2,5): important to fix, should be given high priority		
Heuristic	**Problem Description**	**Suggestions for improvement**
Log in / Register		
5	Not clear that behind different pictures different information can be retrieved	Provide a header for the different pictures (e.g., "about the project", "success stories mentor") to make it easier to find the required information
1.1	If manually typing the date of birth, a dot is not can't be typed; there is no error message	Format for date of birth should be part of the declaration; e.g. Birthday (dd/mm/yyyy)
4	The hyperlink in activation e-mail is not displayed as a full link; no information about which e-mail address used; e-mail only in English	Separately display hyperlink as a full link; provide more information in activation e-mail (name, platform); activation e-mail in selected language (e.g., German)
Profile		
4	Information about allowed formats for uploading pictures seems to be wrong (e.g., pdf, doc)	Display correct picture formats
4	No feedback when clicking on picture itself; only when clicking on area underneath	Possible to edit profile picture by directly clicking on picture
3	Editing profile picture: text underneath needs to be clicked - overall button does not react	Make edit button clickable

	(Browser: Opera)	
1.2	Saving information (general account settings): pop-up window not closing → when clicking save button no feedback provided	After saving information main profile page should be visible again
4	Changing old password to the same password is possible	Should not be possible
	"C:\fakepath\paper.pdf" file path was displayed instead of data name only (windows format)	File name is sufficient
1.2	Adding second timestamp: without valid values error without explanation occurs	Provide error message with an understandable explanation of what was going wrong
4.1	"save" and "add" confusing: only clearly recognizable that you have to click on "save", if you have already clicked on "add" - has not been consistently implemented (for expertise information saved when clicking on "add")	Provide a consistent solution for the "add" and "save" button in the profile area
5.1	Provided solution for editing availability inefficient if adding the same time for more than one day	
2.1	Labelling for days missing in overview	Provide labelling for days in overview (e.g., Monday, Tuesday)
4.2	Information about the comma to indicate expertise is hard to notice → confusion with the "add" button – inconsistent to "availability"	Provide consistent solution for all "add" options
Communication – search for a Mentor/Mentee		
6	Searching for a mentor: preferable if expertise would be visible – only Nationality displayed	Provide information about expertise of a user or about area in which advice is needed
5.1	Network: confusing contact can be seen two times → not clear what difference is	Clarify why information is necessary both times or delete
4	Adding new contacts: pop up window inconsistent with platform design	Provide consistent design
4.6	Adding user to Network via his profile: button not clickable, only font is clickable	Overall button should be clickable
Calendar		
3.3	A certain day could not be selected; current date always automatically selected	Should be possible to select certain days/dates when clicking on a calendar field (e.g., clicking on 28th of December, this date should paper in new entry)
bug	Setting up new calendar entry: when selecting participant curser remains "active" even if navigating somewhere on the platform where it is not possible to select anything	Handle mouse-over effects
4.1	Information about appointment is cut off and disappears when scrolling down	Should not be cut off; put information bubble over the day for dates at end of the month

6	Appointment list does not provide any information about subjects of the meeting → difficult to identify at one glance a specific meeting if having more than one appointment with a certain person	Provide information about the subject of the meeting in overview list
5	Appointments cannot be edited	Allow users to edit appointments
2, 4, 5	"All appointments": separate tab confusing; also that this information not displayed in overall calendar	No need to have separate tab for "all appointments", delete it
6.1	Legend: white font on yellow background hard to read	Font colour: black
Network		
5.1	Meetings from collaboration partners cannot be deleted: confusing; users might not remember anymore, from whom certain messages were and if appointment can be deleted or not	Allow users to delete appointments independently of whether they have established the appointment or not
6	Displaying both labels "Materialsammlung/ Tool Pool" confusing	Display only German expression
4.1.,6	Window for video call: very large; covers platform page → hardly possible to have a call and simultaneously work on the platform	Allow for minimizing video-chat window; however, window should remain next to platform tab to allow having a call and at work together at the same time
4.1	Both persons have to end a call	Call should end if one person ends it
1	No message/notification when video blocked by browser settings	Provide error handling – e.g. in Q&A section with tutorials how to set up different browsers
5	Every new call opened in a new tab: More than one tab can be opened within a call with one user	Provide error message and only allow one call/tab to be opened at the same time
Progress		
1, 2, 5	When closing a topic (mentee): close and save buttons with same position and colour → confusing; also what is happening when closing a topic, comments not saved?	Buttons should be made differentiable (colour and position)
3	Deleting title for a topic in Progress not possible (e.g., typos cannot be corrected)	Allow for easily changing titles
5.2	Not clear how to set up the structure – missing description	Provide information how to use progress
5	All subtopics need to be closed separately before the overall topic can be closed (mentee) → confusing	Helpful if users can close topic independently of the subtopics (e.g., particularly with a variety of subtopics)
4.1	Chat: in the middle of the screen if you scroll down	Should always be at the bottom

1.1	No feedback for new chat messages, trims other information	Colour could change for new messages
General Comments		
4	"save/Speichern" buttons: inconsistent labelling → German and English labelling mixed up	Make labelling consistent to chosen language
Minor usability problem (2,4– 1,5): should be fixed after the major usability problems have been solved		
Heuristic	**Problem Description**	**Suggestions for improvement**
Log in/Register		
5.1	Detailed information about the project difficult to find when already logged in	Detailed information should be always present
5	Information about roles is difficult to find	Font should be bold in order to easily find required information
2	"How to get active": confusing → wording implicates that information is about registration process instead of roles	Provide information about how to interact on the platform; make it more prominent, where to find that information
1.1, 4	Entering wrong e-mail address: error message only displayed after clicking save button; more efficient to directly receive feedback (while typing)	E-mail format could be instantly checked: e.g., font in red when typing in incorrect format
2.1	Date format: German-native speaker not familiar with date format	Better in German: dd.mm.yyyy
1.2	Message after registration disappears when clicking somewhere at the site: information that an e-mail is sent might be missed	Information about system status should not disappear automatically and be easily visible
4	Logging in with Facebook account: platform uses the name, however, does not use profile picture	Also use the profile picture
4	Indicating the sex: male preselected	The sex should not be preselected
Profile		
4.1	No information about the format or size of profile pictures provided	Provide information about size or format
4.1	Changing profile picture: deleting the old picture is needed	Allow to easily upload a new picture
2.1	Time display: AM and PM in addition to times from 0-23 confusing	Delete AM and PM in German version
3.3	24:00 and 00:00 is working, while only 00:00 is shown after saving	
2.1	Confusing that current time is always preselected because in most cases current time won't be the time to choose (e.g., if availability is edited to	Select actual hour but not actual minutes,/ always put minutes to 0

	9.15, then the time that is automatically selected in the time picker of availability is 9.15)	
Calendar		
4	List of possible participants for a certain calendar entry only shown with "mouse over"	Chose pop ups instead of mouse over because mainly used for the platform (consistent)
4	Selected participant highlighted in light-yellow: different to other colours of platform	Use consistent design
6.2	"ausstehend" doesn't fit the box → cut off when tab has been resized	Should always fit the box
Network		
2.2	Envelope for information in mutual agreement not understandable	Information should always be an "i"
6	Weird visualization of the text: no line break; not possible to make some kind of "bullet points" in order to write down mutual agreements	Provide possibility of line breaks or bullet points
Progress		
5.1	Dialog not spotted instantly	More efficient to see the first few comments without clicking on "comment"
General Comments		
5.1	Notifications are not found easily	"show all" at the end of the pop up
Cosmetic problem (1,4– 0,5): needs to be fixed when extra time is available		
Heuristic	**Problem Description**	**Suggestions for improvement**
Profile		
4	Adding language: automatically selected as "native"	Select at "beginning" level
Communication – Searching for a Mentor/Mentee		
4	Visiting the profile there is no information shown in the browser tab - only "/ProMe"	
Network		
6.4	User name separated with a dot "."	Improve consistency: Use a blank instead

Table 13: Identified usability problems.

7.4 Summary

Overall, experts were positive towards the platform. Nevertheless, it was obvious that there are still some usability issues that need to be solved before the field trials. Most of the issues concern consistency and standards, for instance, that changing the new password to the old one is possible, or that when adding a new contact the pop up window is inconsistent to the design of rest of the platform, and information architecture (e.g., meetings from collaboration partners could not be deleted). Therefore, a great variety of the identified issues could easily be solved by following a consistent design and functioning throughout the whole platform. All in all, the evaluation revealed mostly major usability violations and less cosmetic problems. As a consequence, the entire interaction with the platform was impeded, primarily because of inconsistency problems (e.g., buttons), and it was at some point difficult to easily operate and navigate on the platform. To tackle these issues, concrete suggestions for improvement were discussed with the technical partner (see Table 13). Unfortunately, at this moment, we could not consider the video call tool as well as the search function of the platform, since there had been some difficulties with the implementation.

8. CONCLUSION

Overall, the (user) studies that were carried out within the iterative evaluation allowed us to gather feedback from potential end users and supported us to address their needs already in an early stage of the development process. Moreover, the expert evaluations supported the development team to improve the usability of the system. As already mentioned in the beginning of this document, additional activities were required in order to support the development towards a version that is testable in the field.

The design workshops were in particular important for the design of the overall structure of the system, and allowed us improving the overall idea of the platform as well as to identify important issues that need to be considered (e.g., privacy issues). The first heuristic evaluation proved valuable to improve the usability of the platform and, finally, the user evaluation supported in particular the improvement of the provided collaboration tools, which are a major part of the ProMe platform. The second heuristic evaluation revealed consistency issues that needed to be addressed, and improvements with regard to the overall information architecture were developed. The user studies in the laboratory were important in order to investigate the usefulness of the platform in the early beginning of a collaborative relationship. Finally, the third heuristic evaluation allowed us to identify major consistency issues. Based on the recommendations made within these studies it was possible to develop a version of the platform that could be tested in the field.

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ANNEX

Annex A: Heuristics

1. **System status**
   1.1. User feedback:
   - The system should always keep users informed about what is going on, through appropriate feedback within reasonable time. In addition, the feedback should be adapted to different tasks [Nielsen 1993].

   1.2. Error messages:
   - An error message should explicitly indicate what has gone wrong in a human-readable language. Furthermore, it should provide a precise description of the problem as well as a constructive advice on how to fix it [Nielsen 1993].

2. **Match between system and real world**
   2.1. Language:
   - The information and interface components have to be understandable [Affonso et al. 2010]. Instead of using jargon and technical terms the interface should speak the users' language. It should use words that older adults know. If there are technical words or jargon the interface should assist the users in learning what the terms mean [Chisnell et al. 2006].

   2.2. Metaphors:
   - The technology should make use of virtual objects and actions as metaphors for objects or actions in real world. A classic example of a software metaphor is the folder: Since people put things in folders in the real world, they immediately understand the idea of putting files into folders on a computer [Apple 2012]. It is important that metaphors are not used to have another meaning than in real world. E.g., the folder should not be used as a recycle bin.

3. **User control and freedom**
   3.1. Audio:
   - Users should have the possibility to use the volume button to adjust the volume how they want to have it. In order to hear sounds privately the technology should provide the possibility to use headsets and headphones. Additionally, it should be possible to switch the interface to silent [Apple 2012].

   3.2. Stop control:
   - To maintain user control and freedom the technology should allow to stop actions. The current state when stopping should be saved at the finest level of detail possible [Apple 2012].

   3.3. Flexibility:
   - The interface should offer the possibility to perform frequently used operations especially fast, using dialogue shortcuts. Typical accelerators include abbreviations, having function keys, command keys or specific gestures that package entire command in a single keypress. A classic example of a shortcut is "STRG + s" to save a file [Apple 2012].

   3.4. Search function:
   - In addition, the technology should provide a search function in order to find information more quickly.

4. **Consistency and standards**
   4.1. Standards:
   - The appearance of a control that performs a standard action should not be changed radically. Moreover, the interface should follow the recommended usages for standard user interface elements. It should be avoided that standard buttons and icons mean something else, as otherwise the users may be confused [Apple 2012].

   4.2. Consistency:

- The interface should not use different words, situations or actions for the same thing [Nielsen 1993]. Additionally, it is important to have the same controls on the same position in the whole interface.

5. Information architecture

5.1. Minimize the users' memory load:

- Regarding information architecture it is important to make the interface easy to skim and to scan. The pages should look well organized (versus cluttered or busy) and there should be a clear visual starting point to the page. Moreover, if the interface is dense with content, it should be grouped to show what is related. Frequently used topics should be before all others [Chisnell et al. 2006]. Only necessary information should be present and irrelevant information should be avoided [Kurniawan et al. 2005]. Thus the amount of text should be minimized. It is important to increase the focus on main information [Apple 2012, Chisnell et al. 2006].

5.2. Navigation:

- The shallowest possible information hierarchy should be implemented. For any given task a reasonable length (2-5 clicks) should be given. Furthermore, the navigation should be easy and predictable. The path through the information should be logical and easy for users to predict. In addition, markers should be provided on each screen, such as titles and back buttons [Apple 2012]. Clicking the back button should always go back to the page the user came from [Chisnell et al. 2006].

6. Visual Design

6.1. Contrast/Use of colours:

- It should be a high contrast between touch areas, text and the background [Spinks 2012].

6.2. Appearance of control elements:

- Control elements should be highlighted differently from other non-clickable items (e.g., through contours). Thus labels should be easily distinguishable from controls and it should be obvious what is clickable and what is not. In order to make the controls easily clickable there should be enough space between different targets and they should be large enough [Apple 2012, Chisnell et al. 2006].

6.3. Design of buttons:

- Graphics should be simple as well as meaningful and should be relevant and not for decoration [Kurniawan et al. 2005]. Furthermore, the buttons should be descriptive enough to make it easy accurately predict what the content will be. An image on a button should be task-relevant. Additionally, any controls should be clearly and unambiguously labelled [Chisnell et al. 2006].

Annex B: User study in the lab

Items for Social Presence

- I get a good enough idea of how my communication partner at the other end is reacting.
- I get a real impression of personal contact with my communication partner.
- I can easily assess my communication partner's reactions to what s/he said.
- I experience a great sense of realism when communicating via the platform.
- I get a good feel of my communication partner.
- It is like a face-to-face meeting when communicating via the platform.
- It is just as though we are in the same room.
- My communication partner at the other end seems real.
- I am happy to use the ProMe platform for communication purposes within a mentor relationship.
- I get to know my communication partner very well if communicating via the ProMe platform.

Items for Perceived Usefulness

- The platform allows me to accomplish tasks very quickly.

- The platform improves my performance, when working together with my collaboration partner.
- Working via the ProMe platform increases my productivity.
- Working via the ProMe platform enhances my effectiveness when working together with my collaboration partner.
- The ProMe platform makes it easy to work together.
- The ProMe platform is useful for collaboration purposes between mentor and mentee.

Items for Perceived Ease of Use

- Learning to operate the ProMe platform was easy for me.
- It is easy to get the ProMe platform to do what I want it to do.
- My interaction via the ProMe platform is clear and understandable.
- The ProMe platform is flexible to interact with.
- It was easy for me to become skilful at using the ProMe platform.
- I find the ProMe platform easy to use.

System Usability Scale

- Overall experience regarding the usability of the system
- I think that I would like to use this system frequently.
- I found the system unnecessarily complex.
- I thought the system was easy to use.
- I think that I would need the support of a technical person to be able to use this system.
- I found the various functions in this system were well integrated.
- I thought there was too much inconsistency in this system.
- I would imagine that most people would learn to use this system very quickly.
- I found the system very cumbersome to use.
- I felt very confident using the system.
- I needed to learn a lot of things before I could get going with this system.

Big Five Inventory

- I see myself as a person, who ...
- ... is reserved.
- … is generally trusting.
- … tends to be lazy.
- … is relaxed, handles stress well.
- … has few artistic interests.
- … is outgoing, sociable.
- … tends to find fault with others.
- … does a thorough job.
- … gets nervous easily.
- … has an active imagination.

Item scores of perceived usefulness and ease of use

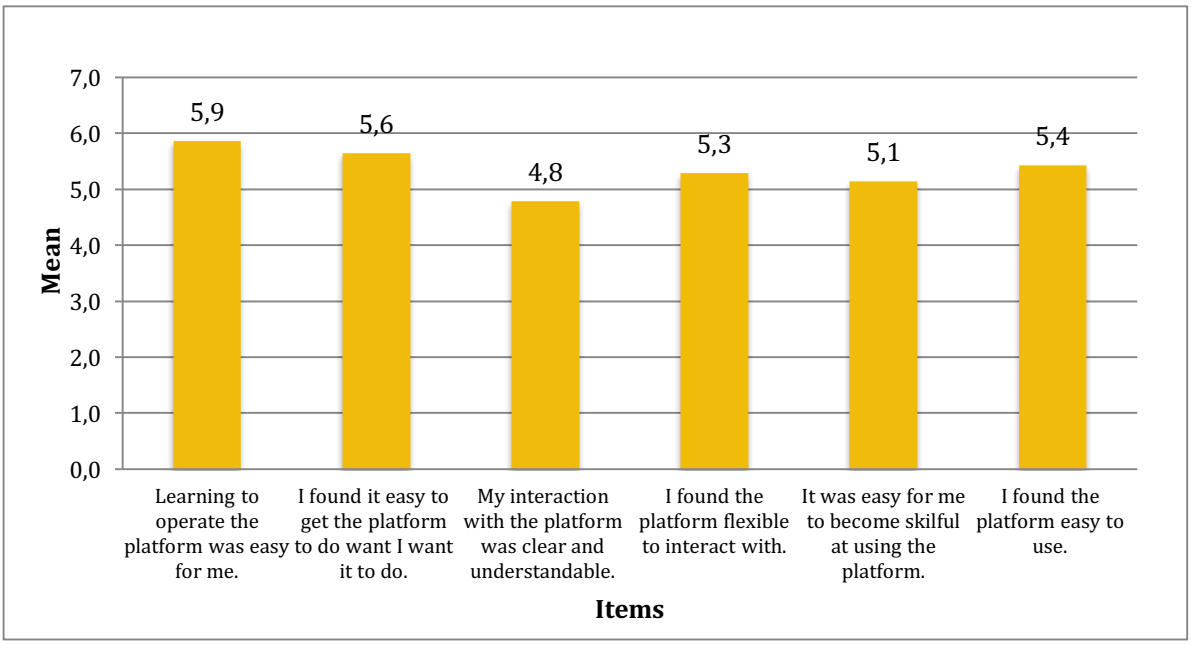

Figure 15: Mean ratings of usefulness per Item

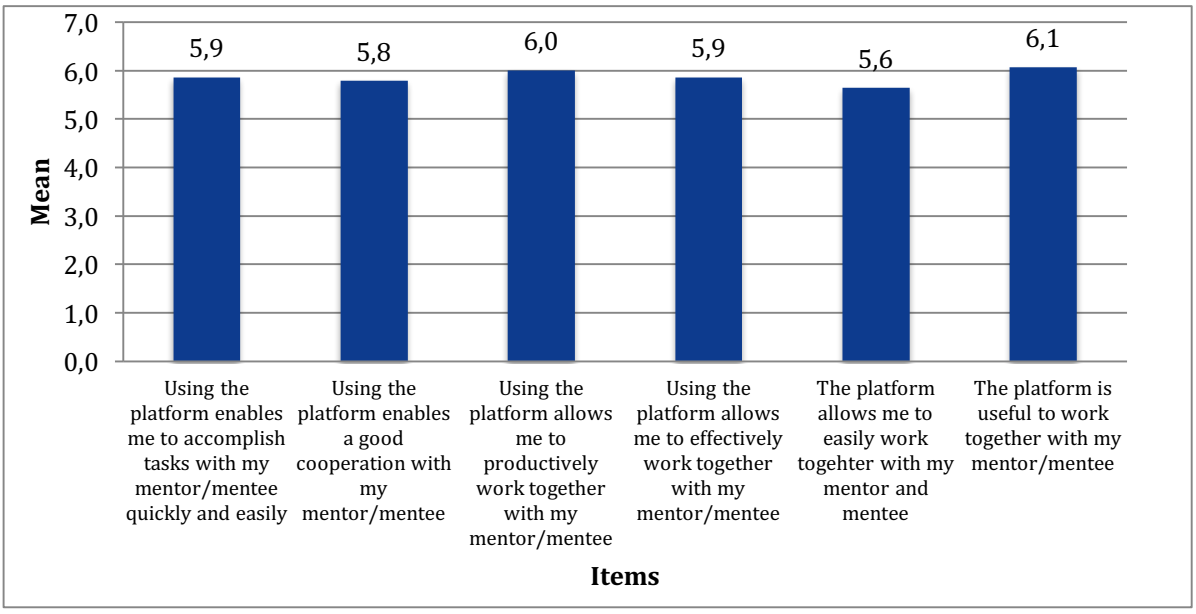

Figure 16: Mean ratings of Ease of Use per Item

Social presence scores for the different communication channels

Communication Channel	Social Presence Mean	SD
Text Message (only) (4)	4,7	0.5
Video/Audio Call (only) (10)	5.7	1.1
Voice Call (only) (2)	6.9	0.2
Video Call (only (2)	6.1	0.1
Text Message and Video (3)	6.2	0.5
Text Message and Audio (3)	4.2	0.3

Table 14: Mean scores and Standard Deviation for Social Presence for the different communication tools