The project iCareCoops no AAL-2008-1-(214-118) is funded under AAL JP.

DEMONSTRATOR AND TEST DESIGN

Project Title:

FOSTERING CARE COOPERATIVES IN EUROPE BY BUILDING AN INNOVATIVE PLATFORM WITH ICT BASED AND AAL-DRIVEN SERVICES

PROJECT	
Acronym:	iCareCoops
Coordinator:	SYNYO GmbH
AAL Project No:	214-118
Project Start:	1 March 2015
Duration:	34 months
Report Covers:	23 months
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DELIVERABLE	
Number:	D5.1
Lead partner:	VIA
Work Package:	WP5 Test
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Table of Contents

1 INTRODUCTION

This deliverable is the basis of the pilot tests. It includes a software demonstrator and the test design. A running demonstrator has been deployed and prepared for initial user tests. This means that all basic functions are integrated and customised towards end-users' needs.

The **demonstrator** has been installed on SYNYO's test server and can be accessed by all consortium members with user name and password.

The **methodology of the end-user tests** is explained in depth in this deliverable. Chapter 2 describes the usability test design in the context of iCareCoops and summarises results from the paper prototype tests. Chapter 3 provides and overview of the internal testing process and the iterative optimisation of the prototype e.g. the conduction of heuristic evaluations and expert design walkthroughs. Finally, this deliverable describes Task 5.2, the development of a verification test, where end-user tests are designed and performed on the iCareCoops solution. The leader of Task 5.2 is VIA. This chapter also provides an overview of the pilot tests.

2 USABILITY TEST DESIGN

The usability tests carried out during the iCareCoops should be carried out in multiple iterations, each involving from seven to ten representative subjects form different user cohorts, as suggested by Nielsen & Landauer (1993). In addition, to get a wider range of insights, different test methods should be applied, depending on the needs and skills of the test participants. In their meta-studies on usability engineering, Jeng (2005) and Holzinger (2005) identified partially overlapping sets of test methods, which can be applied in iCareCoops testing as well. The following table gives an overview of the range of tests that can be selected from.

Usability Test Methods	
Thinking Aloud	Field Observation
Questionnaire	Interview
Focus Group	Transaction Log
Card Sorting	

Table 1: Usability test methods identified by Jeng (2005) and Holzinger (2005) for potential use in iCareCoops testing.

Usability is a multidimensional construct defined by the user, his or her task, the environment and the product itself (Jeng, 2005). Therefore, for every test iteration and test session these features need be defined beforehand (ISO, 2006). In order to evaluate the solutions usability, a set of usability criteria needs to be explored, that can be measured quantitatively or qualitatively. Common usability criteria found in scientific literature (Jeng, 2005) and technical standards are (ISO, 1998, 2006):

Usability Criterion	Measured as …
Effectiveness	Degree of task completion, percentage of tasks completed (9241-11)
Efficiency	Time to task completion, tasks completed per time frame, cost of completion (9241-11)
Satisfaction	Rating scale, voluntary usage frequency, frequency of complaints (9241-11)
Controllability	Interaction speed (9241-110)
Adaptability	Degree of individual adaption (9241-110)
Learnability	Number of learned functionalities, time to learn function (9241-11)
Memorability	Time to re-learn (9241-11)
Ability of self-description	Number of reference to external manuals, number of wrong input formats (9241-110)
Conformity with expectations	Number of misunderstandings, number of identified inconsistencies (9241-110)
Task suitability	Number of useless information pieces or process steps (9241-110)
Helpfulness	Number of requests for help (9241-11)
Affect	Emotions occurring during testing (Jeng, 2005)
Error Recovery	Time to recover from error (9241-11), number of steps to recover from error (9241-110)
Fault Tolerance	Number of recognized and reported errors (9241-11), percentage of understood reports (9241-110)

Table 2: Usability criteria defined in related literature and technical standards.

2.1 Paper Prototype Testing of the User Interface

The test plan follows the practical approach to usability testing defined by Rubin (2008, pp.67).

2.2 Overall Goals and Objectives

The first iteration of usability testing aims to validate the interface design and should therefore be performed before actual coding or implementation of software. In the course of this test iteration we will gather baseline data about the overall **usability** and **ability of self-description** when using without any previous training. The goals are to

- assess the **overall usability** for user groups performing basic, common tasks
- identify **obstacles**
- verify early **assumptions** about the user groups derived from the focus groups
- create a repeatable usability study **protocol**

Research Questions

Based on the testing goals the following research questions can be formulated:

1. How well does the interface support the user's tasks within achieving the goal?
2. How easily and successfully do users find the info they are looking for?
3. How well do users understand the chosen naming?
4. How closely does the software flow reflect the users thinking?
5. What obstacles prevent users from completing task?
6. What questions do users ask as they use the solution?
7. Which interface elements are problematic / helpful?
8. Which elements of the cooperative and personal profile are useful / missing?
9. What causes frustration / satisfaction among the users and about what feature?
10. How quickly does he learn how to use the solution?
11. What differences can be found between the user groups?
12. How do users conceive the solution?
13. Does it have value to them?

Usability Criteria

As paper prototypes are only illustrating the workflow and do not simulate the behavior of a software solution completely, only some of the usability criteria mentioned above can be evaluated in these tests. An example would be timing issues, which are essential for efficiency measures that can't be simulated properly with a paper prototype.

Therefore, the following usability criteria will be measured during paper prototype testing:

Usability Criterion	Measurement Method
Effectiveness	Number of tasks completed
Satisfaction	Visual rating scale, complaint count
Ability of self-description	Number of wrong inputs
Conformity with expectations	Number of identified misunderstandings, number of identified inconsistencies
Helpfulness	Number of active requests for help
Affect	Notable emotional reactions to usage

Table 3: Usability criteria and measurement methods for iCareCoops paper prototype testing.

The measurement of these usability criteria is performed using the supporting documents provided in the Annex of this document.

Participant Characteristics

In WP2 three main end-user groups have been defined and modelled into personas in D3.1. Thus, the tests are carried out with three different user groups in two locations. One test session is performed with the members of Seniorengenossenschaft Riedlingen by SYNYO, exploring the usability for cooperative staff and managers in their working environment. The other session is carried out with older adults by ZDUS, investigating in the suitability of iCareCoops for service receivers in a home setting. We aim to achieve a 50:50 gender split and cover tech-savvy as well as not so experienced users. Building on a mathematical model for usability testing (Nielsen & Landauer, 1993), Rubin outlines 4-5 users will expose 80% of UI flaws (Rubin, 2008, P.72). We will have between 5 and 10 participants from each user group.

2.3 Method

A time and cost efficient way to accomplish the goals of the first testing iteration this is the creation of paper prototypes (Snyder, 2003). Following the guidelines from Snyder (2003), these prototypes will be created as Wireframe Designs in Balsamiq Version 3 and printed afterwards in grayscale.

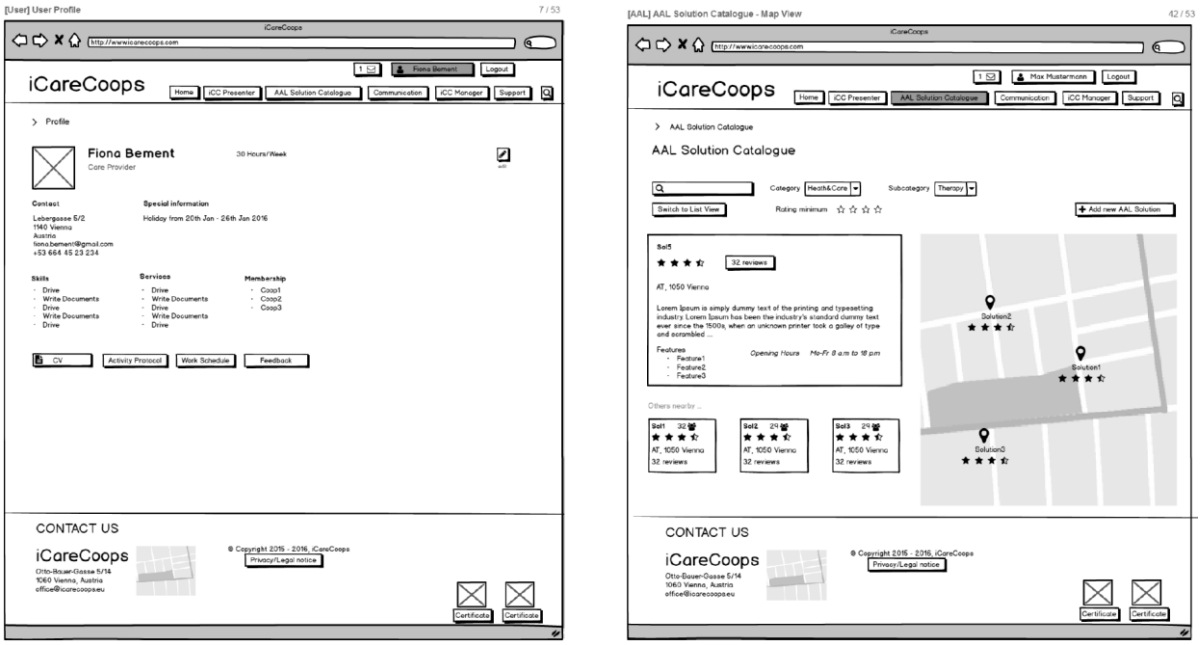


Figure 1: Wireframe Examples

The paper prototype test iteration will be mostly exploratory, because it is conducted at an early stage of the development cycle. Since the iCareCoops solutions only exist as high-level concepts, the test moderator will interact with the participants extensively. Sitting by the participant the moderator can gather first hand impressions. Each user group will test different elements of the solution. Members of a user group will receive the same tasks. The order after the initial registration task will be random to minimize learning effects. We collect data about success and error rates as well as qualitative data about the user's experience with the solution. The main method to be used in the paper prototype test is thinking-aloud testing. Thinking out loud requires the user to verbalize all thoughts while working with the system in order to give better understanding of their interpretation or potential misconception of the interface provided (Nielsen, 1994). The tasks to be performed by the subjects are deduced from the requirements explored in work package 2 and Tasks 3.1, covering features of the iCareCoops web solution prioritized in Task 3.2 with respect to the iCareCoops project aims. For some of the wireframes, participants in this session will be allowed to indicate which fields they would use and which not. In addition, they will be allowed to add ideas for further fields they are missing. Furthermore, a background interview will assess basic information about the participant before the test. After the testing a post-test debriefing will collect qualitative data about the participant's preferences and issues. The testing session can be outlined as follows:

Duration	**40 minutes in total**
Pre-test arrangements	NDA Background questionnaire

(10 min)	Introduction to testing procedure
Tasks (20 min)	Cooperative managers will receive tasks concerning management features. Staff members will receive tasks concerning service features. Care receivers will receive tasks concerning booking of services.
Post-test debrief (10 min)	Broad questions about the user's preferences and other qualitative data Follow-up on any particular issues during the task completion

Table 4: Session Outline.

The following tables give a summary of the planned paper prototype tests for each of the three user groups:

Tasks	1. Register for iCareCoops 2. Setup cooperative on iCareCoops 3. Invite member to become manager 4. Invite member to become service provider 5. Invite member to become service receiver 6. React to a request 7. Poll members about a certain issue
Users	4-5 cooperative managers
Product	iCareCoops UI Paper Prototype
Environment	Work at Desktop Computer or on a Tablet in an Office, moderator sits next to user
Methods	• Thinking aloud • Questionnaire • Interview
Measures	• Error rate • subjective satisfaction • questionnaire replies

Table 5: Paper prototype test design for tests with cooperative managers.

Tasks	1. Register for iCareCoops 2. Request joining a cooperative 3. Create a new service 4. Schedule service assignments 5. Answer a poll 6. Place a request

	7. Answer a members question
Users	7-10 service providers
Product	iCareCoops UI Paper Prototype
Environment	Work at a Desktop Computer or on a Tablet in an Office, moderator sits next to user
Methods	• Thinking aloud • Questionnaire • Interview
Measures	• Error rate • subjective satisfaction • questionnaire replies

Table 6: Paper prototype test design for tests with cooperative staff members.

Tasks	1. Please register for iCareCoops 2. You return to the platform at a later stage after you have already completed the registration. Please join a cooperative. 3. Please reply to the message you have received 4. Please look for the service “Massage” 5. Please start a poll with all coop members 6. Please schedule a new service assignment 7. Please download the manual “Text1”
Users	7-10 older adults in need of care services
Product	iCareCoops Information Solution UI Paper Prototype
Environment	Home setting with mobile device (phone or tablet), moderator sits next to user
Methods	• Thinking Aloud • Interview
Measures	• Error rate • subjective satisfaction

Table 7: Paper prototype test design for tests with older adults and service receivers.

The session with the cooperative managers is reduced in participant count, as Riedlingen is not expected to have enough management staff for higher numbers. This should still be sufficient to find more than 70% of the problems related to the UI (Nielsen & Landauer, 1993).

Data to be Collected & Reporting

For all tests, a set of parameters derived from the measured usability criteria is captured during the session. For the data collected pass-fail criteria are defined for the iCareCoops UI paper prototype. In

order to get a better estimate of the severity, thresholds are defined with respect to the relative number of participants reaching them. When these thresholds are exceeded, a UI re-design will be considered, if no explicit flaw in the test design is identified to cause this exceeding. The following table shows the thresholds defined for iCareCoops paper prototype testing:

Criterion	10% of the participants …	50% of the participants …
Task completion	Fail ≥5 tasks	Fail ≥3 tasks
Requests for help	Request help ≥16 times	Request help ≥8 times
Misunderstandings	Misunderstand ≥5 items	Misunderstand ≥3 items
Inconsistencies	Experience ≥5 inconsistencies	Experience ≥3 inconsistencies
Negative Affect	React negative ≥3 times	React negative ≥1 time
Overall Impression	Rank impression “Bad”	Rank impression “Poor” or “Bad”
Reuse	-	Would not reuse the solution
Information Overload	Rank information provided and/or interactive elements “too high”	-
Information Missing	-	Rank information provided and/or interactive elements “too low”
Language	Had many problems	Had some problems
Missing Operations	Miss many essential interactions	Miss some essential interactions

Table 8: Thresholds for consideration of a UI re-design for iCareCoops.

Task completion is defined by reaching a so-called end-point within the paper prototype. An end-point is a predefined specific wireframe design from the first iteration of the Deliverables D3.2 and D3.3. The end-points for all tasks are described below. The visual design of those end-points can be found in the aforementioned Deliverables form the concept work package of iCareCoops (WP3).

TASK	END-POINT
Cooperative Manager Tests (SYNYO in Germany)	
1. Please register for iCareCoops	HOME Registration Success

2. You return to the platform at a later stage after you have already completed the registration. Please create your cooperative.	PRESENTER Coop Registration Notification
3. Please invite somebody to join the coop as a service provider.	MG Invitation Request Notification
4. Please reply to the message you have received	COMMUNICATION Message click „Reply“
5. Please start a poll with all coop members	COMMUNICATION New Poll click „Send“
6. Please download the manual “Text1”	SUPPORT iCareCoops Support click „Download“
7. Please show nearby AAL services.	AAL AAL Solution Catalogue – Map View
Service Provider Tests (SYNYO in Germany)	
1. Please register for iCareCoops	HOME Registration Success
2. You return to the platform at a later stage after you have already completed the registration. Please join a cooperative.	PRESENTER Join Request click „Join“
3. Please add a service which you offer.	USER User Profile (after edits)
4. Please schedule a new service assignment	MG New Appointment Notification
5. Please reply to the message you have received	COMMUNICATION Message click „Reply“
6. Please start a poll with all coop members	COMMUNICATION New Poll click „Send“
7. Please add a new product to AAL catalogue.	AAL Add new AAL Solution click „Send“
Care Receiver Tests (ZDUS in Slovenia)	
1. Please register for iCareCoops	HOME Registration Success
2. You return to the platform at a later stage after you have already completed the registration. Please join a cooperative.	PRESENTER Join Request click „Join“
3. Please reply to the message you have received	COMMUNICATION Message click „Reply“

4. Please look for the service "Massage"	AAL AAL Solution Service
5. Please start a poll with all coop members	COMMUNICATION New Poll click „Send"
6. Please schedule a new service assignment	MG New Appointment Notification
7. Please download the manual "Text1"	SUPPORT iCareCoops Support click „Download"

Table 9: End-points for the tasks to be completed by participants in paper prototype testing.

Data collected data will be assembled into a brief report with a summary of the study, quantitative and qualitative results as well as a discussion of implications. We will provide recommendations to improve the concept and suggest follow-on research for WP5.

2.4 Test Result

Paper Prototype Testing

Test results are quantitative and qualitative in nature. Their implications will be discussed so that recommendations for improving the solutions can be derived. All templates for data collection can be found in the Annex.

Participants: The paper prototype testing had 22 participants (8 coop managers, 6 service providers of a care coop, 8 care receivers). The first interesting finding was, that care coop management and service providers consisted mostly of elderly people themselves with an average of 67 years among managers and 53 years among service providers compared to 74 years among care receivers.

Use of ICT: All managers always use the telephone for communication (100%), followed by email (96%). Moreover, WhatsApp and fax is used by them. Service providers prefer the phone (89%) and email (78%). WhatsApp (67%) and Facebook (56%) are more popular among this user group than SMS. Care receivers say they always use the phone to get in touch with others, followed by email (83%) and SMS (79%). The strong use of SMS is probably due to their avoidance of messengers such as WhatsApp. The distribution between private and work situations is mixed.

Office Tools: All user groups are well experienced with web browsers, which is essential for the success of iCareCoops. Word is another office tool used across all user groups, while Outlook as an email client is more common among managers. Excel, Calendars and databases are less common. Thus related features should be kept very simple.

Device Usage: Care receivers are twice as likely to use their phones rather than a computer. Laptops and phones are standard tools for managers and service providers. Tablets can be, as expected, neglected at the moment, due to lack of usage among the target groups.

Data Storage: Paper forms are still as much in use as digital documents among managers and service providers. Evan handwritten notes are common (85%). Thus it is vital to provide print features and consider paper workflows for UX design.

Overall Usability: The overall usability being the main goal of the prototype testing was assessed with the previously outlined KPIs and thresholds. As the following table shows, results are generally positive and the paper prototypes passed most of the target values. Nonetheless, half of the participants showed some negative emotions towards the solution during the tests. These emotions were in most cases direct results of the other criterions where the prototype failed, namely misunderstandings, information overload, used language and missing operations.

Criterion	10% of the participants …	Result	50% of the participants …	Result
Task completion	Fail ≥5 tasks	**4,5%**	Fail ≥3 tasks	**36,4%**
Requests for help	Request help ≥16 times	**0%**	Request help ≥8 times	**18%**
Misunderstandings	Misunderstand ≥5 items	**9,1%**	Misunderstand ≥3 items	**54,5%**
Inconsistencies	Experience ≥5 inconsistencies	**0%**	Experience ≥3 inconsistencies	**18,2%**
Negative Affect	React negative ≥3 times	**4,5%**	React negative ≥1 time	**50%**
Overall Impression	Rank impression “Bad”	**0%**	Rank impression “Poor” or “Bad”	**18,2%**
Reuse	-		Would not reuse the solution	**31,8%**
Information Overload	Rank information provided and/or interactive elements “too high”	**13,6%**	-	
Information Missing	-		Rank information provided and/or interactive elements “too low”	**22,7%**
Language	Had many problems	**18,2%**	Had some problems	**40,1%**
Missing Operations	Miss many essential interactions	**18,2%**	Miss some essential interactions	**45,5%**

Table 10: Results for consideration of a UI re-design for iCareCoops.

Key insights of each criterion are described below:

Feedback from Participants: Managers and service providers are only moderately satisfied with the state of the prototype. Only about one third of them would use it again. In contrast, all care receivers

would use the solution again and are 83% satisfied with it. This might be due to the fact that managers and providers are more experienced with technical solutions and therefore have higher expectations. On the other hand, care receivers might see the value added iCareCoops would have for them. Feedback concerning the presentation of the platform is mixed. The qualitative results support the quantitative in most cases. For instance, used language and information overload, especially for elderly users, were expressed during the testing sessions. Another criterion the prototype failed was interaction options. 30% of the managers, generally more experienced with technology than the user groups, think that elements are missing. Service providers are not sure, if the solutions are helpful for the tasks. All participants were fully satisfied with the assistance of the researchers conducting the test sessions.

Test Tasks: Although a total of 12 questions were asked concerning task 3, none of the managers were able to invite a new service provider to join the solution. Only two could start a new poll and download the manual and three could show nearby AAL services. Only one of the service providers managed to add a new service they offer. Most of their questions concerned the platform in general, polls and the AAL catalogue. All care receivers were able to complete all tasks due to the strong assistance by the researchers. In contrast to the other user groups they asked for assistance (60 times) and a lot of questions too.

Expression of Emotions: Emotional reactions are spread over all tasks. They range from anger about the complexity of the platform, to frustration about it ("I am too old for this."). A couple of participants were surprised about the completion of tasks (e.g. where the manual could be found). Especially the care receivers had concerns that they might do something wrong and also about privacy on the platform. People not familiar with computers generally are afraid of using the wrong commands and breaking the computer or the software.

Misunderstandings and Inconsistencies: The 22 participants discovered 16 concrete inconsistencies on the current state of the prototype. There were 24 misunderstandings about certain elements, where the concept has to be tweaked to be easier to understand. The participants also contributed with 26 concrete suggestions on how to improve the solutions. While this is one of the criterions where the solution failed at this early testing stage, a lot of misunderstandings could be unravelled already and can easily be improved for the next development iteration. For example, the difference between a user and a coop was not understood by a majority. Moreover, participants were confused why to join a coop. Wording and technical terms, while easy to fix, caused a lot of confusion during the testing e.g. "support", "my services" and "appointments". The term "AAL" is completely unknown. Since iCareCoops aims to raise awareness on AAL it will be kept. Nonetheless, an explanation of the term and the benefits of the initiative must be added. Care receivers also had difficulties understanding the difference between registration and login and software workflows in general. Suggestions for improvement by the participants range from a wizard to description texts

for all elements. Additionally a reduced UI for care receivers was suggested. Coop managers will use member management most of the time, so seamless workflows are vital for iCareCoops' success. Some UI inconsistencies are missing poll/messaging options within the member list and a second-level-navigation. Elderly people especially demand clear steps back and forward within their tasks as they are not used to this kind of thinking. The elderly are lost if there are too many options available for them at once, they would just use the functions they really need. Thus, reduced features and menus for them will be considered. Some of them have never used an online discussion board before. Therefore, this form of communication has to be re-evaluated or clearly explained. All learnings from the prototype testing were turned into requirements. These will be considered for the next iteration of the technical specification to come up with improved clarity, reduced information per page, and easier language. Because of the high number of misunderstandings and missing operations of the prototype, additional research about user experience for elderly users has been conducted (5.1). These new insights and UX implications will be developed into design mockups in the course of WP4.

Lessons Learned for Test Design

During the tests, some minor test design flaws were identified, which will be discussed to be avoided in subsequent test sessions. The mayor findings from evaluating the paper prototype test design can be summarized as followed:

- Language barriers and translation problems might lead to unforeseen confusion when answering questionnaires
- Horizontal and/or vertical lines are suggested to support correct box ticking in case of more than four items and/or options
- Reuse should be considered under certain conditions instead of just yes/no (i.e. "I would use this solution, if …")
- Assessment of the researcher teams performance and the test quality might be reconsidered, though not excluded
- Tasks should be related to the participant's regular tasks instead of generic actions (i.e. "schedule a car pool ride" instead of "schedule an assignment")
- Dropdown Menus for list filtering should not be set to a default value or shown as lists, as they are tempting to be clicked without any real gain

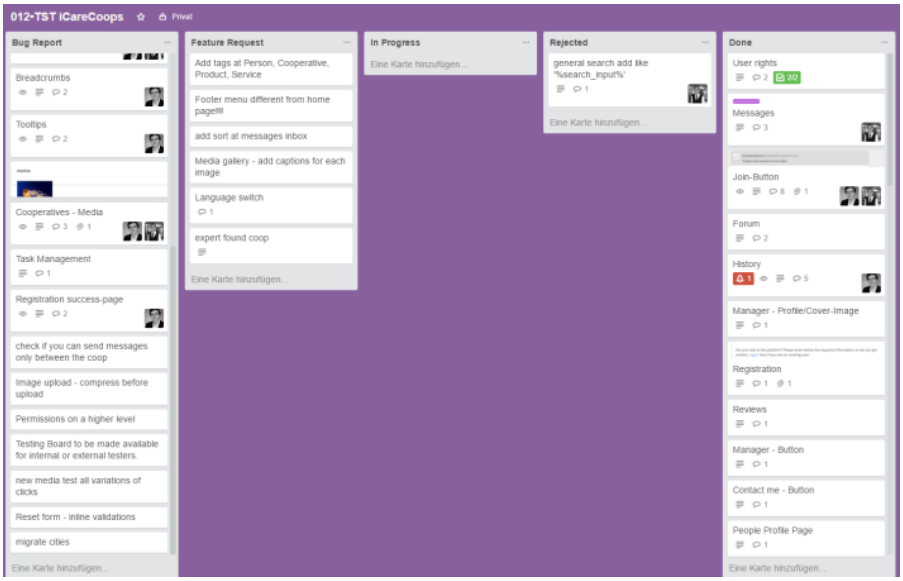
Based on these findings, for the following sessions it is highly advised to shift wording conventions away from technical task descriptions to a more natural language. An example would be changing "Please register for iCareCoops." to "Please create a new account for the platform." Not all lessons learned can be carried in a meaningful way to the tests with the digital iCareCoops prototype, but are rather useful for future paper prototype testing sessions. An example is the filtering option that changes listed items in a digital prototype while not having any visual effect on paper prototype tests.

3 TESTING AND ITERATIVE PROTOTYPE OPTIMISATION

Testing is a crucial phase in every software engineering project. iCareCoops combines different test methods to iteratively optimise the technical prototype with close collaboration between testers and developers. Test procedures can be divided into three types – requirements analysis, UX tests and functional tests. Over the period of three month (August to October 2016) a team of four software testers with advanced knowledge of the field thoroughly examined the iCareCoops web-platform. Among the testing methods employed by the team were risk-based and equivalence class tests. It was tried to insert unusual values where one would expect erroneous behaviour of a software application. Equivalence class testing was used, for example, for the three user-groups of care giver, service receiver or cooperative manager. Their efforts resulted in about 70 defects of medium to high severity. As usual in iterative software development projects the number of minor style deviations was much higher. Due to the high usability goals iCareCoops wants to achieve even small UI glitches have to be fixed.

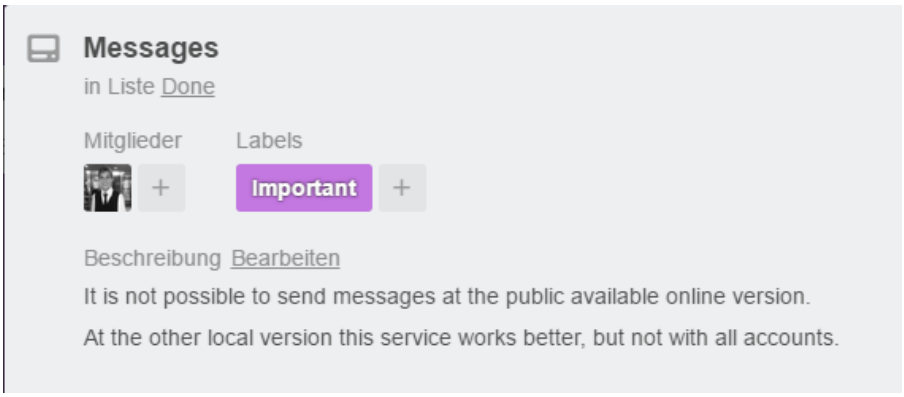
Requirement analysis (Sommerville, I.) is an important tool to evaluate whether the solution offers the functions which were defined at the project start. The MoSCoW-model is used for the prioritization of requirements. “Must haves” and the “Should haves” are features that will be implemented for the initial tests. Requirement analysis is much easier to conduct when the requirements are uniquely interpretable and consistent, like in iCareCoops. For example one detected difference to the requirements was that the cooperative manager should also be able to add new service tasks via the task management although he himself is not a service provider. Requirement analysis allowed for easy detection and implementation of this missing function.

Tests of the user experience (Myers, G) are essential to secure that requirements formulated in the style guide (D4.3) are fulfilled. This guide contains mostly non-functional requirements, which are defined to guarantee a consistent and easy-to-use design. As the iCareCoops web-platform will be used by older adults too it provides accessibility tools. The solutions will conform to WCAG-AA and offer features to help people with reduced abilities to set a higher contrast, for instance. The exact accessibility specification is also a part of the UX style guide.



Screenshot of the Trello test board

The third part of the tests concerns functionality (Rätzmann, M.). Functional tests check if the platform provides the functions in the initially defined form. For example, in its first version the service search did not work as expected. While search bar and button were present a search for a term did not show any search results. The issue management tool “Trello” is used to report the detected defects and streamline the bug-fixing process connecting testers and developers on a shared task board. Moreover, defects can easily be prioritized, described, and tracked in a structured way.



Screenshot of an exemplary issue on Trello

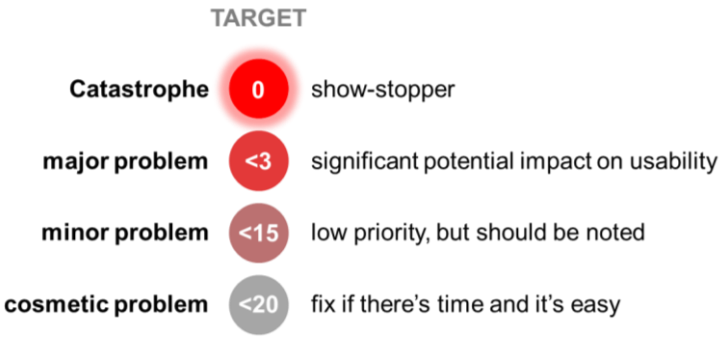
At a second stage of testing other members outside of the development organisations will be invited to test the solution.

3.1 Expert walkthrough with heuristic evaluation

At the AAL Forum 2016 the team of iCareCoops had the opportunity to invite external experts to a hands-on workshop. 20 randomly selected participants who saw the paper prototype of the iCareCoops web-platform for the first time conducted an expert walkthrough with heuristic evaluation. The only prerequisite for participation was basic or advanced knowledge of UX.

Test design

The objective of the expert test was to identify usability problems of current prototype. Measures were number and severity of identified problems. The ten principles for user interaction by Nielsen/Molich were used as heuristics for classification of issues. Severity was ranked based on the scale from Barnum. The web-solution was made available in the form of colour paper prototype on A3. The 20 participants were divided into three groups led by an iCareCoops consortium member. Each test team was guided through up to five tasks to be fulfilled as coop managers, the main target group of the first prototype release. Target values for the prototype to pass the test were zero catastrophic issues, less than three major problems, less than 15 minor problems and less than 20 cosmetic problems.



Before the walkthrough the group leaders made sure that all participants understood the test design. Then, they read out loud the task description and showed the first screen. Participants were asked for their opinion on how they would complete the task. If they wanted to take a completely different path than the ideal one, they were told that this was impossible during this test because of the time constraints. Participants should point out any issue they see right away. The group leader wrote down each issue and the related screen on a moderation card and proceeded. Once a task was completed the leader asked again what participants thought of the flow.

TASK 1	REGISTER COOP
Task description	**You are the manager of a new care cooperative. Please register your cooperative on the platform!**
Ideal click-flow	**1.1: [HOME] Startpage** Click "Register" OR Click "get started" 1.2: [HOME] Startpage 2 Click "Register a cooperative" 1.3: [Register] Register a cooperative 1 Fill in the form and click "Continue" 1.4: [Register] Register a cooperative 2 Fill in the second form and click "Continue" 1.5: [Register] Register a cooperative 3 Check the data and click "Submit" 1.6: [Register] Done

TASK 2	CHANGE THE PROFIL PICTURE
Task description	**You return to the platform at a later stage after you have already completed the registration. Please login and change the profile picture of your coop!**
Ideal click-flow	2.1 = **1.1: [HOME] Startpage** Click "Login" 2.2: [HOME] Login Enter email address and password and click "Login" 2.3: [HOME] Logged in Startpage ***Shortcut to 2.5 - Click "Manager"*** **OR Click "My Cooperative"** 2.4: [MG] My Coop ***Shortcut to 2.6 – Click "Edit" on profile picture*** **OR Click "Manager"** 2.5: [MG] Manager Click "Profile/Cover Image" 2.6: [MG] Cooperative – Edit/New Entry Click "Select image" next to "Profile picture"

	2.7: [MG] Cooperative – Edit/New Entry Choose image and click “Open” 2.8: [MG] Cooperative – Edit/New Entry Click “Submit” 2.9: [MG] Cooperative Profile

TASK 3	**INVITE A NEW SERVICE PROVIDER**
Task description	**We have returned to the home page. You are already logged in and you want to invite the expert “Silvia Müller” to join your coop as a service provider.**
Ideal click-flow	3.1 = **2.3: [HOME] Logged in Startpage** **(A) Click “Expert Pool”** 3.1.2: [MG] Expert Pool Choose the right expert for your coop and click “Invite to join coop” **(B) Use global search for “Silvia Müller”** 3.2.2: [HOME] – 1 When there are more possible persons, choose the right one. 3.2.3: [MG] Search Click “invite to join coop” **(C) *Shortcut to 3.3.3 - Click “Manager”* OR Click “My Cooperative”** 3.3.2: [MG] My Coop Click “Manager” 3.3.3: [MG] Manager Click “Member Management” 3.3.4: [MG] Cooperative – Edit/New Entry Click “Invite Member” 3.4: [MG] New Message You can adapt the suggested text and click “submit” 3.5: [MG] New Message: ”Invitation sent” screen

TASK 4	POLL
Task description	**We have returned to the home page. Please start a poll with all coop members.**
Ideal click-flow	4.1 = **2.3 [HOME] Logged in startpage** Click “Polls” 4.2: [HOME] Poll overview Click “New Poll” 4.3: [MG] ALL Polls New Add a title and at least two answers and click “Submit” 4.4: [MG] All Polls

TASK 5	PRODUCT SEARCH
Task description	**We have returned to the home page. Please buy the cheapest GPS device!**
Ideal click-flow	5.1 = **2.3 [HOME] Logged in startpage** **(A) Click “Products” to filter** 5.1.2: [HOME] Products Mark the Checkbox next to the category “GPS Devices” and then click “Search” 5.1.3: [MG] Products filtered **(B) Click “Products” to search** 5.3.2: [HOME] Products Search for “GPS” with the internal search function 5.3.3: [MG] Products search **(C) Use global search for “GPS”** 5.2.2: [HOME] Search results “Click” on device “LOK8U Freedom” 5.4 [MG] Product page Click “Collective Buy”

10 Usability Heuristics for User Interface Design (Nielsen/Molich 1990, later adapted)

1) **Visibility of system status:** The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
   a) Do you know where to go next in the navigation?
   b) Is it clear if the content rendering of a page is completed?

2) **Match between system and the real world?** The system should speak the users' language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
   a) Do you understand the terms used on the website/the tool? Labels Headings Explanations ...
   b) Do you understand the meaning of the icons?

3) **User control and freedom:** Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
   a) Do you know how to return to the main page / 'home' function ?
   b) Is the 'home' function available on every page?

4) **Consistency and standards:** Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
   a) Do symbols and labels repeat?
   b) Are existing standards for symbols / metrics used? (Home = House; Help = Question mark)

5) **Error prevention:** Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
   a) Are there sufficient error messages?
   b) Do you understand messages trying to prevent you from entering invalid data?

6) **Recognition rather than recall:** Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
   a) Is the structure of topics clear and logical for you?
   b) Is the structure of information clear and logical for you?
   c) Is the structure of actions you can choose clear and logical for you?

7) **Flexibility and efficiency of use***:* Accelerators -- unseen by the novice user -- may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
   a) Are shortcuts guiding you through the system available? (e.g. to not having to click through a user's manual every time)
      i) If yes, do you find them useful?
      ii) If no, would you find it useful to have shortcuts while navigating the website?

8) **Aesthetic and minimalist design**: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
   a) Is the information provided on the website precise (e.g. correct and specific)?
   b) Is the information provided on the website too extensive or too sparse?

9) **Help users recognize, diagnose, and recover from errors:** Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
   a) Do you understand why an action was erroneous?
   b) Do you understand how to solve the problem?

10) **Help and documentation:** Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.
   a) Do you find help or contextual explanation (i.e. to explain specific words or steps) where necessary?

Once all five tasks have been completed or the test time was up each group evaluated findings according to the ten heuristic principles and severity. Groups went through the collected cards and decided severity of the discovered issues. Participants were supposed to decide on their own while leaders tried not to influence decisions. Severity was marked with stickers on the card. Due to the limited workshop time only the top-3 issues with highest severity were analysed for the affected heuristic principle. The principle numbers was also added to cards. After the group sessions the top--3 findings were presented before all workshop participants.

3.2 Results

Surprisingly test participants evaluated the prototyped more detailed than expected. Thus, none of the groups managed to complete more than three tasks because of the time constraints. Nonetheless, a total of 47 issues have been identified. The prototype failed the test because 10 of the issues were categorised as major and 23 as minor. It must be noted, however, that categorisation happened very quickly and probably had room for improvement. No catastrophic errors have been found. So the prototype at least passed the most important criteria. Affected heuristic principles were mixed. Thus, it was impossible to draw any additional conclusions.

3.3 Next steps

All issues have been added to Trello as bugs to be fixed. Because of the effectiveness of the expert walkthrough – 50 issues in 20 minutes – another iteration might be useful for another version of the prototype.

4 TEST DESIGN FOR USABILITY, FUNCTIONALITY, AND PERFORMANCE PROBLEMS

Task 5.2 is the development of a verification test, where we design and perform usability tests on the iCareCoops solution. The leader of Task 5.2 is VIA and the following organizations are contributing: ZHAW, COOPEU, ZDUS, RIED, IDEAL, SIVECO.

The test is performed in the language of the countries in question, except for the tests carried out by the technical experts, where the test will be in English.

Usability is a quality associated with a website, and it concerns making the digital effects as useful as possible. It is crucial to the experience the user has when performing a task, and it is vital to the iCareCoops solution success (Gregersen and Wisler-Poulsen 2013).

The general usability test criteria are important, however, they will often be tested as a primary functionality (Gregersen 2013). It is the most effective and efficient way to uncover usability problems. The short description of our usability pilot test is as follows: We watch users trying to accomplish tasks on a website. In our case the pilot testing consists of three iterations. Changes are made to the prototype so that findings are corrected. Each pilot test involves representative test individuals from the user cohorts, as suggested by Nielsen & Landauer (1993). We will use the findings from the usability test and feedback loops for further development of the prototype. We plan field tests with the primary future customers of iCareCoops i.e. managers of cooperatives.

We are interested in covering the users' experience when they use the iCareCoops solution. We divide usability into three main categories as previously described by Gregersen and Wisler-Poulsen: Functionality, efficiency, and satisfaction.

To get a wider range of insights, we have decided to use thinking aloud, qualitative semi-structured interviews and quantitative test methods.

4.1 Overall purpose

The aim of usability testing is to investigate the interface design. The main aims are to identify and create a complete list of obstacles, problems for performing basic tasks and suggestions for improvements. Research questions:

1. How useful is the product in the users' organization? (meaning)
2. How easily do the users solve the tasks? (effectiveness)
3. What obstacles prevent users from completing the task?
4. Which interface elements are problematic/ helpful?
5. Which interface features or tasks cause emotional reactions and to what degree?
6. Which suggestions do users have to improve the product
7. Identify number of bugs, inconsistencies, navigational dead ends, and time spent performing tasks.

4.2 Participant characteristics

Experts: The prototype I (in an English version) is tested by a group of experts in Denmark. They will produce a report containing suggestions for improvements. These improvements will be considered for incorporation in the iCareCoops solution leading to prototype II. The experts are ICT engineering

students at VIA Business. We are looking for technical experts - alternatively it could be iCareCoops members. They are trained in testing ICT solutions.

Managers: In the first pilot test session we use prototype II (see chapter 1.3). It will be carried out with managers of ETRI - Development Cooperative by ZDUS staff members and on members of the Seniorengenossenschaft Riedlingen by SYNYO, exploring the usability for cooperative providers and managers in the working environment. ETRI helps create different startup cooperatives dealing in supply and services, and is therefore suitable also for pilot testing. They are very interested in the iCareCoops platform, and have agreed to participate.

In the second pilot test prototype III is tested on members of the Seniorengenossenschaft Riedlingen by SYNYO and on members of ETRI - Development Cooperative by ZDUS staff members. Prototype II and III include all features exploring the usability for managers in their working environment. This group of managers is selected because of the close cooperation in previous parts of iCareCoops. A group of relevant service providers and a group of older adults in need of care services should be included in the test of prototype III. Tasks and interview guide for managers concerning usability in prototype III test is the same as in prototype II test. At prototype III test there will be added further marketing questions like Collective Buying, Shared Logistics etc. The groups of service providers and older adults in need of care will only be exposed for the Thinking Aloud test.

It is expected that the interviews of managers will contribute with enough information on usability issues. Therefore no interviews will be conducted with service providers and older adults in need of care.

We aim to have tech-savvy as well as not so experienced managers. Building on a mathematical model for usability testing (Nielsen & Landauer, 1993), Rubin outlines 4-5 users will expose 80% of UI flaws (Rubin, 2008, P.72). We will have up to between 5 and 10 participants from the user group.

4.3 Usability test method

VIA suggests the following design as shown in figure 1 and methods for usability tests as shown in table 1-4:

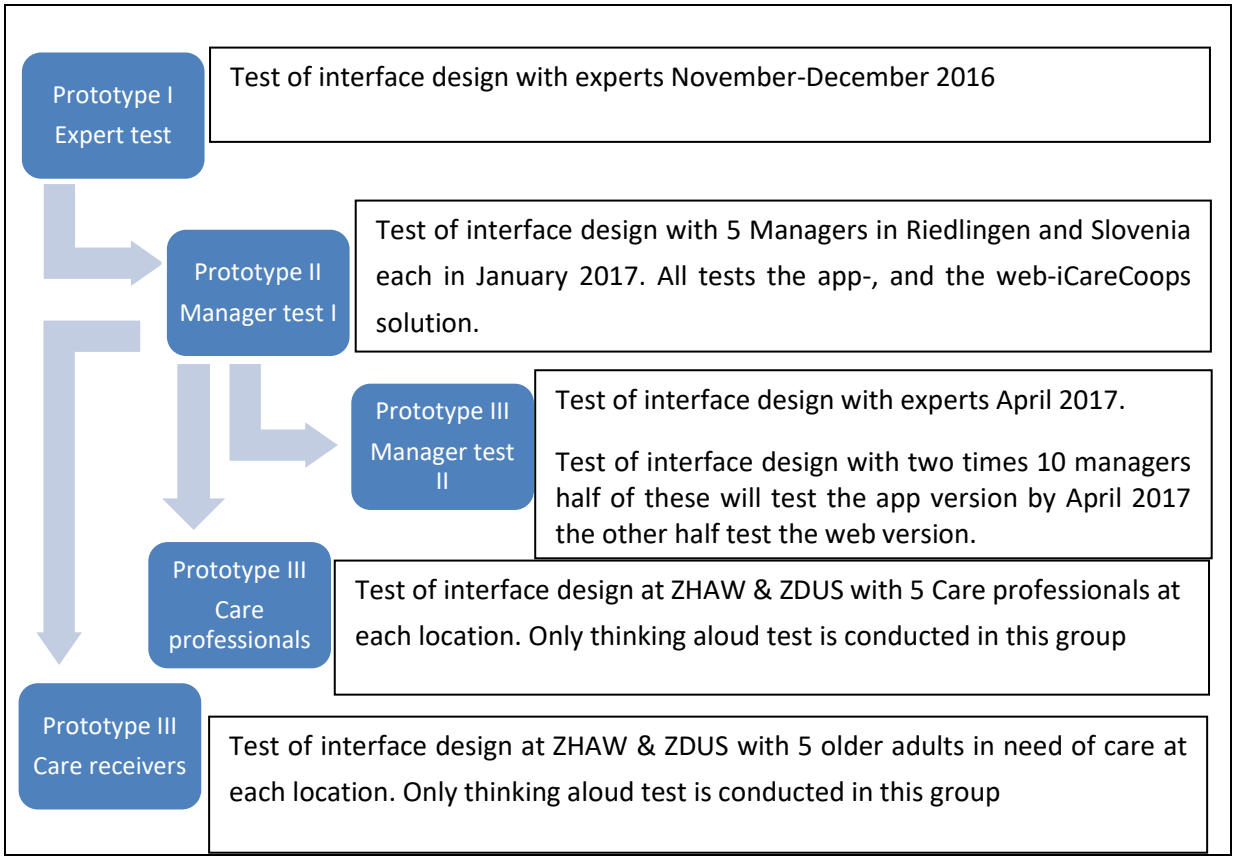


Figure 2 – Plan of iCareCoops test solution

Random Explorative study of the prototype I	We ask the experts to navigate the product and search for defects.
Users	Experts (ICT engineering students from VIA business or iCareCoop members)
Product	iCareCoops UI Prototype I (November 2016) and prototype III (April 2017)
Environment	Work at desktop computer or on a tablet.
Methods	• Make a report containing bugs and other usability issues (see ch. 1.4)
Measures	• Identify possible obstacles • Identify bugs, inconsistencies, navigational dead ends, etc.

Table 1: Usability test design for tests with experts

4.4 Preparation Before Test

Prior to testing prototype II, it is necessary that the web part of iCareCoops solution is established and there must be created a cooperative containing all features as described in **Frontend Implementation Status Report.** In addition to be ready to record the audio and the screen and for those who accept the conditions described in the Informed Consent document (se Appendix IV) it is also necessary to install a screen recorder such as Camtasia Studio. Prior testing, two copies of the Informed Consent document also need to be translated and printed and signed, one for the participants and one for the project. In accordance to score the emotions the Emotional Wheel needs to be printed so that it can be used during the test (see Appendix I).

I can be useful to translate and print the interview guide so that it can be broad to the subsequent qualitative interview.

4.5 Test Endpoints

The task completion is defined by reaching a so-called end-point within the website prototype. The end-points is predefined specific wireframe design. The end-points are described for all feedback loops and for both the iCareCoops web solution and the app solution for Android. The visual design of those end-points can be found in the **Frontend Implementation Status Report**.

Endpoints iCareCoops web solution

- Registration
- Authentication
- Password recovery
- Tasks and tasks actions including open tasks and schedules
- Cooperatives and cooperative level actions (accepting members, joining a cooperative for both care givers and receivers)
- Private messaging system
- Map (cooperative listing by GPS coordinates)

Endpoints iCareCoops app solution

User

- Login
- Reset/Resend password
- Register which tasks you are interested in

Task

- Get list of predefined tasks for a coop
- Create task
- Edit task
- Delete task

Schedule

- Get user schedule. Possible to get a schedule for a user. It should be possible to post for how many days into the future the
- Get coop schedule. Possible to get a schedule for the coop.

Chat

- Create a new chat. A chat can be between two or more users
- Post a message to a chat
- Get list of chats for specific user

The explorative tasks in the tables below are based on the respective endpoints.

Explorative tasks	We ask for completion of the test setup to avoid bias and get the feedback needed. • Login and registration • Invite and remove members • Set service provider role (rights) to an edit level (if it exists) • Show member details • Edit content in a cooperative profile • Add a cooperative service • Remove a cooperative service • Create a poll for members
Users	10 cooperative managers in the test of prototype II. 5 cooperative managers in each of the two prototype III tests of the iCareCoops web solution (ZDUS and SYNYO) and 5 cooperative managers in each of the two prototype III tests of the App solution (ZDUS and SYNYO).
Product	iCareCoops UI Prototype II and Prototype III
Environment	Work at desktop computer or on a tablet in an office, moderator sits next to user Camtasia studio recording (video recording of screen and voice)

Methods	Thinking aloud test including video recording of screen and audio recording of voice of the manager and observation of the manager (see ch. 1.5) Semi structured motivational qualitative interview with a predefined interview guide (see ch. 1.6)
Measures	• What percentage of tasks is completed? • Qualitative description of functionality, efficiency and satisfaction • Identify type and number of bugs, inconsistencies and navigational dead ends and identify number of clicks before target is reached. How often do they recover if they encounter problems? How many times do they need help? How many completed the test and how many gave up? How long time does it take them to solve the test? • Subjective satisfaction • Number and degree of emotions during thinking aloud test

Table 2: Usability test design for tests with cooperative managers

Tasks	8. Register for iCareCoops 9. Request joining a cooperative (There has to be a cooperative to join) 10. Create a new service 11. Schedule service assignments 12. Answer a poll (a poll must be created in which the members can participate) 13. Place a request 14. Answer a member's question (There has to be a question from a member to answer)
Users	5 care professionals consisting of a group of coordinators inside ZDUS project Elderly for Elderly http://www.zdus-zveza.si/project-elderly-for-elderly And 5 care professionals recruited by ZHAW
Product	iCareCoops UI Prototype III
Environment	Work on a desktop computer or on a tablet in an office, moderator sits next to user
Methods	• Thinking aloud
Measures	• Interface features that causes emotional reactions, and to what degree. • Time consumption solving task • Number of obstacles preventing users from completing tasks

Table 3: Usability test design for tests with cooperative care professionals.

Tasks	8. Register for iCareCoops 9. Join a Cooperative. 10. Reply to a message. (There has to be created a message that the test person can answer.) 11. Order the service “Physiotherapy” and schedule it 12. Answer a poll (There has to be created a poll to answer.)
Users	5 older adults in need of care services from each location (ZDUS and ZHAW).
Product	iCareCoops Information Solution UI Prototype III
Environment	Home setting with mobile device (phone or tablet), moderator sits next to user
Methods	• Thinking Aloud
Measures	• Interface features that causes emotional reactions, and to what degree. • Time consumption solving task • Number of obstacles preventing users from completing tasks

Table 4: Usability test design for tests with older adults and service receivers.

4.6 Experts Reporting

We suggest that technical experts test the product. The aim is to make them find possible bugs and other usability problems for performing basic tasks and give suggestions for improvements. The experts are ICT engineering students. They are familiar with website-/product testing. After the test the experts make a Q/A-report on the product’s usability. Findings and suggestions are noted in a summary, so results can be incorporated in prototype II.

4.7 Thinking Aloud Test

The arguments for choosing the thinking aloud test is that it gives us a list of identified usability problems for performing basic tasks as described by Gregorsen (2013). It will contribute to answering our research questions. In addition, the thinking aloud test gives the moderator the opportunity to ask for suggestions for improvements of the product and business related questions.

In a digital environment, thinking aloud is a frequently used method in usability tests. In most of the research on websites usability tests are set up in which a user is given a set of realistic tasks, in our case for example a manager offering care. We request that the test persons perform the tasks thinking aloud while testing the prototype version reached at this stage. The thinking aloud test begins with a brief introduction containing information on the purpose of the test, interviews, and testing procedure. At the prototype II test all test persons will first be testing the iCareCoops web solution because they have to be redistricted before they can test the app solution. The same procedure is conducted in prototype III testing.

At the thinking aloud test there will be a moderator and an observer.

The participants fill in an informed consent document[1] before test. This declaration is prepared by the individual partners and should be included. An English version is included (see appendix IV). A short test assignment is offered to let participants become familiar with the "thinking aloud" technique and the way to collect emotional data is introduced.

Thinking aloud requires the users to verbalize all thoughts while working with the system in order to give a better understanding of their interpretations or potential misconceptions of the interface provided (Nielsen, 1994). In this part, a moderator is present and is supposed to help the test person think aloud. Sitting next to the participant, the moderator's task is to gather the participant's expressions of emotions and combine them with the situation in which they occurred. Each group will receive realistic tasks (see table 2). While performing tasks, the screen audio will be recorded. The video recording includes screen capture, and capture of the participant's face. The latter involves only those who have accepted video recording of their faces. We suggest that the programme for video recording used should be Camtasia by Techsmith, https://www.techsmith.com/camtasia.html.

The benefits of recording audio and video of what happens on the screen and record the face of the test person is that it gives the opportunity to analyze emotions in connection to tasks. All three methods will be synchronized. Furthermore, the recordings gives the opportunity to replay if needed while analyzing. We suggest that the test design of the app will be similar to the test design of the iCareCoops solution (webpart).

The moderator should be polite and neutral, when asking questions and giving comments. The moderator has two tasks during the scenario with the test person. The first task is to ask questions, if the test person stops thinking aloud. If the test person stops working for 3-4 seconds, then the moderator should make a comment or ask a question - for example "what are you thinking?".

The observer has one task during the scenario. It is to observe what the test person is doing on the screen and document this so that the 6 research questions can be answered. Conducting the analyse it is possible to use the recordings from the thinking aloud test if necessary.

If any test persons can´t solve the tasks or if they are unable to continue then the moderator must guide the test person through the problems so the test can be conducted.

Emotional wheel

The second task is to observe emotional expressions during the task. Before testing the moderator print and include the emotional wheel. This can be found at appendix I.

[1] An informed consent document is prepared by individual iCareCoops partners

When observing, the moderator asks what emotion are evoked. Participants can choose between following emotions: anger, frustration, sadness, happiness, joy, and pride. The participants score emotions on a numerical scale from 0-5, where 0 is the lowest degree, and 5 is the highest degree of emotions (see appendix I). The choice of emotions and the way to score are inspired by the Emotional Wheel (Fontaine, 2013). The reason for analysing emotions by using the emotional wheel is that it gives the opportunity to investigate usability issues.

4.8 Motivational qualitative interview

Motivational interview

In order to evaluate the usability of the iCareCoops web and App solutions, we also use motivational qualitative interviews. Therefore, after the thinking aloud test the moderator will make individual interviews. In addition, we record the audio of the interview because it makes it possible to listen to it again during analysing. Moreover, an issue is to ask questions based on the thinking aloud test. The interview is based on an interview guide (see table 5). The questions in the interview guide seek to uncover usability criteria such as: functionality, efficiency, satisfaction, self-description ability, conformity with expectations, helpfulness, and affect. The interview guide is a repeatable interview, and the plan is to use the same interview guide in all tests (see figure 1). The role of the observer is to take notes in OneNote during the interview so that these notes will function as bookmarks in the recorded audio. Before conducting the interview the observer make OneNote ready for the interview. Insert the 6 research questions (see appendix III) and turn on microphone so that the audio will be recorded in OneNote. When notes are taken during the interview these will function as codes.

Motivational qualitative interview guide

Research questions	Interview questions	Questions to help answering
Effectiveness	Describe how the interface supports your task in terms of achieving the goal. Explain how you solved the tasks?	What obstacles prevent users from completing task?
Satisfaction	How satisfied are you with the product and the interface?	What causes frustration or satisfaction? Describe the feature. What questions do you have

		regarding help?
Conformity with regard to expectations	Explain how the solution might be of value for you? How does it correlate with your expectations? Which suggestions could you contribute to improve the design?	
Functionality	What do you think of the functionality of the web site? How do the menu work for you? How did you experience the navigation on the homepage? How satisfied are you with the design: colours, size, contrast, symbols etc. How do you think the information you got on the homepage was usable? Describe missing features regarding functionality?	How do you understand the text on the site? Are the functions of the site easy or difficult to use? Did you need to request help? At which points do you actively request help? Describe interface elements you find problematic or helpful? Are some interface elements problematic? Can you describe some good elements? Did you miss some functions?
Affect	Describe how you felt, while you tested the solution?	
Marketing analyses questions Se Appendix II for further questions about marketing analyses.	What will it take to make you purchase this product? Which changes should be made to the product to make you interested in buying it?	

	Do you have suggestions to other target groups in terms of what functions and services this product could provide?	

Table 5. Interview guide for qualitative interview

4.9 Test results to be collected, analysed, and reported

1. How useful is the iCareCoops solution in the user's organization?
2. How easily do the users solve the tasks?
3. What obstacles prevent users from completing the tasks?
4. Which interface elements are problematic/ helpful?
5. Which interface features or tasks cause emotional reactions, and to what degree?
6. Which suggestions do users have to improve the product?

Analysis of the video data from the think aloud test will be carried out.

4.10 Experts reporting and summary

The test by VIA ICT students were performed November 2016 and bug reports were created December 2016. There were 14 ICT students prepared 67 bug reports all together. Several were concerning different browser issues. The iCareCoops web solution did for example not work in Chrome. Other reports described problems changing website colours. For further details on the findings se appendix V (separate file available on http://project.icarecoops.eu/download/).

SYNYO, iDeal Development and Siveco will analyse the bug reports by the end of December 2016. All bug reports are included in appendix V. Based on the findings prototype II will be developed January 2017.

4.11 Thinking Aloud Test and Emotional Wheel Analysis (qualitative)

The video and audio of the thinking aloud test are analyzed in ways inspired by the method described by Malterud (2011). For a brief English summery of the method, see ch. 1.7.

The findings from prototype II testing are incorporated into prototype III.

The same procedure is repeated in prototype III test with service providers and older adults in need of care.

The emotions gleaned during the thinking aloud test are to be analysed by associating them with the task where they occurred. This provides an overview of the emotions associated with each task.

For all tests, a set of qualitative data is derived from the measured usability criteria during the session. For the data collected in each iteration SYNYO, Siveco and iDeal Development will get the result for further processing on the iCareCoops solution.

In this analyses it is not relevant to make quantifications of errors, as this will not make sense in terms of this small population of test individuals (Kvale & Brinkman, 2015). If an informant discover a problem, this issue will be relevant to add to the results, as this individual can also be representative of a larger population of users.

A report on what the test groups in total have stated will be made. The qualitative data collected will be assembled in a report with a summary of the study, as well as a discussion of implications. This will provide recommendations to improve the solution.

4.12 Emotional wheel analysis (quantitative)

The emotional test score is quantified in each of the five categories: anger, frustration, sadness, happiness and joy and the degree of emotion evoked (0-5).

If the average level of the following emotions: anger, frustration or sadness during a given task reaches 3 or more then it will be relevant to reconsider and redesign the iCareCoops solution in question.

The emotions: happiness and joy give an impression of aspects of the product that have a high usability. This will contribute to a methodological triangulation which supports findings in the qualitative analyzes. The emotional wheel is ready for printout (se appendix I) so that it can be used during The Thinking Aloud Test.

4.13 Analysis of the semi-structured interview using systematic text condensation

The audio containing the qualitative interview is analyzed in ways inspired by the method described by Malterud (2011).

Transcription

The recorded interview should be structured into a written form in order to prepare it for further analysis. In this phase the interview is changed from an oral to a written form, the so-called transcription. The procedure involves going ahead and writing down the interview word by word. It is time consuming to transcribe the entire interview. Therefore, we suggest that only important pieces of the interview are transcribed (where the 6 research questions are answered), in order to prepare each code category for further cross analyses. We suggest that notes are taken in a program that can bookmark the text, while the interview are conducted and if necessary also afterwards when listening to the recorded interview. We suggest OneNote for the task because it can contain audio and meet the need of bookmarking.

Coding

The first step is to code each of the test group recordings of interviews in categories corresponding to the six research questions described in ch. 1.1. We suggest that coding is made during interview as described previously.

If two codes describe the same phenomenon, they should be condensed into one.

From coding to meaningful categories

The second step is to condense the content of each category in each interview, thereby presenting the most important findings. The meaning appears in a condensate. This means gathering sections of text that belong to each code

Interpreting

The third step is to conduct analyses between interviews so that each of the categories will be cross analyzed.

Thereby the text sections are sorted according to patterns, and represented in a condensate of meaningful text, according to the categories. Then descriptive statements are made according to each category and the condensate will contain the most important themes from all interviews. It can be useful to do this in co-operation with another researcher in order to identify more aspects. It is important to avoid drawing conclusions that do not correspond to the data.

The conclusions from the analysis of the interview are incorporated into the next prototype along with the findings from the thinking aloud test and the emotional wheel analysis.

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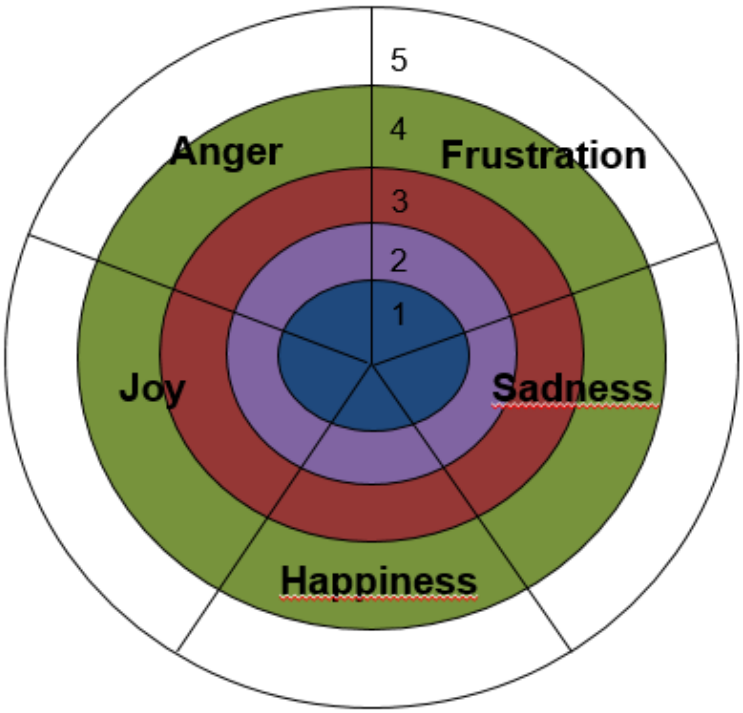
APPENDIX I – EMOTIONAL WHEEL ANALYSIS

Emotional wheel analysis



Ready for print, so that it can be used during the Thinking Aloud Test.

APPENDIX II – ADDITIONAL QUESTIONS AT TEST SESSIONS

SYNYO's suggestions: Does your coop support volunteers? (app integration)

Would your coop use collective buying / shared logistics features?

Pricing and Payment: Who would pay?

How much would you be willing to pay? (annual €1000?) Business perspective:

Do you have an open membership? (Registration on platform should be possible)

What type of payment do you prefer? (annual, monthly, other)

What system would iCareCoops replace?

Which is the most relevant feature for you?

Which feature is still missing?

Does task management suit your coop management process?

Pricing and Payment: Who would pay? How much would you be willing to pay? (annual €1000?)
User perspective:

What functions are you missing?

Do you have programs you want to have to be integrated?

What kind of processes do you use in the software?

What software do you use?

Will you also use the app? (security)

Would you like to get a trial version?

What do you want to share with other coops? Which functions should be covered?

What do you expect from the provider? (support)

How many people (members and staff) will use the software?

What do you consider as a specific need depending on your own country?

Do you feel comfortable with a provider from a foreign country?

What kind of customisation would be useful for you?

What do you expect from the software provider? (support, languages)

Questions for Pilot: Could you implement the solution as it is? If no, what would be required to do so? What tools are you currently using?

Tech perspective:

What kind of security & privacy measures are required for the solution?

What ethical issues have to be considered when it comes to logging and data usage (storage etc.)?

What is the required duration of storage (history for legal documentation, chat message storage etc. ?)

What data can be accessed by users and tech support?

Do you have any reporting needs (financial, feedback, other)?

Where shall the application be hosted (on premises or in public cloud host)?

APPENDIX III – USE OF ONENOTE

Screen dump from OneNote showing how to code.

Interview Example

13. december 2016 11:14

How useful is the iCareCoops solution in the user's organization?	How easily do the users solve the tasks?	What obstacles prevent users from completing the tasks?	Which interface elements are problematic/ helpful?	Which interface features or tasks cause emotional reactions, and to what degree?	Which suggestions do users have to improve the product?

APPENDIX IV - INFORMED CONSENT

Informed consent

The purpose of the Thinking Aloud Test and the follow up Interview is to be able to verificate the iCareCoops solution.

When you give your concent you participate under the following conditions:

All material will be anonymous. Video and/or audio files will be deleted after the project ended. Participants will not be identified in published material.

I hereby give permission that audio and/or video recordings in which I participate can be used for analysis and evaluation of this iCareCoops solution.

I give my consent that audio where I participate can be recorded and used for analyzing. ☐

I give my consent that video where I participate can be recorded and used for analyzing. ☐

_____

Date and signature participant

Date and signature moderator and observer