Toolbox

AAL
AMBIENT ASSISTED LIVING

Understanding

Testing

Conceptualizing

Methods of User Integration for AAL Innovations

Toolbox

This toolbox was crafted by YOUSE GmbH, on behalf of the AAL Association.

The Ambient Assisted Living Association is organizing the Ambient Assisted Living Joint Programme (AAL JP). The AAL JP aims at enhancing the quality of life of older people and strengthening the industrial base in Europe through the use of Information and Communication Technologies (ICT). Therefore, the AAL JP is an activity that operates in the field of services and actions to enable the active ageing among the population.
The programme is financed by the European Commission and the 22 countries that constitute the Partner States of this Joint Programme.
See more at: http://www.aal-europe.eu/

YOUSE supports companies and research projects with its expertise in user experience design, usability engineering, user testing and user integration. Based on its user-centred design approach, YOUSE helps to develop innovative products, better and smarter services, user-friendly packaging and manuals, especially for the 'generation plus'.
YOUSE has worked in various AAL projects and offers its services – together with its panel of "senior innovators" – at its two locations Munich and Berlin, Germany. The company is managed by Dr. Christoph Nedopil and Dr.-Ing. Sebastian Glende.
See more at: http://www.youse.de/en

Overview Methods

Description

This toolbox provides method cards for your user-centered design process of AAL technology. It is a selection of best-practice methods from many different sciences.
Each card describes the aim of the method and when to employ it (depending on research questions, type of participants, etc.), and it shows a practical example for the implementation of the method.

Note

The methods described here can be combined with each other or with other user-integration methods (such as focus groups, interviews, questionnaires, etc.) throughout the user-centered design process.

Phases

The method(s) can be employed according to the product development phase:

❶ **Understanding**
In this initial phase, information is gathered about the behaviour and needs of potential users and stakeholders, as well as their specific use context.

❷ **Conceptualizing**
In the second phase, ideas and concepts are developed to satisfy user needs in a potentially new way.

❸ **Testing**
In the third phase, new concepts or products are tested by users or experts (often with several iterations) to receive feedback and reveal usability problems.

Overview Methods

Phase	Method	Participants				Effort
		Healthy Seniors	Impaired Seniors	Stakeholders	Consortium	Time & Ressources
Understanding	Persona	+	+	+	+	++
	Self-documentation	+		+		++
	Shadowing	+	+	+		+++
	UTE-Analysis	+		+	+	+
Conceptualization	Walt-Disney-Method	+		+	+	+
	Brainwriting	+		+	+	+
	Storyboard				+	++
	Selection-List				+	+
Testing	Cognitive Walkthrough	+		+	+	++
	Paper Prototyping	+		+		+++
	Wizard-of-Oz	+	+	+		+++
	Co-Discovery	+	+	+		++

Persona
Understanding

Description

Profile of archetypical end-users or stakeholders indicating individual characteristics or demographics, e.g. lifestyle choices, budget, or technological affinity (derived e.g. from ➜ **Self documentation**, ➜ **Shadowing** or expert interviews). Personas can be employed throughout the innovation process to make sure that the focus of the design is on the users' needs, e.g. for ➜ **UTE-Analysis** or ➜ **Cognitive Walkthrough**.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | Consortium

Effort

●●● Preparation ●●○ Realization ○○○ Analysis

Preparation

- ➜ Background information about primary target groups (e.g. from ➜ **Shadowing**, ➜ **Self documentation**, interviews, market research, literature)
- ➜ Photos or pictures to represent persona

Procedure

1. The research team determines the most important target groups or stakeholders for the AAL technology being tested.
2. Information is collected about each target group. Note: Individual archetypes are more interesting than "the average user" (who does not exist).
3. For each subgroup, a persona card is created with typicial characteristics and demographics.
4. The persona cards help to keep track of the users' needs throughout the development of the product or service. They can be distributed throughout the consortium or put on the wall, e.g. when choosing the functions of the final product.

Persona
Understanding

Example Persona of a senior's relative (categories/focus/style can be adjusted to the consortium's information needs)

Likes

- Gardening to relax
- Spending time with her family
- Trying new cooking recipes
- Taking bike trips

Fears

- Being isolated when growing old herself
- Neglecting her own familiy
- Something happening to her mother-in-law when she is not there

Lisa Hanson

Age	61 years
Relationship	Married
Children	2 sons, 1 grandchild
Specifics	Housewife, taking care of her mother-in-law (aged 85) for 5 years now

Thoughts and feelings

- Feels stressed sometimes when taking care of her mother-in-law
- Feels guilty if she does not visit her mother-in-law often enough

Goals

- Doing something useful
- Going on a trip with her husband at least once a year
- Making time for herself

Self-Documentation
Understanding

Description

Analytic method used to establish a realistic picture of the target group and the needs of the individual within his or her natural environment. Primary users or stakeholders are asked to document specific aspects of their lives by camera, diary, or journals. The results illustrate the individual's most significant needs and environmental factors and can be used to develop ➔ **Personas**, which can be used throughout the product development process.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | Consortium

Effort

● ● ○ Preparation ● ○ ○ Realization ● ● ○ Analysis

Preparation

- ➔ A minimum of 4-5 representatives of each main user group
- ➔ Documentation material (camera, diary, or journal) for each participant
- ➔ Instruction sheet for each participant detailing what to document, focusing on the aspects that are most important for the AAL technology that is to be developed

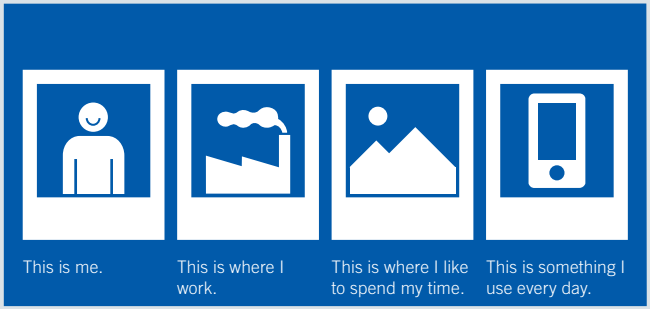
Procedure

1. Each participant is equipped with documentation material, e.g. a camera, and detailed instructions on what should be documented and for how long.
2. The participant documents his or her life according to these instructions.
3. The collected material is presented to the consortium to develop a better understanding of the target group participants and their everyday lives (depending on the research question).
4. The obtained qualitative information is analysed in regard to requirements that the new product or service should satisfy.

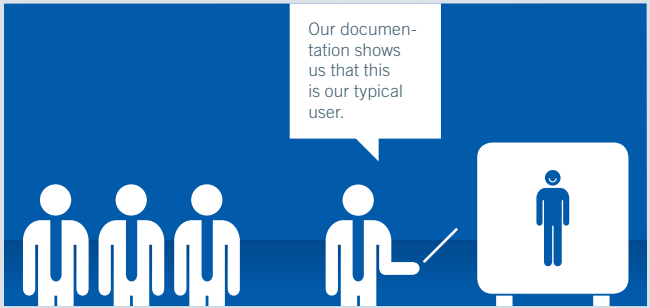
Shadowing
Understanding

Example Self-Documentation of a user

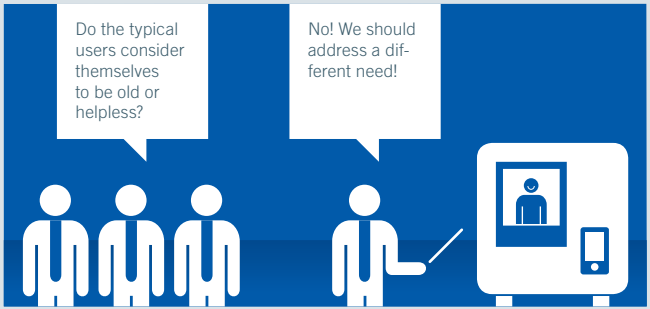
1 Participants are equipped with documentation materials.



2 Participants document their lives.



3 Results are presented to the consortium.



4 Conclusions are drawn for product or service design.

Shadowing
Understanding

Description

Observation technique used to collect information about a person's everyday activities and natural environment. Shadowing gives insight into complex behavior or factors that the individual may be unaware of or unable to identify on his or her own. Results can be used to develop ➜ **Personas** and to help create new product or service ideas.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | Consortium

Effort

● ○ ○ Preparation ● ● ● Realization ● ● ○ Analysis

Preparation

- ➜ 1-3 representatives from each main user group
- ➜ Camera/video and protocol for the observer
- ➜ Permission to observe the individual in his/her natural environment (several hours or even days)

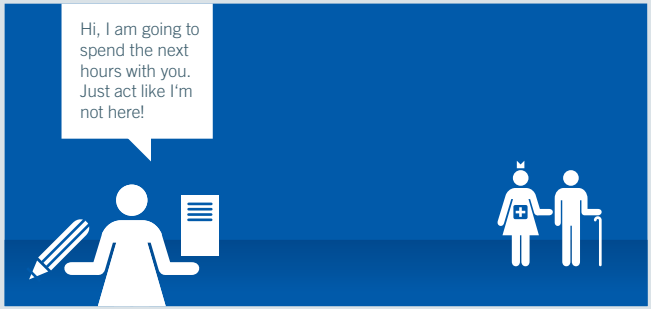
Procedure

1. The research team determines the most important target group and processes that should be analysed.
2. The supervisor visits and accompanies the participant in his or her natural environment, taking notes or pictures (if allowed).
3. The supervisor may pose questions on-site or as follow-up to the visit. It is important not to influence or interrupt the participant in his/her daily activities.
4. The qualitative data obtained is analyzed to determine typical or important routines, limiting factors/handicaps, or basic requirements in order to develop new ideas for supporting products or services.

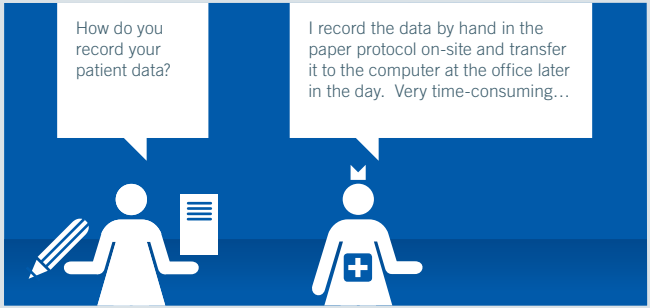
Shadowing
Understanding

Example Shadowing of a caregiver‘s workday

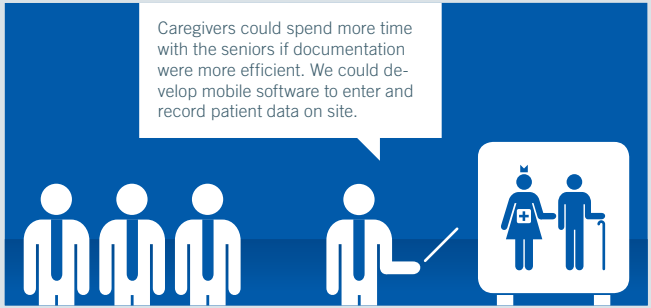
1 Definition of target group and context.



2 Observation in natural environment.



3 The supervisor can ask the caregiver follow-up questions.



4 Analysis of obtained data.

User-Task-Environment-Analysis

Understanding

Description

Analytical method used to identify requirements regarding the user, the task and the environment. Results can also be evaluated with a ➔ **Selection List** or visualized with ➔ **Storyboards**.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | Consortium

Effort

● ○ ○ Preparation ● ○ ○ Realization ● ○ ○ Analysis

Preparation

- ➔ 5-12 participants from target groups or experts
- ➔ A rough idea of the product
- ➔ UTE-Analysis form and writing materials
- ➔ Form can be filled in individually by each participant (and discussed at the end) or completed together on a larger worksheet.

Procedure

1. Definition of the categories User, Task, and Environment
2. Description of physical and mental actions of user to fulfill task
3. Analysis of collected information
4. Definition of product requirements
5. Documentation of results

User-Task-Environment-Analysis

Understanding

Example Designing a health-monitoring interface for elderly users

Category	Note	Description	Requirements
User	Think about the different target groups (including primary, secondary, and tertiary stakeholders) and their characteristics, for instance: ➜ age ➜ education ➜ family background ➜ interests & values ➜ health condition ➜ technical affinity	Elderly person, dementia, technically inexperienced	➜ Larger buttons, more suitable for shaky hands ➜ Reminder-function for the user
		Caretaker, technically inexperienced, stressed	➜ Touchscreen operational with gloves
		Son-in-law / family member, interested in safety of seniors, living in another city	➜ Alert in case of detected emergency ➜ Regular protocol
Task	Think about the goals the users might want to achieve, for instance: ➜ task characteristics ➜ task duration ➜ task frequency ➜ physical / mental demands ➜ error risks / safety demands ➜ secondary tasks like installing, unpacking, services	Measuring blood pressure every day, displaying values	➜ Nice, unobtrusive storage case ➜ Big numbers, high contrast
		Initial activation of product	➜ Easy-to-read manual with pictures and step-by-step instructions
		Overview of biometric values summary	➜ Data storage ➜ Display with graphs
Environment	Think about critical technical, physical, or organizational conditions of the environment, for instance: ➜ space / location of product ➜ thermal / lighting conditions ➜ Compatibility with other products / equipment	Dust	➜ Easy to clean, waterproof display
		Lighting	➜ Good contrast, glare-free display
		Reporting to stakeholders	➜ Compatibility with other interfaces / applications

Walt-Disney-Method

Conceptualization

Description

Creativity technique used to generate new, realistic ideas for products and services. Results can be further discussed with a ➜ **Selection list** or in a focus group. The chosen functions could be visualized with ➜ **Storyboards**.

Suitable for

Healthy Seniors | ~~Impaired Seniors~~ | Stakeholders | Consortium

Effort

● ○ ○ Preparation ● ○ ○ Realization ● ● ○ Analysis

Preparation

- ➜ 3, 6, 9 or 12 participants (users, consortium or stakeholders)
- ➜ 3 workspaces in different corners of the room, equipped with pens & paper
- ➜ If applicable: product presentation or product to be optimized
- ➜ Qualified facilitator to supervise that participants stay within their role

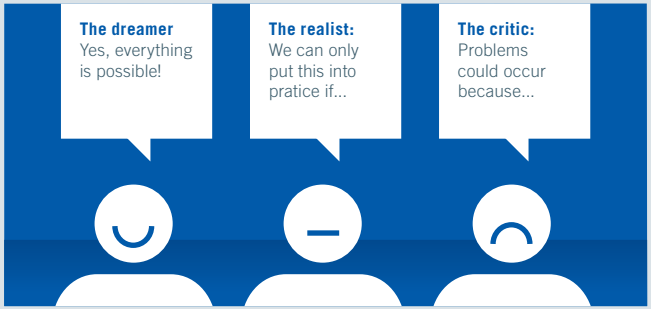
Procedure

1. Participants are split up into 3 groups:
   - A The “Dreamers”, generating ideas without regard to their practical implementation.
   - B The “Realists”, thinking about necessary steps for putting these ideas into practice.
   - C The “Critics”, assessing possible advantages and disadvantages of these ideas.
2. The workshop supervisor presents and explains the problem.
3. Participants familiarize themselves with their role, and the dreamers start to develop ideas in their group.
4. Ideas are discussed with all 3 groups. The dreamer group seizes the issues raised by the realists and critics to continuously improve their ideas.
5. The facilitator takes care that participants stick to their rules.
   After a fixed period of time, participants can change roles to see things from a different angle.

Walt-Disney-Method

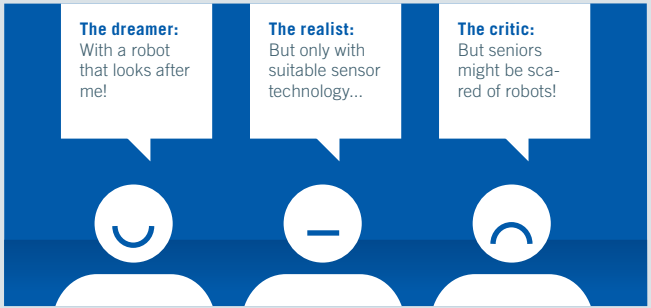
Conceptualization

Example Monitoring vital parameters of chronically ill persons

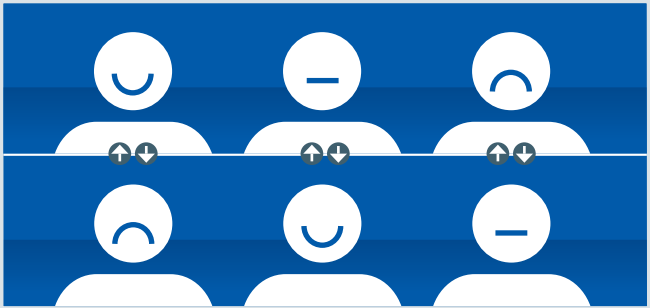


1 Assignment of roles to different participant groups.

2 Explanation of task.



3 Developing ideas according to roles.



4 Discussion and changing of roles.

Brainwriting
Conceptualization

Description

Creativity technique for generating many concrete ideas for product functions or services by end-users or other stakeholders. Results can be further evaluated with a ➔ **Selection-List** or focus groups, and realized in terms of ➔ **Storyboards**.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | Consortium

Effort

● ○ ○ Preparation ● ○ ○ Realization ● ● ○ Analysis

Preparation

- ➔ 5-10 participants from the target group
- ➔ Pen and prepared form or A6-cards for each participant, where the number of lines correspond to the number of participants
- ➔ Working top for taking notes

Procedure

1. The workshop supervisor presents and explains the problem.
2. Every participant makes 3 suggestions for solving the problem, respecting the time limit. (3-6 min. until form is passed on; first round may take longer).
3. The form is passed on to the left-hand neighbour.
4. Every participant refines or amends the suggested ideas (3-6 min.).
5. Repeat steps 3 and 4 until everyone has his/her original form back.
6. In case the proposed ideas cannot be refined, the form is placed in the centre of the table (“pool”), and another one is taken up from there if available.
7. Solutions are presented and discussed.

Brainwriting
Conceptualization

Example Developing a robot to enhance seniors‘ every day lives

Participant	Time	1. Suggestion	2. Suggestion	3. Suggestion
Participant A (Initial Idea)	5 min.	help with food shopping	send reminder	connect to friends / family
Participant B (Amendment statement)	3 min.	carry shopping bags	send reminder to take medicine	provide video chat
Participant C (Amendment statement)	3 min.	order food online	alert senior of unattended hotplate or open window	suggest a time to meet
Participant D (Amendment statement)	3 min.	serve as a seat on the way	send reminder to remember keys before leaving the house	display availability status or position
Participant E (Amendment statement)	3 min.	automatically check missing items	remind senior of appointments with friends / doctors	exchange photos / videos / greetings

Storyboard
Conceptualization

Description

Development of simple cartoons to depict product functions or services before implementation to deduce potential weaknesses or critical acceptance issues. The illustrated functions can be generated through ➜ **UTE-Analysis**, ➜ **Walt-Disney**, or ➜ **Brainwriting** and used in ➜ **Cognitive Walkthrough** or focus groups. Storyboards can also serve as instructions for usability tests (see e.g. ➜ **Co-Discovery**)

Suitable for

Healthy Seniors | Impaired Seniors | **Stakeholders** | **Consortium**

Effort

● ○ ○ Preparation ● ● ○ Realization ○ ○ ○ Analysis

Preparation

- ➜ Definition of the target group, the problem that needs to be solved, and how exactly the solution is effective.
- ➜ Photos and/or scribbles depicting the interaction between the user and AAL-system
- ➜ Glue, scissors, large work board to sketch out cartoon

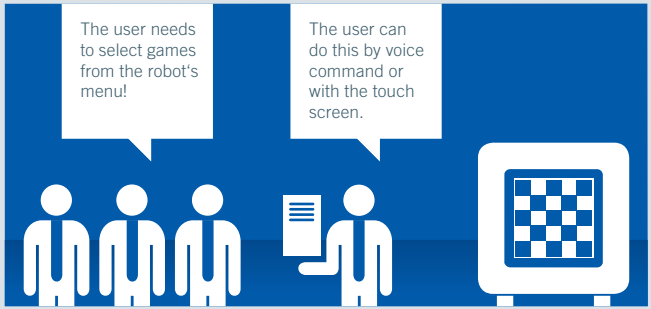
Procedure

1. The consortium defines a list of potential functions or services.
2. The product functions / services are broken down into individual use cases and are illustrated (e.g. scribbled) as a series of steps on a large work sheet.
3. The storyboards focus on the problem of the user and the suggested solution. A combination of photos make the scenario look more real.

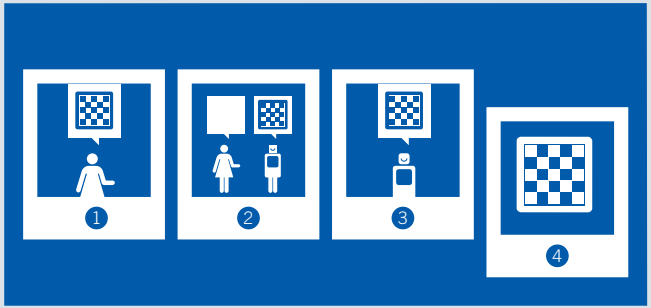
Storyboard
Conceptualization

Example Storyboard of a chess game with an assistive robot for elderly people

1 The use case(s) is/are explained.



2 The user interaction is defined.



3 Use case scribbled on board – at least 4 scribbled.

4 The use case is explained to technicians.

Selection-List

Conceptualization

Description

Evaluation method used to systematically select product functions or concepts from a variety of ideas, e.g. from ➜ **Walt-Disney-Method** or ➜ **Brainwriting**. Use ➜ **Personas** to help to focus the evaluation process on basic user requirements when defining the final scope of product functions to develop.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | **Consortium**

Effort

● ○ ○ Preparation ● ○ ○ Realization ● ○ ○ Analysis

Preparation

➜ List product functions/use cases/concepts
➜ Develop and agree on selection criteria

Procedure

1. Enter the product functions/use cases/concepts into the selection list form.
2. Use either the given criteria or your own to evaluate the product factors/use cases/concepts.
3. Evaluate each option within the consortium according to the defined criteria.
4. Assign weights to each category or define “killer criteria” to simplify the process and allow for a more specific selection.
5. Exclude unsuitable options and pursue only the viable options or gather more information about unclear issues.

Selection-List
Conceptualization

Example Designing an intelligent lighting system for elderly singles

Categories / Categories of Use	Category weight	Enhance Mood	Optimal task lighting	Supporting falling asleep	Remind of Appointments	Warnings
Technical Implementation	-	bright ambient light	bright, glare-free task light	slight transi-tions, changing proportion of blue light	light flashes	light flashes
Major benefit for seniors	+ + +	yes	yes	yes	no	yes
Expenses (sensors / actors)	+ +	high	high	high	ok	high
Effect measurable?	+ +	yes	partially	yes	no	no
State recognition possible	+ + +	no	partially	yes	yes	yes
Novelty value	+	yes	yes	yes	no	no
Compatibility with overall project goal	+ +	yes	yes	yes	no	no
Comments		only long-term effects	switch to brighter light needs habitu-ation	adapt to inidivual prefe-rences	appoints-ments must be managed electronically	connection with household electronics
Final Decision		pursue	gather more information	pursue	skip	skip

Cognitive Walkthrough

Testing

Description

Analytic inspection method used to evaluate prototypes from the user's perspective. It is usually performed by a usability expert, but users or stakeholders can be included. The testers take the role of the user and "walk through" the process of using the product, either virtually or with the support of the actual product. The analysis uses prototpyes (e.g. ➜ **Paper prototypes**) or ➜ **Storyboards**, complete systems, or manuals. Expert evaluation can be based on the information obtained from ➜ **Personas**.

Suitable for

Healthy Seniors | ~~Impaired Seniors~~ | Stakeholders | Consortium

Effort

●● Preparation ●● Realization ●● Analysis

Preparation

- ➜ 1-10 experts, users, stakeholders
- ➜ Explanation of the system being tested
- ➜ Instruction sheet with user characteristics (e.g. technological expertise, impairments) and evaluation criteria
- ➜ Protocol to note operational sequences to solve each task

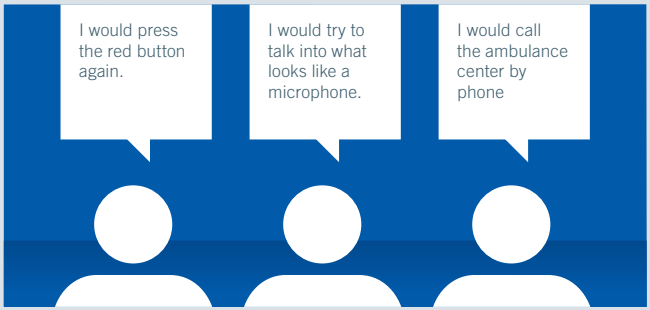
Procedure

1. The system (prototype, storyboard, pictures, video...) and the task are introduced.
2. Participants note or discuss how they would solve a given task.
3. The optimal solution is presented. The following questions are discussed:
   - A Would users recognize the desired option as a viable choice?
   - B Would users understand how to handle the system?
   - C Would users recognize progress towards the goal?
4. Solutions for the detected usability problems are developed.

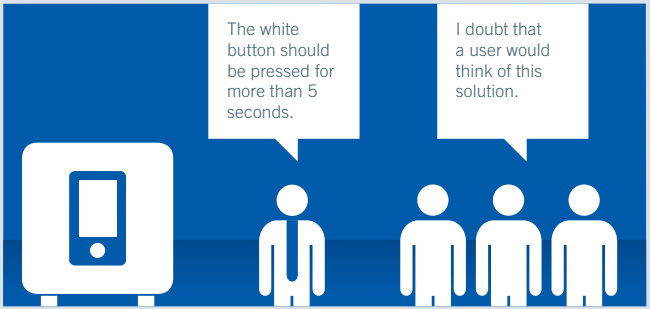
Cognitive Walkthrough
Testing

Example Evaluating an emergency device for elderly people.

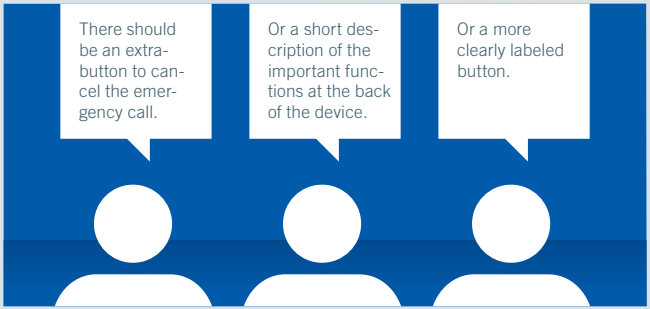
1 Explanation of product/system and test procedure.



2 Participants hypothesize the correct solution.



3 Presentation of the correct solution.



4 Development of alternative solutions.

Paper Prototyping
Testing

Description

Method used to test the functionality and layout of a graphical interface before its programming. The test person navigates through the simulated paper (or electronic) display sheets to detect usability problems. The focus is on the navigational structure of a software or web-interface. Paper prototypes can also build the basis for a ➜ **Cognitive Walkthrough**.

Suitable for

Healthy Seniors | ~~Impaired Seniors~~ | Stakeholders | ~~Consortium~~

Effort

●●● Preparation ●●○ Realization ●●○ Analysis

Preparation

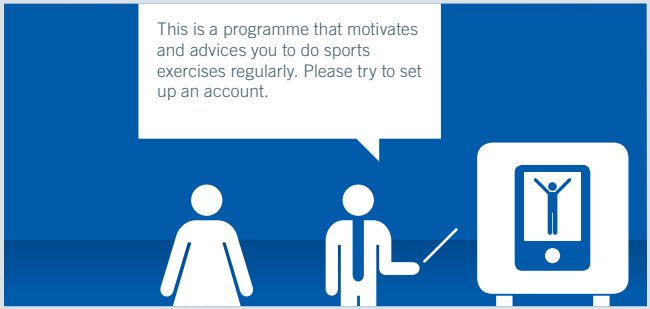
- ➜ Minimum of 5 participants from the target group
- ➜ Instructions for the cognitive walkthrough exercise
- ➜ Images of the interface display that pertains to the usability functions being tested
- ➜ Protocol and/or video to document the test

Procedure

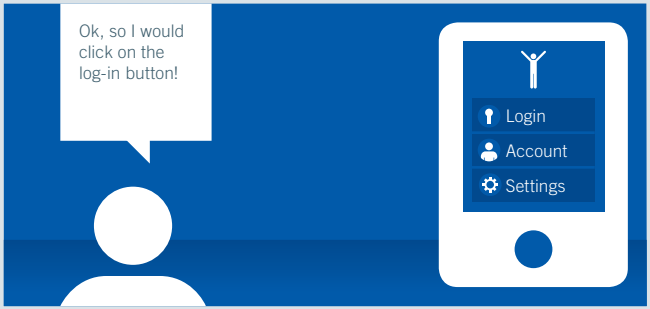
1. The product and the task are introduced to the participant.
2. The participant says aloud which button or menu item he or she would choose.
3. The supervisor presents the corresponding display sheet. Steps 2 and 3 are repeated until the task is solved.
4. At the end of the exercise, the supervisor asks the participants why they chose an item or what response or buzz word they expected instead. Feedback is used to improve the user interaction.

Paper Prototyping
Testing

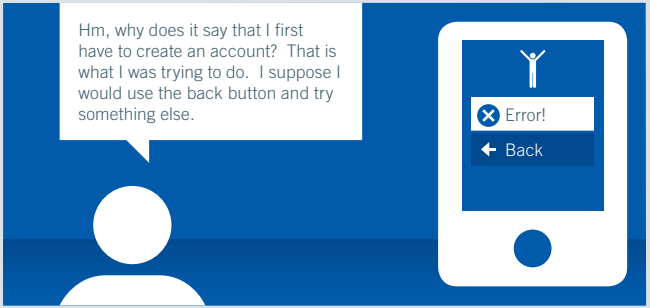
Example Testing a sports-game to enhance patients health status.



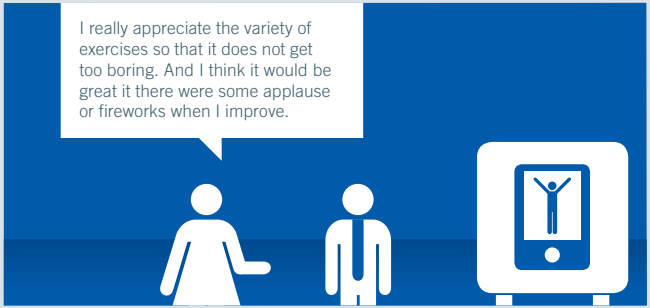
1 Introduction of product and task.



2 The participant tries to solve the tasks.



3 Presentation of new display sheet.



4 Overall evaluation of the participant.

Wizard-of-Oz
Testing

Description

Simulation technique used to perform usability tests with prototypes that do not yet function autonomously. The system is controlled or replaced by a human operator, simulating the planned system behaviour. This technique is an alternative to ➜ **Storyboards** if the system's benefits need to be experienced rather than visualized.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | Consortium

Effort

●● ○ Preparation | ●●● Realization | ●● ○ Analysis

Preparation

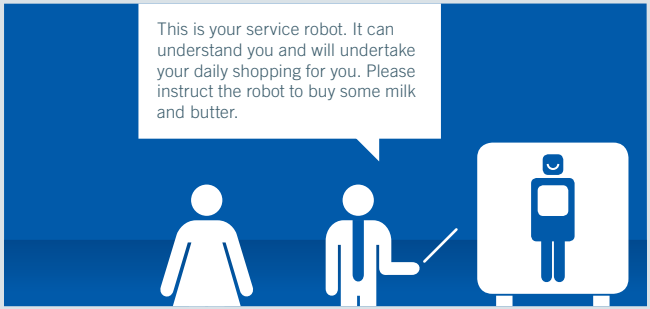
- ➜ Minimum of 5 participants from the main target group
- ➜ Product prototype or simulation
- ➜ Instruction with tasks for the users
- ➜ Protocol and/or video to document the usability tests

Procedure

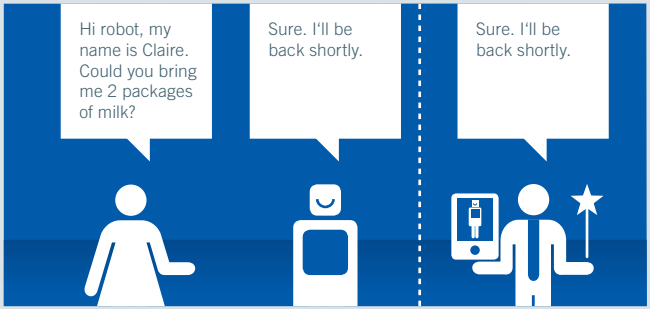
1. The product and the task are introduced to the participant.
2. The participant interacts naturally with the prototype.
3. The human operator simulates the functions remotely (out of sight of the participant).
4. The supervisor remains in the background and takes notes about interesting aspects of the interaction.
5. At the end of the exercise, the supervisor asks the participant about his/her experience and the aspects of the product that he / she liked or disliked.

Wizard-of-Oz
Testing

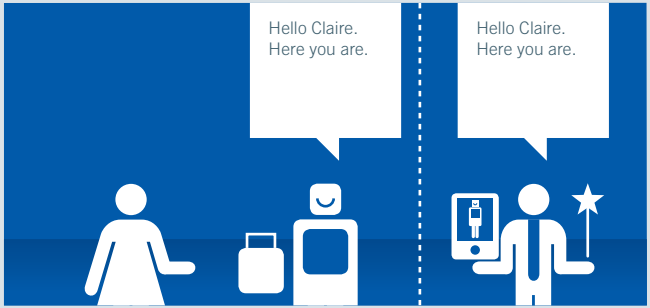
Example Testing a service robot for elderly users.



1 Explanation of product and task.



2 Participant interacts with the prototype.



3 Incomplete functions are simulated by the human.

4 Discussion of the participant's experience.

Co-Discovery
Testing

Description

Testing method conducted with two participants (testing with two participants can lead to more natural and productive discussions than usability tests with one participant alone). Participants perform a usability test with a product or prototype and describe what comes to their minds about the product. Can be used with ➜ **Wizard-of-Oz** method.

Suitable for

Healthy Seniors | Impaired Seniors | Stakeholders | Consortium

Effort

● ● ○ Preparation ● ● ● Realization ● ● ○ Analysis

Preparation

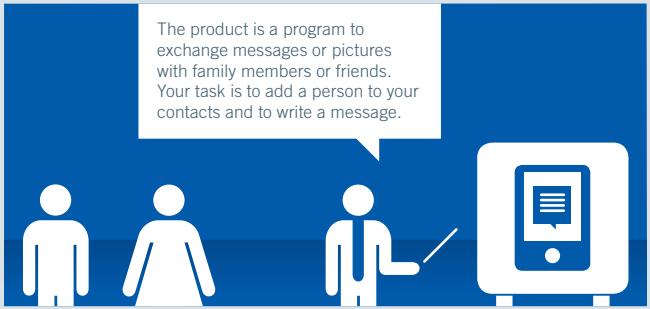
- ➜ Minimum of three pairs of participants from the target group
- ➜ Impaired users can be included when paired with relatives or caregivers for support.
- ➜ Prototype/product
- ➜ Instructions with tasks to be performed by the participants
- ➜ Realistic environment in which the product would be used
- ➜ Protocol and/or camera or voice recorder for supervisor

Procedure

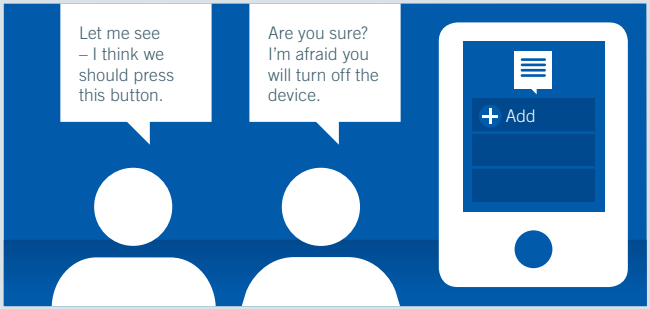
1. The participants are provided with a short description of the product and its intended function.
2. The participants work on the given tasks while continuously offering their thoughts and reactions to the product („thinking aloud“).
3. The supervisor notes any difficulties that may occur.
4. After the test, participants discuss any difficulties they encountered with the product to gain better insight into where the problems lie.
5. Results are presented to the consortium and product improvements are discussed. Video excerpts help illustrate the difficulties participants experienced.

Co-Discovery
Testing

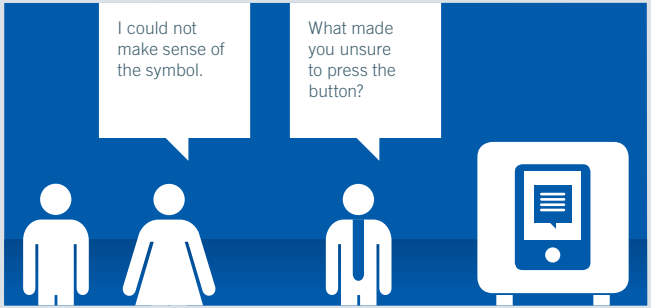
Example Testing online communication software for elderly users



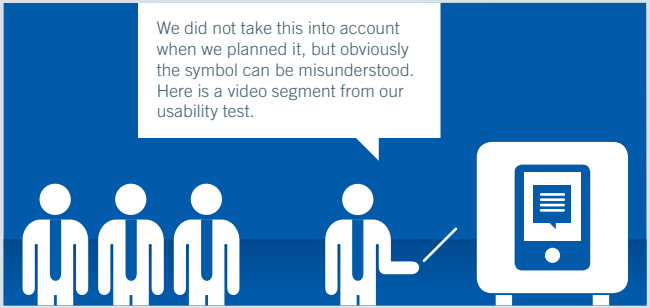
1 Explanation of product and task.



2 The participants try to solve the task while thinking aloud.



3 The supervisor asks about their thoughts.



4 The results are presented to the consortium.

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