D2.3 – Evaluation Report of the 1st Evaluation (Draft)

Project acronym:	KNOTS
Project name:	Knowledge Transfer-System
Strategic Objective:	A knowledge transfer-system for people in care
Project number:	AAL-2013-6-144
Project Duration:	July, 1st 2014 – June, 30th 2017 (36months)
Co-ordinator:	Dr. Stefan Goetze
Partners:	Fraunhofer Gesellschaft (DE) Protronic (DE) Eurotronik (SI) CareTech (SV) Die Johanniter (DE) Hemtjänskompaniet (SV)

D2.3

Version:	1.0
Date:	2016-03-07
Author:	Meis, Timmermanns
Dissemination status: PP	

Once completed please e-mail to WP leader with a copy to
mgmt@knots-project.eu.

Deliverable 2.3	Executive Summary
This document describes the first evaluation of the initial KNOTS prototype. Experts evaluated the software and discussed important aspects which should be corrected before an evaluation with end users. Since the technical development of the KNOTS system was not as far developed as initially planned, this document is considered to be preliminary and will get updated with results of the next prototype evaluation.	

Dissemination Level of this deliverable	
P	Public.
Nature of this deliverable	
R	Report

Due date of deliverable	M20		
Actual submission date	2016-03-07		
Authorisation			
No.	**Action**	**Name/ Company**	**Date**
1	Prepared	Simon Timmermanns (JUH), Markus Meis (FHG)	03.03.2016
2	Approved by 1st reviewer	Stefan Goetze (FHG)	04.03.2016
3	Updated	Simon Timmermanns (JUH)	07.03.2016
3	Approved by 2nd reviewer	Stefan Lund (CTK)	07.03.2016
4	Released	Simon Timmermanns (JUH)	07.03.2016

Disclaimer: The information in this document is subject to change without notice. Company or product names mentioned in this document may be trademarks or registered trademarks of their respective companies.

1   Table of Contents

2 Introduction: Topics and aims of the evaluation

This deliverable describes the results of the first evaluation of the available KNOTS software and hardware (due date February 2016), with the focus on software and APPs. The consortium decided to test the application in different expert groups in a first step. Due to technical limitations of the KNOTS system (not all planned features have been implemented up to a level which was planned till these evaluations) the planes end-user tests with elderly users have been shifted. The developers / the KNOTS partners will first correct the named aspects / shortcomings to set up the prototypes for an evaluation with real "elderly" end users.

The expert groups evaluated the different screens and functions on different devices. The focus was set on the following four groups:

- Group 1: Coordinators of voluntary care givers (Germany; JUH) and coordinators of professional care givers (Sweden; Hemtjänskompaniet)
- Group 2: Experts and software engineers (Germany, Fraunhofer)
- Group 3: End-users: voluntary care givers (Germany) professional care givers (Sweden)
- Group 4: Customers/End-users: patients in Germany and Sweden

The following hardware and software has been tested:

- KNOTS smart phone APP
- Stationary KNOTS tablet (together with the KNOTS software)

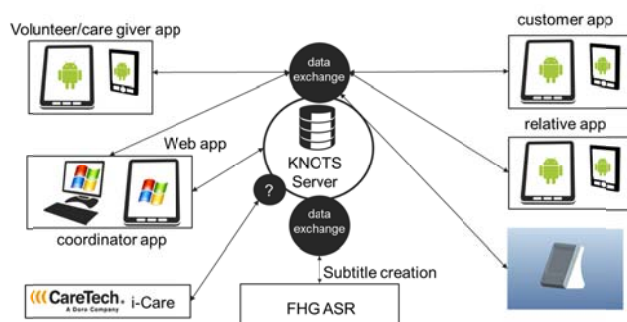The KNOTS system with the main components and elements is depicted in Fig. 1 (as a reminder).

Fig. 1: Structure of the KNOTS hard- and software.

According the DIN EN ISO 9241 we will follow a strict human design centered (HCD) process for testing the KNOTS soft- and hardware, see Fig. 2. The results reported here, are focusing on the prototype I stage. The soft- and hardware were first evaluated with experts and coordinators (groups 1 and 2) in the realm of heuristic evaluation (HE, see below, Section 3) as the first step of an iteration process. After the heuristic evaluation with coordinators and experts the next step is the improvement of the soft-and hardware of the KNOTS system.

In the next iteration step we will test the soft- and hardware with end-users, namely patients and care givers. The results of this evaluation step will be added to this report afterwards.
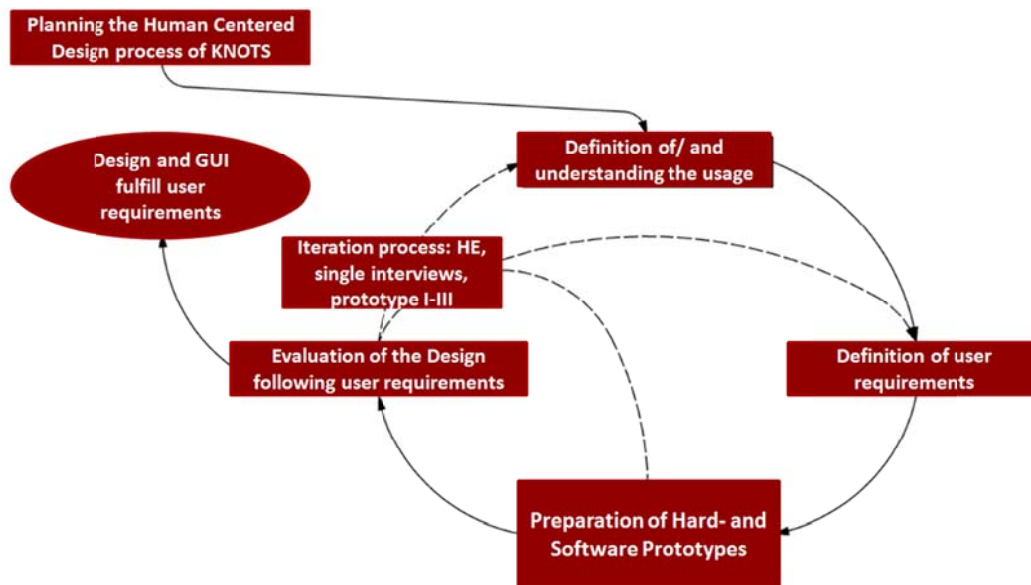
Fig.2: The HCD process according the DIN EN ISO 9241 in the KNOTS project

3 Methods

For the evaluation of the groups 1 and 2 we use the efficient method of Heuristic Evaluation (HE). HE is the most informal method and involves having usability specialists and experts judge whether each dialogue element follows established usability principles (the "heuristics"). The advantages of HE are: quick and relatively inexpensive feedback to designers, feedback early in the design process, suggest the best corrective measures to designers and usage together with other usability testing methodologies [1, 2]. Following Nielsen we assume, that the number of six experts is enough to detect the main rough usability problems.

So, we invited in two sessions six experts from groups 1 and 2. The duration of the session was three hours, following a structured interview form. We used an adapted check-list of the DIN EN ISO 9241-20:2009-08 to structure the HE process. The HE was conducted by two social scientists of the Hoerzentrum Oldenburg and University of Oldenburg.

After the HE process with experts and (software) engineers, the upcoming step in KNOTS will now be to improve the GUI's software and possibly the hardware. After this iteration step, we are going to ask the end-users, the formal and informal care givers. This iteration procedure is in line with the ISO DIN EN ISO 9241.

In the following screenshots the GUI's and surfaces of the two hardware platforms Smartphone and the KNOTS station are shown (calendar, KNOTS knowledge transfer, chats).
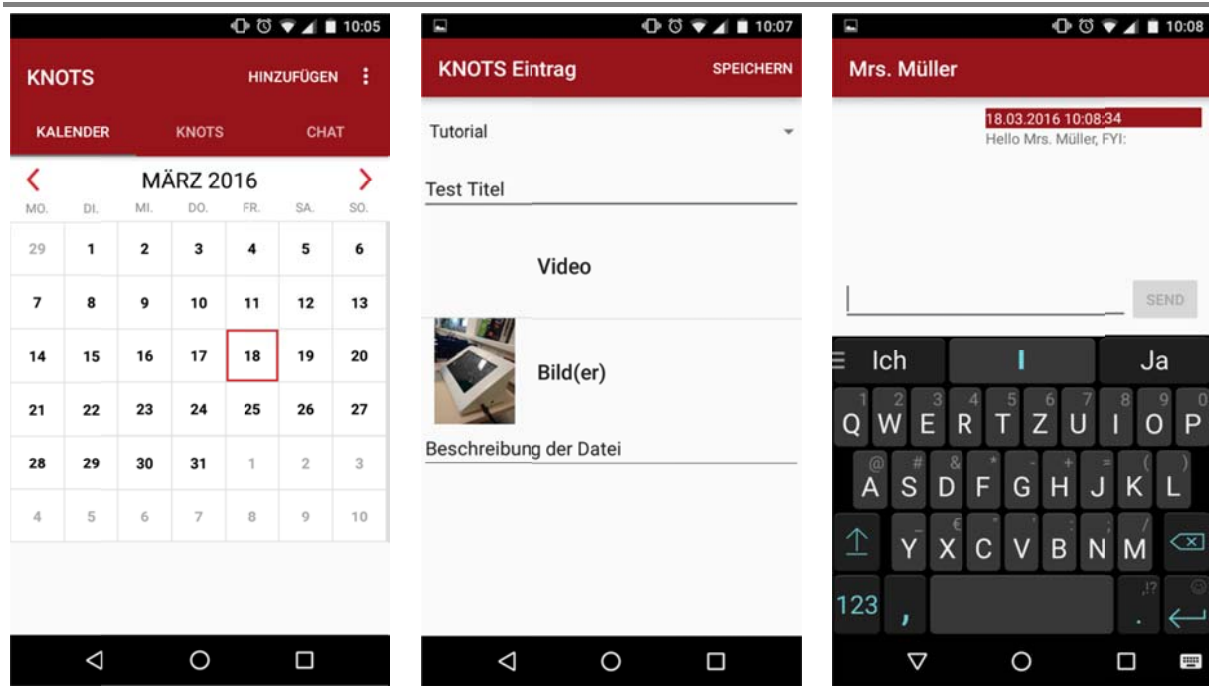
Fig. 3.1 Calendar function   Fig. 3.2 Knots with access to videos   Fig. 3.3 Chat function

Fig. 3: Screenshots of the main function of the Knots smartphone software in German.

The prototype of the station with the Android software is depicted in Fig. 4.

Fig. 4.1 Station: Calendar function   Fig. 4.2 Station: Chat function

Fig. 4: Photos of the main function of the Knots station prototype.

The next numeration represents the adapted ckeck-list following the ergonomics of human-system interaction - Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services (DIN EN ISO 9241-20:2009-08).

We identified the following topics following the DIN EN ISO 9241-20:

- Section 1: Perception of visual information
- Section 2: Perception of acoustic information
- Section 3: Presence and location of relevant control elements
- Section 4: Perception of status of control elements and displays

- Section 6: All actions and functionalities, including maintenance and settings, can be accessed and performed.
- Section 9: Errors and mistakes can be corrected
- Section 12: Possibility to use products efficiently
- Section 13: Understanding of how to use the product
- Section 14: Understanding the displayed material

We evaluated the features of the soft- and hardware by closed questions, following the structure very bad/very insufficient (- -), bad/insufficient (-), fair (o), good (+), very good (++) with a coding from 1 to 5. A Median below 3 indicates the dichotomous qualification of "failed" (red boxes), a median equal 3 or higher indicate the qualification "passed" (green boxes). Additionally, we collected data of open ended questions for ideas of improvements of the prototype II and the end-user tests.

4 Results

4.1 Median values according to DIN EN ISO 9241-20

In Tab. 1 the main results of N=6 coordinators and experts (software) engineers and product developers are listed, following the nomenclature/index structure of the DIN EN ISO 9241-20.

Tab. 1.: Median values of the HE according the DIN EN ISO 9241-20 checklist

Index	Description DIN EN ISO 9241-20:2009-08	KNOTS Station App				KNOTS Mobile App			
		Cal	Knots	Chat	Gen.	Cal	Knots	Chat	Gen.
1.	**Perception of visual information**								
1.4(-1)	The contrast between the saved event and the date is sufficient.	2				4			
1.4(-2)	The contrast between the control elements is sufficient.		2,5	2,5			3,5	4	
1.4(-3)	The currently active tab can be clearly distinguished from the others.	2	2	2		2	3,5	2	
1.7(-1)	The font size is clearly legible.	2	1	1		3,5	2	2	
1.7(-2)	Text can be modified by adjustable font size when vision is impaired.				1				1
2.	**Perception of acoustic information**								
2.3(-1)	The volume level is visible.				3				3
2.3(-2)	The control elements to adjust volume are easy to comprehend.				4				3,5
2.3(-3)	The control elements to adjust volume are easy to use.				3				4,5
3.	**Presence and location of relevant control elements**								
3.5	Control elements are located at positions where they can be identified even when vision is impaired.	2,5	3	2,5		4	3	4	
3.8	Information is provided to describe the arrangement of control elements (video clips).				N/A				2
4.	**Perception of status of control elements and displays**								
4.4/5.1-4 (-1)	There is visual feedback upon activating a control element.	4	4	4		4	4	2	
4.4/5.1-4 (-2)	The acoustic feedback signals differ clearly from each other (using the keyboard, navigation keys (e.g. "go back"), or volume control).				3				2,5

No.	Description								
6.	**All actions and functionalities, including maintenance and settings, can be accessed and performed.**								
6.15(-1)	Control elements in close proximity to each other can be precisely used.	2	3	3		4	4	4	
6.15(-2)	The touch display responds immediately upon touch input.				4				5
6.15(-3)	The touch display recognizes precisely the desired touch input even for control elements in close proximity to each other (e.g. "add" and settings).				2				4
9.	**Errors and mistakes can be corrected**								
9.1	The user will be notified when committing an error while using the device or application.				4				4
9.2	The notification provides an instruction/explanation on how to deal with the error.				2				4
9.3	A correction of entries is possible (undo, delete, correct).				2,5				2,5
12.	**Possibility to use products efficiently**								
12.11	While watching the instructional videos control elements to navigate through the video clip are available.		N/A				4		
13.	**Understanding of how to use the product**								
13.1(-1)	It is possible to obtain information on the product and its functionalities.				1				1,5
13.1(-2)	There are cues that indicate to the user at which navigation point she/he is (e.g. grey bar).	2	2	2		2	2	3	
13.1(-3)	Orientation with respect to previous and subsequent navigation points is given at all times.	2,5	1,5	2		2	2	2,5	
13.2(-1)	The used terms clearly convey the corresponding functionality (e.g. "add").	3,5	4	4	4	3	3	4	4
13.2(-2)	The used symbols clearly convey the underlying function (e.g. arrows in the calendar, settings).	4	2			4	2		
14.	**Understanding the displayed material**								
14.4(-1)	Video clips contain subtitles to better comprehend the content of the video clips.		N/A				2		
14.4(-2)	Displaying subtitles in videos can be activated and deactivated.		N/A				1		
14.5(-1)	It is possible to increase the size of the displayed content.			1	1,5			2	1,5
14.5(-2)	Automated line breaks to improve legibility are implemented.			4	4			4	4
14.6/.7	Videos offer the option to modify their speed and to pause them.		N/A				2,5		

Legend: Median values, red cells: below 3 ("failed") and green cells: 3 or higher values ("passed"), N/A: not available/relevant
Cal: Calendar feature; KNOTS: Knowlegde data, videos; Chat: chat feature; Gen.: general aspects

The results, separated for the coordinators and the (software) engineers can be obtained from Tables 2 and 3 in the Appendix of this document.

It is obvious from Tab. 1 that the App for the stationary terminal was rated lower with higher usability problems than the Smartphone App. There seems to be some headroom to optimize the implementation for the tablet which may be understandable given that the app was originally developed for a smart phone and the ported to the tablet screen size. Here, more preference was given to implementing functions (due to delays in the development) that on optimizing the content to the larger screen (which of course is subject of next future work). Moreover, it is obvious that the KNOTS consortium has to work on the system logic, see Section 13 "Understanding of how to use the product" and Section 1 "Perception of visual information".

4.2   Open ended aspects and suggestions for further improvement

In this sub-chapter the qualitative details of usability aspects of the four domains Calendar, Knots (knowledge system), Chat and general aspects will be shortly reported in catchword. The lists can be used for further improvements for the next prototype.

4.2.1   General aspects

- Separation between the tabs and indication of activation should be more clearly → 1. Enlarge grey bar; 2. Thicker font of the selected tab; 3. Outline the tabs to separate them from each other

- Elements in close proximity should have greater distances to accommodate all finger sizes and fine-motor skills

- "Add" is almost always visible, it should display only, if the function is needed

- The three points on the upper edge are not being recognized as the settings menu (very Android specific) → Use other Symbol, e.g. a gear-wheel or a 'setting' as text

- Take note of 13.2(-2), in which, although the results suggest that the used terms are largely understood, the volunteers made some contradictory comments. Thus, for example, that "Add" in the chat tab could mean that a new chat partner can be added, although this is not an intended function

- The acoustic feedback should use sounds that can be perceived by the elderly. Android sounds are mostly not suitable

- The font size should be changeable in the setting of the KNOTS App, possibly additional to the settings of the Android System.

- The search process for tutorials/information via speech recognition is generally evaluated as positive and recognized as an easy to use operation, albeit we tested this function only with a web interface

- The prototype of the station has been criticized in terms of the large edges around the display and the inferior quality of the used tablet display, which often imprecisely recognized the users input

- It was also noted that the stationary prototype necessarily must meet hygienic standards and thus be sterile and should be at least robust against splash water for practicable use in the realm of home care

- The keyboard is often displayed, but not needed for the respective function

4.2.2 KNOTS functions

- Grey text is difficult to read, especially in the current size. Should be a larger font and more distinctive color

- In the context of small font the magnifying glass icon is often recognized as an opportunity for magnifying the content and not as a search function

- There is no preview of the content in the Knots index

- It is not clear what has to be entered for a new entry. The steps should be numbered or the procedure should be explained

- Saving a new entry is always possible, even without data. Should be possible only when data has been entered

- In the entry index the title of an entry should be distinguishable from the description below. Title font should be more thick or in bold letters

- When putting in a title for a picture, there is no "Save" button. A "Save" button should be added.

- In a Knots entry the keyboard appears in the text field and it is not possible to see what was written while writing, because the screen does not scroll up. The screen should scroll up / lifted by the keyboard

- Videos should show on-screen controls from the beginning, not only when the video was tapped. These controls should be labeled

- When watching a video it should be possible to change to landscape mode when turning the Smartphone

4.2.3 Calendar functions

- Dark red at appointments and black font color is hard to read. Font color could be white

- The dark red marking of appointments makes the marking of the current day invisible. Marking of the current day should be highlighted, e.g. in white and larger numbers

- The participants desired a selectable schema of the weekly overview including upcoming appointments. Approximately like a timetable to see all events for one week.

- The stationary system should utilize the screen size better. This means larger cells for each day and less days of the following month.

- Larger font for event overview and no grey font; eventually a black font

- In the settings for a new event the save button (disc) and the red cross should be farther apart

  o The red cross is difficult to see on the red background. It should be white or written in text; same for the disc

- The arrows for changing the month should be located further from the edges of the screen and they should be larger

- Wiping in the calendar tab to change the month is confusing because in other tabs it means to change to the next tab, depending on the direction of the wipe gesture. Wipe should be deactivated in the calendar

- Add button should be highlighted

- How to delete an appointment is not easy to understand (Android: holding the entry until a menu appears).

- Appointments / Events can't be edited

4.2.4 Chat function

- Grey text is difficult to read, especially in the current size. Should be in larger font and distinct color

- Send button should be highlighted

- The keyboard is being displayed from the beginning, which is disturbing if one wanted to read the send messages only. The keyboard should only be displayed, if one wanted to write a message

5 Appendix

5.1 Separate results (coordinators)

Index	Description DIN EN ISO 9241-20:2009-08	Station				Mobile			
		Cal	Knots	Chat	Gen.	Cal	Knots	Chat	Gen.
	1. Perception of visual information								
1.4(-1)	The contrast between the saved event and the date is sufficient.	2				4			
1.4(-2)	The contrast between the control elements is sufficient.		1	2			4	4	
1.4(-3)	The currently active tab can be clearly distinguished from the others.	2	2	2		2	4	2	
1.7(-1)	The font size is clearly legible.	2	1	1		4	2	2	
1.7(-2)	Text can be modified by adjustable font size when vision is impaired.				1				1
	2. Perception of acoustic information								
2.3(-1)	The volume level is visible.				4				4
2.3(-2)	The control elements to adjust volume are easy to comprehend.				4				4
2.3(-3)	The control elements to adjust volume are easy to use.				4				4
	3. Presence and location of relevant control elements								
3.5	Control elements are located at positions where they can be identified even when vision is impaired.	1	3	2		4	3	4	
3.8	Information is provided to describe the arrangement of control elements (video clips).				N/A				2
	4. Perception of status of control elements and displays								
4.4/5.1-4 (-1)	There is visual feedback upon activating a control element.	4	4	4		4	4	4	
4.4/5.1-4 (-2)	The acoustic feedback signals differ clearly from each other (using the keyboard, navigation keys (e.g. "go back"), or volume control).				4				3
	6. All actions and functionalities, including maintenance and settings, can be accessed and performed.								
6.15(-1)	Control elements in close proximity to each other can be precisely used.	3	4	3		4	4	4	
6.15(-2)	The touch display responds immediately upon touch input.				4				4
6.15(-3)	The touch display recognizes precisely the desired touch input even for control elements in close proximity to each other (e.g. "add" and settings).				2				3
	9. Errors and mistakes can be corrected								
9.1	The user will be notified when committing an error while using the device or application.				4				4
9.2	The notification provides an instruction/explanation on how to deal with the error.				4				3
9.3	A correction of entries is possible (undo, delete, correct).				2				2

ID	Description								
12. Possibility to use products efficiently									
12.11	While watching the instructional videos control elements to navigate through the video clip are available.		N/A					4		
13. Understanding of how to use the product									
13.1(-1)	It is possible to obtain information on the product and its functionalities.				1					1
13.1(-2)	There are cues that indicate to the user at which navigation point she/he is (e.g. grey bar).	2	2	2		2	2	2		
13.1(-3)	Orientation with respect to previous and subsequent navigation points is given at all times.	2	1	2		2	1	2		
13.2(-1)	The used terms clearly convey the corresponding functionality (e.g. "add").	3	4	2	3	4	3	4	4	
13.2(-2)	The used symbols clearly convey the underlying function (e.g. arrows in the calendar, settings).	4	2			4	2			
14. Understanding the displayed material									
14.4(-1)	Video clips contain subtitles to better comprehend the content of the video clips.		N/A					2		
14.4(-2)	Displaying subtitles in videos can be activated and deactivated.		N/A					2		
14.5(-1)	It is possible to increase the size of the displayed content.				1	1			1	1
14.5(-2)	Automated line breaks to improve legibility are implemented.				4	4			4	4
14.6/.7	Videos offer the option to modify their speed and to pause them.		N/A					4		

5.2 Separate results (engineers)

Index	Description DIN EN ISO 9241-20:2009-08	Station				Mobile			
	1. Perception of visual information	Cal	Knots	Chat	Gen.	Cal	Knots	Chat	Gen.
1.4(-1)	The contrast between the saved event and the date is sufficient.	4				4			
1.4(-2)	The contrast between the control elements is sufficient.		3	4			3	4	
1.4(-3)	The currently active tab can be clearly distinguished from the others.	4	4	2		2	3	2	
1.7(-1)	The font size is clearly legible.	2	1	1		3	2	4	
1.7(-2)	Text can be modified by adjustable font size when vision is impaired.				1				2
	2. Perception of acoustic information								
2.3(-1)	The volume level is visible.				2				2
2.3(-2)	The control elements to adjust volume are easy to comprehend.				4				3
2.3(-3)	The control elements to adjust volume are easy to use.				2				5
	3. Presence and location of relevant control elements								
3.5	Control elements are located at positions where they can be identified even when vision is impaired.	4	3	4		4	4	4	
3.8	Information is provided to describe the arrangement of control elements (video clips).				N/A				2
	4. Perception of status of control elements and displays								
4.4/5.1-4 (-1)	There is visual feedback upon activating a control element.	4	4	4		4	4	1	
4.4/5.1-4 (-2)	The acoustic feedback signals differ clearly from each other (using the keyboard, navigation keys (e.g. "go back"), or volume control).				3				2
	6. All actions and functionalities, including maintenance and settings, can be accessed and performed.								
6.15(-1)	Control elements in close proximity to each other can be precisely used.	2	2	3		5	4	4	
6.15(-2)	The touch display responds immediately upon touch input.				5				5
6.15(-3)	The touch display recognizes precisely the desired touch input even for control elements in close proximity to each other (e.g. "add" and settings).				4				5
	9. Errors and mistakes can be corrected								
9.1	The user will be notified when committing an error while using the device or application.				4				4
9.2	The notification provides an instruction/explanation on how to deal with the error.				1				2

9.3	A correction of entries is possible (undo, delete, correct).				3				3,5
12. Possibility to use products efficiently									
12.11	While watching the instructional videos control elements to navigate through the video clip are available.		N/A				4		
13. Understanding of how to use the product									
13.1(-1)	It is possible to obtain information on the product and its functionalities.				1				2
13.1(-2)	There are cues that indicate to the user at which navigation point she/he is (e.g. grey bar).	2	3	2		2	3	4	
13.1(-3)	Orientation with respect to previous and subsequent navigation points is given at all times.	3	2	2		2	2	4	
13.2(-1)	The used terms clearly convey the corresponding functionality (e.g. "add").	4	4	4	4	3	2	4	4
13.2(-2)	The used symbols clearly convey the underlying function (e.g. arrows in the calendar, settings).	4	3			4	2		
14. Understanding the displayed material									
14.4(-1)	Video clips contain subtitles to better comprehend the content of the video clips.		N/A				2		
14.4(-2)	Displaying subtitles in videos can be activated and deactivated.		N/A				1		
14.5(-1)	It is possible to increase the size of the displayed content.			2	2			2	2
14.5(-2)	Automated line breaks to improve legibility are implemented.			4	4			4	4
14.6/.7	Videos offer the option to modify their speed and to pause them.		N/A				2		

6   References

[1] Nielsen, J., and Molich, R. (1990). Heuristic evaluation of user interfaces, *Proc. ACM CHI'90 Conf.* (Seattle, WA, 1-5 April), 249-256.

[2] Nielsen, J. (1994). Heuristic evaluation. In Nielsen, J., and Mack, R.L. (Eds.), *Usability Inspection Methods*. John Wiley & Sons, New York, NY.