COGKNOW

"Helping people with mild dementia navigate their day"

Human Factors Impact Analysis

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The human factor analysis of the Cogknow project field test #1

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COGKNOW Report Context

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1 Summary

The COGKNOW project aims at developing a functional, user-validated cognitive prosthetic device which addresses the needs of people with mild forms of dementia. Our main target group is living in Europe, all in all around 900,000 people. The vision of the project is to assist these people in navigating through their day by providing technological support for cognitive reinforcement.

Work package 1 (wp1) of the COGKNOW project is designed to deliver a Human Factor Analysis on data collected in three field tests of the COGKNOW device and services (termed the COGKNOW Day Navigator) for people with dementia (Pwds) and their informal carers. Each field test covers increasingly complex levels of functionality of the prototype to be tested. While in the first two field tests the focus will be on user-friendliness and perceived usefulness, the third field test will investigate the functionality, usability and acceptance of the finished prototype and its impact on the Pwds' autonomy and quality of life. Each field test is performed at three test sites (Northern Ireland, The Netherlands and Sweden) with a total of 15-18 user-dyads (Pwds and informal carers).

This report (Deliverable 1.5.1 of the COGKNOW project) presents the Human Factor Impact Analysis of field test # 1, which was carried out in the homes of 16 people with dementia living in the regions of Amsterdam, Belfast and Lulea. The study was carried out in 2007.

The methods and work plan for data collection before, during and after the field test were described in detail in deliverable 4.1.1.of the COGNOW project. We have applied semi-structured interviews, field observations, pre-formulated bottleneck checklists, and some in situ measurements to investigate the applicability and perceived usefulness of the COGKNOW device, as implemented in its first prototype.

A majority of our informants evaluated the overall system design as user-friendly and useful. However, some difficulties were reported in the use of the touch screen interface, and in its present form, the mobile device was evaluated as less applicable by the users than the stationary component of the COGKNOW system. The first prototype of the COGKNOW device has limited functionalities.

The reminding and alarm systems are judged as useful by a majority of informants, and this also goes for the picture dialling and media control facilities. The media control and picture dialling systems are also judged as user friendly by the users. Some technical difficulties have been reported on the communication system. Based on the outcomes of field test #1 with users at the three test sites, we have made the following overall recommendations for further development of the COGKNOW prototype prior to field test #2.

The bottlenecks encountered during field test #1 should be resolved in advance of the next field test. The most significant bottlenecks encountered in field test #1 are:

a) The touch screen on both the stationary and the mobile device did not detect the Pwds' touches as expected. This problem was most pronounced on the mobile device.

b) A general unstable function of the Day Navigator's screen on the mobile device.

c) Reminding and safety warnings did not work properly on the mobile device.

d) The connection between door sensors and the COGNOW Home Hubb (CHH) did not work properly.

2 Introduction

2.1 The Human Factor Impact Analysis

The Human Factor Impact Analysis of the COGKNOW project investigates user needs and priorities at an early project stage. The human factor analysis aims at determining the user-friendliness and usefulness as perceived by the users of the system (Raskin 2000, Nyberg & al.2001, Monk 2002).

The results of this analysis form the point of departure for the further prototyping of the system. A functional Requirement Specification is established on the basis of the Human Factor Analysis. Designing the COGKNOW Day Navigator, the Human Factor Analysis builds on personal interviews with selected informants and on workshops of informants gathered together in groups. In addition, context information has been collected. Prior to this report (deliverable D1.5.1), a Functional Requirement Specification has already been formulated (deliverable 1.4.1) as a basis for the first prototype. The Human Factor Impact Report presented here, deals with the first field testing of this prototype as well as some additional pre-test context data. The analysis presented will be fed into work packages two and three of the COGKNOW project, and serves as a basis for further development of the prototype subjected for testing in field test two during 2008. The Human Factor Impact Analysis concerns three test sites in the Netherlands, Northern Ireland and Sweden. Personal interviewing, workshops and collection of context information have been conducted according to a common scheme for all test sites, allowing for comparison of data between sites. Each test site has been managed quite independently by local teams, but several coordination meetings and joint planning sessions have ensured a common approach. The descriptive and analytic results from each test site presented in this report have been put together by the local teams.

The users have contributed extensively to the design process of the COGKNOW prototype, and in the Human Factor Impact Analysis they have been asked to make comments on the performance, applicability and usefulness of the COGKNOW Day Navigator. However, it is a basic presumption for the COGKNOW project that the design builds on state-of-the-art technology (hardware as well as software). Our informants' needs and priorities have been investigated within this preset framework.

Chapters 3 through 5 of this report apply the standard approach to the field, describing and analyzing methods, results and recommendations, respectively. Chapter 2 provides the readers with necessary context information of the investigation. We describe the aims of WP 1 as well as the design of the prototype. In chapter 3 we detail the methods used prior to and during field testing. Procedures during data collection and installation of equipment are described. In chapter 4 the results of the investigation are presented, concentrating on pre-test and semi-structured interviews, and field test observations. In chapter 5 we present our recommendations. Throughout the text, we have used the term "person with dementia" (Pwd) to denote our key informants. In fact, we have interviewed and observed dyads of users, i.e. Pwds and their close persons together. We have, however, tried to avoid the term "carer" in this connection, since the close person is not a carer in the professional meaning of the term. As a synonym for the term "close person" we sometimes apply the term "informal carer". Actually, professional carers are not included in the initial Human Factor Impact Analysis - even if they certainly will be users of the COGKNOW prosthetic device. Hence, in this text the category "user" is restricted to mean Pwds and those persons close to them. The professional helpers will be included in The Human Factor Impact Analysis from field test 2 and onwards.

The following definition of needs, wants and demands is used in this report (Kotler 1980): A need is a felt state of deprivation (including basic needs, social needs and individual needs), for example when someone says he lacks companionship, this implies a need for social contact. Needs can be communicated as met (e.g. I enjoy the company of my children) or unmet (I miss the company of my children). A want is the expression of a need, as shaped by a person's culture and individual development, for example "I need someone to talk to". A demand is a preferred specific solution for a

person to fulfil his or her need (depending on the resources a person have). Our term "user-friendliness" refers to users' observed ability to handle the equipment and its functionalities, whereas the term "usefulness" relates to the perceived ability of the equipment and its functionalities to meet the users' needs. We sometimes use the term "applicability" as a synonym for usability.

2.2 Aim of work package 1

The COGKNOW project aims at developing a functional, user-validated cognitive prosthetic device which addresses the needs of people with mild forms of dementia. Our main target group is living in Europe, all in all around 900,000 people. The vision of the project is to assist these people in navigating through their day by providing technological support for cognitive reinforcement. Work package 1 of the COGKNOW project intends to ascertain the functionality and performance which the COGKNOW Day Navigator needs to fulfil in order for the service to be adequate for testing. The concrete objectives of WP1 are:

a) Obtain insight into the needs and priorities of users of the COGKNOW Day Navigator. We focus on the key areas of reminding, maintaining social contact, performing activities of daily living, and enhancing feelings of safety.

b) Contribute to the user-friendliness and usefulness of the COGKNOW Device. Requirements will be specified within the context of the International Classification of Functioning, Disability and Health (ICF).

c) Evaluate the impact of the developed system on users perceived autonomy and quality of life.

2.3 Tasks, roles and deliverables

This report contributes to the Functional Requirement Specification of the COGKNOW Day Navigator, but the results of the workshops with our informants have already been published in deliverable D1.4.1. The Functional Requirements will be updated based on the Human Factors Analysis with new users in the second and third phase of the developmental process. Here is how the project description documents distinguish between deliverable D1.4.1 and D1.5.1:

An initial Functional Requirement Specification will be established on the basis of interviews and workshops with the users (D1.4.1) in project month six. During the first year, a first field test on the prototype will be carried out.

On the basis of this test (field test #1) and the collected data, a second Human Factors and Needs Analysis will be conducted (completed in project month twelve) in order to feed back information to the technical developers. These results constitute a second deliverable D1.5.1, and an updated Functional Requirement Specification.

Task 1.4 Human Factor Analysis: At the end of the project month 6, a clear specification of users' functional requirements delivered to technical and service developers.

Task 1.5 Project month12: Analysis and list of fulfilled and unfulfilled requirements returned to technical and service developers on the basis of test results of field test #1.

Table 1 describes work tasks, task leaders, and deliverables of work package 1.

Table 1: Tasks, responsible institutions and deliverables in Work package 1

WP1		Human Factor Analysis	Task leader	Deliverable
	T1.1	Detailed work plan	CDH	
	T1.2	Informational and needs inquiry workshops	VUMC	
	T1.3	Needs analysis and storyboards	VUMC	
	T1.4	Iteration between User Needs and Technical Providers	TI	D1.4.1
	T1.5	Human Factors Impact Analysis (Test #1)	NST	D1.5
	T1.6	Human Factors Impact Analysis (Test #2)	BCH	D1.6
	T1.7	Human Factors Impact Analysis (Test #3)	VUMC	D1.7

2.4 The COGKNOW Day Navigator, tested prototype in field test #1

The COGKNOW Day Navigator prototyped during field test #1 consists of two main hardware components. The mobile device (COGKNOW Cognitive Assistant, mobile device) is linked to the COGKNOW Server (CS) and other home infrastructure components, namely the COGKNOW Home Hub and the COGKNOW Sensorised Home (CSH). The home screen is a stationary device placed in the users' home, which communicates with the rest of the system via broadband communication (see the User Manual, published as an annex to the Field Test Report D4.3.1). Figure 1: The pictures shows the COGKNOW prototype investigated during field test #1.

Fig. 1 The COGKNOW prosthetic device tested during field test #1

The COGKNOW prosthetic device aims at supporting Pwds in four main functional areas. These are:

a. Reminding:
   - A day-time indication
   - Optional reminder to make a phone call
   - Optional reminder to prepare/have breakfast
   - Optional reminder to prepare/have lunch
   - Optional reminder to prepare/have dinner
   - Optional reminder to brush teeth

b. Maintaining social contact:
   - Receive incoming telephone calls
   - Picture dialling: call a contact by touching a picture on the screen

c. Performing activities of daily living:
   - Music player
   - Radio function

d. Enhancing feelings of safety:
   - Warning alert when front door is left open
   - Possibility to call for help at the touch of a button

2.5 2.5 Research questions in field test #1

In field test #1, the focus has been on user-friendliness of the stationary and mobile devices, and on investigating basic usefulness regarding the functionality of the COGKNOW device. The general question on user-friendliness was: Are people with dementia able to use the device single-handedly? What are the obstacles to self-sufficient use? The general question on user-friendliness was: Do the users value the functionalities of the device as supportive in their daily living?

In appendix A.3 we provide a complete list of research questions and methods for field test #1. Within WP1, four groups were established with responsibility for elaborating the different research methods:

Group1: Pre-test interviews (led by CDH)

Group 2: Semi-structured interviews (led by VUMC)

Group 3: Observation scheme (led by NST)

Group 4: bottleneck list (led by TI)

In addition, work packages 2 and 3 were asked to elaborate the in situ measurement methods. Some of the research questions had already been formulated in D5.1.1 (see the evaluation strategy, part.4.1). Some of them had been suggested by VUMC, TI and NST and agreed upon by the other WP1 partners.

3 Methods

3.1 Procedures, participants and setting

3.1.1 Procedures

All Pwds were screened according to the Global Deterioration Scale[1], and the close persons were checked against the inclusion criteria for informants during the spring of 2007. After being informed about the aim and state of the project and the first field test, all test participants signed a consent form.

A pre-test interview with Pwds and those close to them was conducted prior to the installation of the COGKNOW device in the Pwds' homes. The pre-test interviews focused on context data. The COGKNOW Day Navigator was installed in the Pwds home during the summer of 2007, the installation work demanding a visit of between 30 and 120 minutes to the Pwds' home.

In Northern Ireland and The Netherlands, the installation, test interviewing and un-installation of the equipment was conducted on the same day (approximately 4-5 hours in total). In Sweden the equipment was installed one day in advance of testing, but in two cases the installation was done 6 days prior to testing (in one of these cases only the home screen was operational). In The Netherlands and Northern Ireland the field-test interviewing was completed within approximately two hours (one hour with the Pwd and one hour with the informal carer), whereas in Sweden prolonged interviewing sessions were conducted, the researchers spending on average 4-5 hours together with the informants. The Swedish approach probably allows for better acquaintance with the prototype prior to testing (depending on the informants' own initiative). In their report from the test site, the Swedish team writes: "At the time of the installation the participants received instructions on how to use the devices and they had the opportunity to use it on their own." (See the field test report deliverable 4.3.1).

The field test interviews concentrate on the users interactions with the four main functionalities of the COGKNOW device. A pre-configured prototype (fixed reminders, fixed photographs for the calling system, fixed music facilities, and a standard warning sensor on doors) was applied during testing.

General questions about the size, shape and weight of the equipment were administered to the Pwds and those close to them, along with questions about the charging of the system. The screen size, readability of text and icons, audibility of the alarms, and handling of buttons were checked in a structured manner (a fixed approach was used at all the sites). Open questions about the specific applicability of the functions installed and about the usefulness of these functionalities as seen from the users' point of view were administered to all informants

.

The field test observations were conducted at all sites. These observations concern the users' handling of the COGKNOW device with respect to the four functionality areas.

A slight adjustment in the timing of field tests at different sites made minor bug fixes and adaptations of the COGKNOW device possible during the test period. Hence, the functionality of the device first subjected to testing was not exactly the same as on those tested at the end of the trial period. In particular, the test in the Netherlands used fairly early versions of the prototype, while the tests in Northern Ireland and Sweden used identical versions of CS, CHH, CSH, and CCA (except for one user in Sweden who used a minor update to the CCA). Even if these adaptations only represent minor differences within some of the functionality areas, they might have influenced some of the users' opinions on applicability and usefulness.

[1] See: http://www.medrounds.org/encyclopedia-of-aging/2006/01/reisburgs-global-deterioration-scale.html

3.1.2 Participants in Field test #1

Inclusion criteria for Pwds and close persons (Pwd/informal carer-dyads) are:

- People with the diagnosis dementia of the Alzheimer type (possible/probable) as described in the DSM-IV-TR. Characteristics of Pwd participants and close persons in field test #1 are summarised in table 2.
- People suffering from mild dementia, as described in the Global Deterioration Scale stages 3, 4, and 5: mild cognitive decline (early confusional stage; GDS 3), moderate cognitive decline (late confusional stage; GDS 4) and moderately severe cognitive decline (early dementia stage; GDS 5) assessed by using the standardized Brief Cognitive Rating Scale (Reisberg 1983)
- People willing and able to participate actively in a research project (confirmed by individual interviews, or participation in a focus group) in which an ICT device is being developed aiming at support of memory, daily activities, communication with family and friends and feelings of safety.

The close person (informal carer) is regularly in contact with/cares for the person with dementia.

Table 2: Characteristics of participants in field test #1

	Amsterdam (n=5)	**Belfast (n=5)**	**Lulea (n=6)**
Persons with dementia			
Age	Mean 64,7 (range 56-78)	Mean 70,8 (range 66- 78)	Mean 69,5 (range 60-77)
Gender	3 female 2 male	4 female 1 male	4 female 2 male
Civil status	4 married 1 divorced	3 married 1 widowed 1 single	5 married 1 single
Carers			
Age	Mean 59,2 (range 49-78)	Mean 64.2 (range 45-72)	Mean 58,5 (range 23 – 78)
Gender	3 female 2 male	2 female 3 male	3 female 3 male
Relation to person	4 spouses 1 daughter	3 spouses 1 children 1 cousin	**3 spouses** 1 daughter **2 son**

3.1.3 Experiences of researchers and users

The installation of the COGKNOW device in the Pwds' homes may to some extent have altered our informants' daily activities. Our informants are persons partially dependent on the care provided by others, and hence the interruption caused by installing a prototype not necessarily functioning perfectly from start on may have caused some unintended stress at the trial site. Even if explicit precautions were taken to prevent this, it was sometimes observed that our informants became tired or stopped cooperating with the interviewers/observers. In the majority of cases, however, the researchers experienced informants as cooperative with a keen interest in the potential benefits from using the COGKNOW services. The users generally seem to have an open-minded approach to their encounters with new technology.

3.2 Pre-test interviews

One month before the field trial, all the people who had participated in the needs inventory workshops (persons with dementia and informal carers) were asked if they were still willing to participate in the field test. If so, their availability during the planned field test period was checked, and an appointment was made for an individual pre-test interview in their home about two weeks before the field test. The procedure during the home visit was explained.

During the home visit, possible changes in background and context variables of the person with dementia and the carer were checked (see Annex A1.1), and when necessary the cognitive status of the person with dementia was checked as well. This was tested with the Mini-Mental State Examination [2](MMSE). The person with dementia was not included in the field test if it appeared that because of cognitive deterioration the person with dementia no longer fulfilled the inclusion criteria (person with mild dementia GDS stage 3, 4 and 5 or MMSE >14; Reisberg, 1993) and therefore almost certainly would have many problems in using the COGKNOW Day Navigator. They were thanked for their voluntary participation in the project and were asked if they were interested in remaining informed about the project results. If so, the researchers promised to keep them informed. If the person with dementia fulfilled the inclusion criteria, the aim and procedure of the field test was explained in more detail.

In order to be able to configure the COGKNOW Day Navigator for each individual person with dementia, several questions were asked during the pre-test interview. For example, these concerned wishes with respect to the type and timing of reminders, and information and photographs to be added to a picture dialling contact list. The availability of equipment was also checked, for instance a radio that could be switched on and off, telephone and electrical outlets etc. At the end of the pre-test interview, appointments were made specifying the date and time of the actual testing. The persons with dementia and the close persons received an information flyer in which they could read all the information on the field test over again. They were also asked to sign an informed consent form (repeated informed consent procedure, see Annex A2).

3.3 Field test interviews

For the first field test, separate semi-structured interviews were composed for the persons with dementia and their informal carers (see Annex A1.2, A1.3). Part of the interview was conducted during the field test and part of it after the field test had been finished. The questions in the interviews were focused on user-friendliness and on (expected) usefulness of the different functionalities in the four COGKNOW areas (memory, communication, daily activities, and safety).

The interviews were conducted by specifically trained senior and junior researchers. These researchers worked under direct supervision of the responsible test site clinical managers to ensure that proper practice was followed and that all identified ethical issues were addressed (see Annex A3 DoW on Ethical Issues).

During the field tests, the participants were interviewed in their own homes and observed while actually using the COGKNOW Day Navigator.

[2] See http://www.minimental.com/

3.4 Observation scheme

During the field test the user-device interaction was also observed by the researchers. A standard observation scheme was composed to make comparisons between the users at the three test sites possible (see Annex A1.4). The observations were conducted by specifically trained senior and junior researchers. The pre-test and field test interviews mainly have a structured and semi-structured form. The field observations are open, and allow for inspection of the users' handling of the equipment, as well as of specific interactions with different functionalities. The observations were written down in a field log during observation of the users.

3.5 Digital in situ measurement

Some of the research questions are approached partly by in situ measurements which measure phenomena through technology. The in situ measurements log traffic data and frequency and timing of specific use of different functionality areas. In addition, the in situ measurement software allowed for sound recordings of user comments. For this aim, research software was developed in WP2 and 3 (for more details, see COGKNOW deliverable 3.1.1, Technical Specification of Systems and Services). The in situ measurement software was installed on the mobile device.

3.6 Bottleneck list

To investigate problems in the user-device interaction during the field test, a bottleneck list was established (see Annex A1.5). The bottleneck list is a checklist established on the basis of the researchers' estimations of difficulties prior to field test #1. The list was used at each test site and left at the Pwds' homes if the test took more than one day. It was filled in by the users or by the researcher who conducted the interview. In field trial #1, where at some test sites the COGKNOW Day Navigator application was used only under supervision of the researcher for a short period (half a day), the researcher filled in the bottleneck list.

3.7 Prescribed test tasks

The first prototype of the COGKNOW device has restricted functionality areas. However, certain key aspects of the prototype are essential for the overall functioning of the system (see Annex A1.5). These key aspects, e.g. charging, internet connection, communication between mobile and stationary device, audibility of alarms, and readability of the user interface were addressed by specifically formulated test tasks prior to testing. To ensure that the different aspects of applicability and usefulness of the COGKNOW Day Navigator were tested and all questions of the semi-structured interview could be answered in the first field test, several prescribed tasks were composed by researchers of WP1 before the tests.

During the field test, the persons with dementia were invited to perform these tasks.

3.8 Data storage and analysis of data

All data were made anonymous to ensure confidentiality. Before any computer storage, a personal key was applied, and the key safely locked. The quantitative data were coded according to a common scheme for all sites and stored in a format suitable for SPSS analysis. Only anonymous data were exchanged between sites. The qualitative data were coded according to a common scheme for all sites using the NVivo software. Only data which had been made anonymous were exchanged. All persons with access to data were bound by the same ethical standards and principles of confidentiality and privacy. Special training on communication skills, ethics and data protection was therefore provided to personnel at the three test sites.

The data analysis focused on answering questions about user-friendliness and perceived usefulness of the device. Descriptive analysis was conducted on the quantitative data of each test site by means of SPSS. The analysis of the qualitative data collected by the field test observations were analyzed using NVivo. The qualitative data collected by means of the bottleneck lists and in situ measurements were summarized in written reports from each test site. The reason for analyzing the data of the three test sites separately was two-fold:

a) Small differences between the stability of the prototype tested at the different sites.

b) The researchers' interest into possible differences and variations between users. Opinions on user-friendliness and usefulness of the COGKNOW Day Navigator between the sites in the three countries.

At each test site, approval from the respective national ethical committees was obtained before any data collection took place.

In field test #1, the data analysis focused on answering questions about user applicability and perceived usefulness of the device. The analysis of field observations, bottleneck lists, in situ measurements, and prescribed test tasks focused on user interactions with the COGKNOW device.

4 Results of the Human Factor Analysis in field test #1

4.1 COGKNOW Day navigator system and design

The report on the results below was written by the research teams at each test site. In the text, we have referred to Annex A1 in which the results of the questionnaires have been presented in detail and Annex A4 in which the results from observations have been presented, for the three test sites. The number of Pwds tested at each test site: Amsterdam n=5, Lulea n=6, Belfast n=5 (for more information see Table 2).

4.1.1 Semi-structured interviews

Amsterdam

In Amsterdam, the overall first impression of the COGKNOW Day Navigator from persons with dementia was positive. Some participants stated that, although development is still in its early stages, they could see the use for such a system. All but one participant stated that the device was easy to learn for the functions they would need. They expected to use a little time to remember the functions of the device, but when interacting with the system they would learn how to use it. When asked, four persons with dementia said they were satisfied with the device in general. None of the participants had any suggestions on how to make the device easier to learn and use.

With regard to the size of the stationary device, two persons with dementia stated that it was too large; the other three persons with dementia judged the size as appropriate. However, all participants stated that the number of buttons on the screen was appropriate and all but one person with dementia judged the button size and text size as appropriate. One person with dementia found the button size as well as the text size to be too small. When asked how useful they thought the stationary device would be, two persons with dementia said it would be useful. One person stated that it would not make any difference with the current routine, but they could see its use for the future. Two persons could not make any statements on the usefulness of the stationary device. None of the persons with dementia found the stationary device to be inconvenient to have in their home, and all were satisfied with the

stationary device in general. One person with dementia stated that it would be even better if the stationary device could be hanged from the wall. Another stated that the home hub could be smaller and less conspicuous in the room.

The size of the mobile device was judged too large by two of the persons with dementia participating, three persons judged its size as appropriate. The screen size, however, was judged appropriate by all but one person with dementia. With regard to the weight of the mobile device, three persons judged it as appropriate and two persons thought it was too heavy. All persons with dementia said the mobile device was too bulky and heavy to carry around. Two participants found the mobile device to be difficult to attach to clothes or body. In contrast, all persons with dementia who used the mobile device during this test (in two test cases the mobile device did not have any functionality) stated that the mobile device was not inconvenient at all and that they were satisfied with the device in general. Two persons with dementia suggested that the mobile device could be lighter and smaller; one person suggested removing the buttons beneath the screen, as they had no apparent use.

Informal carers were divided on their experience with the COGKNOW Day Navigator. Three informal carers stated that this is a good development for people with dementia. On a more personal level, the system could be useful in the future but, with regard to the stage of dementia of their loved ones, this would be a good time to learn how to use the devices. In contrast, one informal carer said this system would be too difficult to learn, especially when the person with dementia did not have any previous experience with computers. All informal carers were satisfied with the Day Navigator in general. All informal carers expected to learn how to use the device quickly themselves, but were divided on how much support and help the person with dementia would need in learning the functions and how to use the device. Three informal carers expected that the person with dementia would need at least some help in remembering the functions and using the system.

Size, button size, text size, as well as the number of buttons on the stationary device were judged appropriate by all informal carers. All but one informal carer stated that the stationary device would be useful for the person with dementia and that the arrangement was sufficiently user-friendly for the person with dementia to operate. One informal carer expected the number of functions on the stationary device to be too large for the person with dementia to remember them all. None of the informal carers found it stressful or inconvenient to have the stationary device in their home. All informal carers were satisfied with the stationary device, of which two were very satisfied. Two informal carers suggested that the stationary device should be wall mounted. One informal carer would like a separate help button next to the bed (this could be the mobile device, but as it had no functionality at the time, the concept remained abstract). One informal carer stated that the text could be removed from the screen, as it had no use and would be confusing for the person with dementia.

Two informal carers expected their loved ones to lose the mobile device sometimes. Three informal carers expected Pwds to forget the mobile device at least sometimes. One informal carer stated that it would be useful to put contact information of the owner on the mobile device. All informal carers were satisfied with the mobile device. One carer suggested removing or covering up the (hardware) buttons as they have no function. Another stated that the mobile device should be lighter and smaller.

Belfast

The results from the Belfast test were largely positive, with four out of the five persons tested reacting in a positive manner to one or more of the devices that were introduced into their home. However, one Pwd reacted in such a negative way to the technology that they refused to use any of the equipment. In general all the Pwds were able to learn the various functions of the system in a short period of time. The general reaction to the system was that they enjoyed using it and were surprised at how easy it was to use. With regards to the stationary and mobile devices, all the persons preferred the stationary device, primarily due to its larger size and ease of use. To begin with, the majority of persons found

the concept of interacting and touching a screen easy to grasp. When asked to comment on the most useful function of the COGKNOW system, two persons reported that they would benefit from reminders the most, while two stated that they could not see how it would be useful in their daily life. The size of the stationary device screen, the buttons and the text were all reported to be of appropriate size by four of the persons. All the icons were perceived as easy to see or recognize and the brightness of the display was reported to be appropriate by four of the Pwds. The presence of the stationary device in the home was of no inconvenience for two persons, a little inconvenient or stressful for two persons and very stressful for one person.

With respect to the mobile device, the general opinion was that it might prove useful if used for a longer period of time and the icons used were not as clear as those used on the stationary device. Both the size of the mobile itself and the size of the screen and its text were reported by three persons to be appropriate. One person was only able to comment on the size of the mobile because it was not functioning on the day of the test, and one person was unable to give any opinion on the mobile device. When asked to comment on the usefulness of the mobile device, three persons said that it might be useful with one person commenting on how it could be used from an armchair to avoid having to move around with arthritis.

In general the informal carers responded in a positive way to the COGKNOW system, mainly surprised at how easy the system was to use. Two informal carers felt that such a short testing period was maybe not useful and both suggested that the system should be tested for a longer period and when the Pwd is alone. All the informal carers felt that the reminding functionality of the system would be of most benefit to help the Pwd to structure and stimulate their day.

The size of the screen, buttons and text were all reported to be satisfactory with icons being easily recognisable. Three informal carers were satisfied, with one being very satisfied, with the stationary device. When asked to comment on improvements for the stationary device two informal carers suggested that the screen could be wall-mounted and one informal carer also suggested that reminders could be accompanied by flashing lights as well as an alarm sound to help people with hearing difficulties.

The mobile device was not viewed as user friendly, with icons that were difficult to see. The general opinion among all the informal carers was that the mobile device would not be as useful as the stationary device.

Lulea

Both participating Pwds and informal carers thought that the stationary device could be useful, and it would be even more useful if it was more closely adjusted to their personal needs. Some of the Pwds who lived with a partner had problems understanding why it was needed since most of the functions in the COGKNOW Day Navigator were already taken care of by their partner. However, several of the informal carers could see the possibility of the Pwd becoming more independent if they had access to a COGKNOW device. One of the Pwds who was living alone had some problems in understanding the usefulness of the device, since she was currently able to perform most activities on her own. However, she could see that there was a point in learning to use the assistive devices while she still had a good ability to learn.

All informal carers and some of the Pwds thought that they would be able to learn how to use the stationary device on their own provided they got opportunity to practise. Two of the informal carers thought that the process of learning would be facilitated if the devices were designed in such a way that they were useful for all family members. It was possible for the Pwds to learn new things, but this often required a great deal of repetition and motivation from both the Pwds and the informal carers.

The Pwds motivation to use new devices would increase if the COGKNOW Day Navigator became a family device instead of an assistive device only for the Pwd.

Another important motivating factor for the usefulness of the assistive devices pointed out by all the participants was the possibility to adjust the functions such as reminders according to personal needs. All the Pwds, except one, applied a memory strategy where they used a large wall calendar to make notes about activities important to remember. They thought that the stationary device should have a similar feature, where it was easy for the informal carer to update the list of important activities. Reminders of activities were needed by all the participating Pwds, who often had problems in initiating them. Both the possibility of being reminded to make calls and the easy way of making calls by pressing a button were appreciated by all Pwds, except one who was still very independent. Some informal carers thought it would be good to have a more expanded directory.

The design of the screen on the stationary device was appreciated by all participants. The concept of using a combination of pictures, icons and text worked well. One of the Pwds who had perception problems thought that text messages could be taken away or at least be minimised. Instead, there should be voice prompts reinforcing the messages. He also thought that there should be stronger contrasts between the icons or buttons and the background. One of the informal carers found the appearance of the stationary device with all the cords that went along with it too technical. It would be easier for the Pwd to accept it if it had blended in more harmoniously with other household equipment and furniture.

The mobile device was more questioned and discussed by the participants than the stationary device. Four out of six Pwds had been using cell phones prior to field test #1, but had quitted due to insecurity in using them. Only two Pwds were still using mobile phones on an everyday basis. The tested COGKNOW device was unstable in its functions, and it was therefore difficult to have an opinion on its usability. They all agreed that the mobile device had to be very easy to operate in order for the Pwd to feel secure in using it. The most important function was the ability to call a family member or a friend if they felt insecure when outdoors. Some of the informal carers thought that it could be good if the mobile unit was “intelligent” and in various ways could assist the Pwd to communicate or direct them selves, but it should not contain too many buttons. One of the Pwds thought that the touch screen was too sensitive and difficult to handle with his fingers. All informal carers were hoping to find a solution where a mobile unit could be used by the Pwds since this would make them more independent. At the same time they had their doubts due to many practical problems needed to be solved. Problems mentioned were the possibility that the Pwd would switch off the power, forget to take it along or switch it off and put it away.

4.1.2 Observations

The overall system design was generally approved by the Pwds and their informal carers at all test sites. The size of the stationary device was judged as appropriate, but some of the Pwds remarked that the screen was not sufficiently clear, and one Pwd in Lulea suggested that text messaging (reminding functionality) should be minimized. One Pwd in Amsterdam had difficulties in deciphering pictures and text on the screen. One Pwd in Amsterdam also thought the text should stand out more pronounced, and another Pwd found the text underneath the pictures too small, but the words to describe the functions were clear. In general, the touch screen design with pictures, texts, and icons was approved by our informants, even if some of them had difficulties operating the touch screen on the stationary device. The sensitivity of the touch screen of the CHH was not high enough for some of the Pwds. Some of the Pwds suggested that a wall mounted version of the home hub would be preferable.

The handling of the mobile device by Pwds as well as informal carers turned out to be more difficult than the operation of the home hub screen (CHH). Since the screen size of the mobile device is

considerably smaller than that on the home hub, the information presented on this smaller screen was harder to understand and the functions were less easy to operate for our informants. Even so, some of our informants suggested that a lighter and smaller version of the mobile device would be preferable. The buttons for the audio recording were perceived as small by two Pwds. One Pwd had to put on reading glasses to see the text and icons. The mobile phone clip was easily attached by one Pwd; another had difficulties attaching it to her belt.

The reminders used during field test #1 were preset (not adjusted to individual preferences), and hence not considered as useful by all of our informants. Most Pwds and their informal carers were able to receive and understand text messages on the home screen, although some of our informants suggested that text reminders should be accompanied by sound signals and/or a flashing screen. One of the Pwds suggested that text messages should be kept to a minimum due to reading difficulties. The observers in Amsterdam notes: “Under the reminders, the other buttons were active, which made it difficult to confirm the reminder properly because the Pwd did not know where to touch the screen”. The report from Lulea states: “Many of the participants felt the lack of a function to customise the reminders and safety warnings according to their personal needs. This made the evaluation of the reminders less meaningful. The Pwds observed the reminders but seemed to think they had nothing to do with them. On the other hand, all carers expressed a need for reminders”.

The picture dialling system (communication functionality) of the COGKNOW prototype was in general judged as user-friendly and useful by our informants. In Amsterdam, Belfast, and Lulea both Pwds and their close persons found this functionality to be easy to apply and to learn how to use. The interaction between the home screen and the Pwds’ telephone needs to be adjusted. The observer in Belfast writes: “The phone connection was problematic, as a continuous beep would sound throughout the call and would continue even after the handset had been reset. This caused some confusion, and in some cases the Pwd thought that the beeping noise was to signal that the call was in progress. In general the Pwds were able to make calls and connect to their intended recipient even with the technical problems that this feature presented”.

The media control system (activity functionalities) of the COGKNOW Day Navigator was judged as user-friendly and useful by both Pwds and their informal carers. The functionalities were found to be easy to operate self-sufficiently by the Pwds, and easy to learn how to use. From Amsterdam it is noted though: “The system allowed for the radio and music to play simultaneously. The CHH fell into a stand-by mode three times, which had to be fixed by the technician”.

The communication between the home screen and the mobile device did not work as expected, and need to be further developed for testing prior to field test #2.

The safety functionality of the COGKNOW Day Navigator did not work as expected and was tested only with a few informants. During one of the two tests with the door sensor in Amsterdam, it showed limited functionality. When the door was open, an ongoing repetition of sound was given.

The charger was only tested with some of our Pwd/informal carer-dyades. Some problems in the application of the charging system were detected. The observer from Amsterdam writes: “The charger was tested in one case, and there were some difficulties with it. When placing the CCA in the charger, the informal carer accidentally touched the bar at the top of the screen and opened a Windows menu. When the Pwd placed the CCA in the charger, the Pwd pushed reasonably hard on the device. With the second attempt, the Pwd tried to put the CCA in the socket for the spare battery, but eventually succeeded in placing the CCA on the charger”.

The majority of the Pwds were able to learn the various features of the system with few problems and in some cases were operating features such as music and radio without any guidance or instruction. The most common problem that was observed with regard to operation was in relation to the touch

screen on both the stationary and mobile device as mentioned earlier. A few of the informants though, had problems operating the prototype functionalities self-sufficiently.
In general our informants judged the system presented to them as useful or as potentially useful in future situations. Several of the informants pointed to the need for individualized system functions, and to a strengthening of the implemented functions (conf. users' opinions on safety functioning and diary recording functions, see Annex 4). The picture dialling system, reminders and media control functionalities were in general judged as useful by the Pwds and their informal carers. Because of environmental issues, one Pwd in Belfast disliked the idea that the system would be running all day and night. Another Pwd at the same location said he had no need for the system yet, but could see the usefulness of such a system in the future.

4.1.3 Bottlenecks

Amsterdam

The Home screen went into a stand-by mode, after which it did not switch on as recording and date-time indication in all cases. The door sensors did not function in three cases.

Belfast

The stationary device had a problem in recognising a press on a few of the screens such as the reminder screens. This bottleneck was only observed during the first day, as it was quickly resolved. The mobile device stopped working on the final day of testing and could not start the day navigator screen.

Lulea

There were several problems after one of the Pwds had switched off the power when she wanted to save electricity using the CHH. One reason for her action was all the cords and connection devices that had lamps that indicated that power was on. The home hub did not pick up its configuration automatically when power was switched on and had to be reconfigured by a technician in order for the different functions to start working properly

The door sensor had many different problems. One was not indicating all the time in the right way, in another cases, it fell down on the floor.

The search function for the mobile device had difficulties due to connection problems. Even when the mobile device had a connection with the internet, it was only possible to activate the search function a couple of times; most times it failed.

In a couple of cases there were problems with the reception of programmes with the attached radio receiver. There seemed to be too many devices in one place, and the radio reception was disturbed by other devices.

When a call was initiated, the computer held the call for some time and it took a long time for the ordinary telephone function to take over. Sometimes the computer held the call all the time. This was confusing for some of the participants. In a couple of instances, the call was not immediately disconnected by the home hub even if the person on the other side had disconnected.

When the volume of the loudspeakers was tuned for reminders and safety indicators it became too loud for telephone calls and there was a problem with acoustic feedback in some of the trials.

The configurations of reminders were limited to a specific date and to content. The limitation made it difficult to make individual adjustments and created many problems when trying to make the evaluation meaningful.
The main problem with the mobile device was unstable function and a tendency to lose the connection with the stationary device. There were also problems with the limited range of the connection of the device, and it could not be used outdoors.

There was a problem in operating the mobile device due to the many steps in the different functions. For example: First press button, then type text message. The same problem was involved when turning off functions such as the radio. Another example was that at the start of a call, a window was displayed asking whether the user wanted to proceed with the call or not. This was difficult for the Pwd to manage, due to the small text and too many steps.

When the phone function was used, the ordinary window of the device was displayed and the device had problems in returning to COGNOW navigator mode.

The return functions when calling were difficult to use and to understand, and seemed not to work properly. They were often slow and subject to delay.

The reminding function and the safety warning did not work on the mobile device

4.2 Reminding functionality

4.2.1 Semi-structured interviews and observations

Amsterdam

All participants with dementia reacted positively to the reminding functionality. Two participants stated that they had no use for it at the moment but could see themselves using it in the future. Four persons with dementia found the reminder messages easy to understand; one understood the messages with some effort. Four persons with dementia found the reminders easy to hear when in the same room but only one participant judged the reminder easy to hear from another room. Three persons with dementia judged the reminder difficult to acknowledge. The participants were divided on which content of the reminder would be supportive. Three persons with dementia found a reminder to make a phone call, a reminder to brush your teeth or a reminder intended to enhance control over activities of daily living not supportive at all. Three persons with dementia judged a reminder to eat at least sometimes supportive and two participants thought of other content for which the reminding functionality would be useful for them personally, for instance a reminder to take medication or a reminder to bring one's keys when going out. All the persons with dementia found the reminder function not at all inconvenient and were satisfied with the service in general. One person suggested that the sound of the reminder could be the voice of the informal carer. Another person said the acknowledgement of the reminder would need improvement, as the screen for confirming receipt had to be pressed too hard.

Four informal carers judged the service to be useful in reminding them to bring the mobile device, to eat or to take medication. All informal carers thought their loved one would easily understand the reminder message. Like the persons with dementia, four informal carers judged the reminder easy to hear when in the same room, but none of the informal carers found the reminders easy to hear from another room. Four informal carers found that the reminder was difficult for the person with dementia to acknowledge. Four informal carers thought a reminder to brush your teeth would not be supportive for the person with dementia. Likewise, three informal carers said a reminder to eat would not support the Pwd. In contrast, all informal carers participating thought the reminder would work very well for

persons with dementia. Only one carer said he/she would be unable to set reminders for the person with dementia. Two informal carers thought they would have difficulties sometimes and two informal carers expected to have no difficulties in setting reminders for their loved ones. Four informal carers felt that the reminder function was not inconvenient at all for the person with dementia; one informal carer expected the service to be a little more inconvenient. With one exception, all informal carers were satisfied with the reminder service in general; one informal carer was dissatisfied because the informal carer expected the function to be too complicated for the person with dementia to learn. Informal carers suggested a link to audio-speakers in other rooms to improve audibility, and would like to see more alternatives for reminder content.

Belfast

Four out of five Pwds reacted positively to reminders and thought that reminders would be very useful. Three Pwds found that they could understand the reminders with some effort and one Pwd stated that it was easy to understand the reminders. In terms of hearing the reminder alarm, four Pwds thought that reminders were easy to hear when in the same room. One Pwd found it difficult to hear on some occasions when in another room. Three persons with dementia found it difficult to acknowledge the reminders, while one thought it to be appropriate. Reminders to brush your teeth and make a phone call were considered to be very supportive by four Pwds, who felt that the reminder function worked very well. Two Pwds suggested that reminders would be useful for appointments. One Pwd suggested that reminders would be useful for remembering about collection for day centre, while one thought it would be useful but did not elaborate any further.

Three informal carers judged the reminding function to be useful, with one carer referring to it as excellent. Four informal carers were able to hear the reminder alarm when either in the same room or in another room. Four informal carers thought that the reminder both to brush teeth and to make a phone call would be very supportive for the Pwd. The reminders were thought not to be inconvenient or stressful for four informal carers and they were all satisfied with the reminding feature, with one informal carer being very satisfied. In relation to suggested improvements for the reminding feature, four informal carers had no suggestions.

Lulea

All participants accepted the function of reminders as something that was needed and useful. However, they felt that it was important that the reminders were adjusted to their personal needs. The reminder to make phone calls was well accepted by several of the participants. According to the carers, four out of six of the Pwds had problems in initiating phone calls even though they appreciated them and the calls were important for their social contacts with family members and friends. All Pwds thought it would be useful to be reminded of events and activities that did not happen every day, such as birthdays of family members, or scheduled visits to a hairdresser or the doctor. Most of the carers thought that it would also be good to have reminders of daily events such as taking medication, remembering to call and remembering what food to make. An important aspect for some of the carers was the possibility of adding and adjusting reminders in an easy way.

Summery Observations

The observation reports of the three test sites with respect to the reminding functionality (see Annex A.4) confirm the results of the semi-structured interviews: Almost all Pwds and informal carers reacted positively to the reminding functionality and found it to be very useful. It also became clear that Pwds and carers were divided about the usefulness of the content of the provided standard reminders. Except for the reminder to make a phone call, which was valued as useful at all test sites, Pwds and carers preferred reminders that were attuned to their own personal situation (reminders for daily and special events) and could be configured and adapted in an easy way by the carer. In Lulea also a

calendar function was proposed. Only some people found it difficult to understand reminders (in Amsterdam) or had difficulty with acknowledgement of the reminders on the touch screen (Amsterdam, Belfast) or the procedure of acknowledgement (Lulea). Simple instruction however proved helpful in those cases.

4.2.2 Bottlenecks

Amsterdam

On the CHH, the reminding function displayed an incorrect picture and an incorrect message in two separate cases. The sensitivity of the home screen was a topic of discussion regarding confirmation of reminders in all cases. The touch screen had to be pushed relatively hard according to all the Pwds. Active buttons underneath the reminder caused some confusion, as confirming the reminder would activate another function (e.g. radio). There was no reminding functionality on the CCA.

Belfast

One noticeable problem with reminders is the fact that the stationary device needs to be reset each time a new reminder is to be configured. This caused a small interruption of about 30 seconds. The reminder to close the front door worked on the stationary device but failed to relay to the mobile device.

Lulea

In most cases, the reminding function worked well from a technical point of view. At one test site the reminders did not work at all, and we could not determine if this was a technical problem or a problem of configuration, since the reminding function was linked to the date. The reminding function of the CCA never worked.

4.3 Communication functionality

4.3.1 Semi-structured interviews and observations

Amsterdam

Two persons with dementia stated that the communication functionality would be useful. Two participants found the separate devices and the order in which they had to be used confusing and unclear. One person with dementia said he/she would not have a use for it yet as the current telephone had its own address book. Thus, three persons with dementia judged the picture dialling service as not very helpful. However, the size of the pictures of contacts on the stationary device was judged appropriate by all participants and all found the picture address book at least appropriate to use. Likewise, the three persons with dementia who used the emergency contact function (in two cases this function did not work during the field test) found it to be appropriate (one person) or even easy to use (two people). Four persons with dementia stated that the picture dialling function was not at all inconvenient; one person found it to be a little more inconvenient. Three participants were satisfied with the service in general. If the picture dialling function was on a single device (integration of the telephone with the stationary device) the service would be much improved, according to two persons with dementia. One participant stated that the emergency contact function should be more in the foreground.

Three informal carers stated that the picture dialling function would not be useful for the Pwd, either because making a phone call was not difficult for the person with dementia using the current method

(two informal carers) or because the service was too difficult due to the separate devices and steps needed to make a phone call with the service (one informal carer). The other two informal carers participating thought the function would be useful for the person with dementia. In correspondence with these findings, two informal carers experienced the picture dialling function as not at all inconvenient and three found it to be a little bit more inconvenient. However, all informal carers were satisfied with picture dialling in general. Two informal carers suggested that the telephone should be integrated with the stationary device so that no confusion could arise with regard to separate devices and steps. Two informal carers would like to see the option to add more contacts in the picture dialling address book. Another informal carer suggested the help icon should be renamed, as the function would not be recognisable from the button name.

Belfast

Four Pwds thought that the picture dialling feature was very useful; however, one Pwd stated that although it was useful they had no problem using the normal telephone. Two Pwds said that the picture dialling function was very helpful and two said it was appropriate. The size of the pictures used on the stationary screen was judged by four Pwds to be appropriate. In contrast, two Pwds thought that the size of pictures on the mobile device was too small. The emergency contact function was considered appropriate by three Pwds, with one finding it easy to use. Four persons commented that using the picture dialling feature was not all inconvenient or stressful. Three Pwds were very satisfied with the picture dialling service in general, with one being just satisfied. There were no suggestions from the Pwds about ways to improve the picture dialling function on either the stationary or mobile devices.

Two carers considered the picture dialling function to be very helpful and two thought it to be appropriate. Four carers found the pictures displayed on the stationary device to be of an appropriate size while two carers thought the pictures on the mobile device were too small. Three carers felt that the Pwds' use of the address book on the stationary device was appropriate; however, two carers reported that it was difficult for the Pwd to use the mobile's address book. The carers were divided in their opinion when it came to how the picture dialling function facilitated social contact, with two carers claiming that it would make it easier to keep in touch and two stating that it would make no difference. The emergency contact function was judged to be appropriate by three carers and thought to be easy to use by one carer. When asked to comment on improvements, none of the carers had any suggestions.

Lulea

The communication function which made telephoning easy was appreciated by almost all participants. One exception was a Pwd who thought that she had no need for it now. All the Pwds found the function useful and easy to learn. The concept of having a directory with pictures and written names was much appreciated. Some of the Pwds could still remember phone numbers, but the carers could foresee that they might have problems later on. Two of the carers found the directory too small and wanted to have the possibility to include more persons.

Two of the carers found the system of calling confusing in the sense that the caller first spoke with the screen and was then requested to pick up the receiver. They thought it was better to have fewer steps in the procedure and only talk directly to the screen. Their thinking was that calling with the CHH was a new procedure that had to be learned anyway, so why confuse it with the old way of calling?

Three of the Pwds found the help function confusing and did not understand its purpose until this was explained. One of them thought that it would be easier to identify the help button if it had a stronger contrast with the background. Four of the carers appreciated the function and thought it was important.

Summary observations

The reported observations from all three sites confirm the findings in the semi-structured interviews that the picture address book was considered appropriate to use. In Lulea the picture dialling function was even mentioned as the easiest to comprehend.

The reported observations also explain the recommendation made by the carers in the semi-structured interviews to integrate the telephone and the stationary device. Most of the Pwds at all sites did not immediately understand how to operate the picture phone. The Pwds showed signs of confusion when using the picture dialling. This varied from confusion during the first time of usage to repeated confusion during the first several attempts. Several repeated verbal instructions and exercising were needed before the Pwd could manage the picture dialling. Reported observations in Amsterdam and Belfast also showed that it was impossible to make a telephone connection when a Pwd picked up the phone too late after pressing the picture on the touch screen.

As mentioned in the semi-structured interviews, the opinion about the usage of the help button was different between the sites. The reported observations at the Lulea site stated that there was some confusion about the help button that seemed to be related to the fact that it had the same design as the other buttons. However, after the first attempts it was easy to use. Several Pwds in Lulea even used the help button as an easy way to call the primary carer instead of selecting her picture in the address book!

4.3.2 Bottlenecks

Amsterdam

The Home screen crashed after using the picture dialling function and/or help function in three cases. There was no communication functionality on the CCA.

Belfast

One problem particularly prevalent with the picture dialling service was that an accidental double press on the phone book icon would automatically select the contact that was in the same location on the following screen. This had the undesired effect of prematurely dialling a contact, usually the first one.
Lulea

When a call was initiated, the computer held the call for some time and it took a long time for the ordinary telephone function to take over. Sometimes the computer held the call all the time. This was confusing for some of the participants.

When the volume of the loudspeakers was tuned for reminders and safety indicators it became too loud for telephone calls, and there was a problem with acoustic feedback.
Calls were not immediately disconnected by the home hub even if the person on the other side had disconnected.

4.4 Activity functionality

4.4.1 Semi-structured interviews

Amsterdam

Four persons with dementia found the radio control and music player function to be useful, enjoyable, and not at all inconvenient: they were satisfied with the service in general. All participants stated that the size of the control buttons was appropriate and found the radio control sometimes easy to use (two persons) or very easy to use (three persons). One person did not appreciate the music player or the radio function. As this person did not like to listen to music at all, the music and radio service seemed not useful, impractical and boring. Suggestions for improving this function included an option to change the radio station and integration of (Windows) media player and music downloads from the internet.

All but one informal carer judged the radio control function to be useful and the music player function to be practical for their loved ones. All informal carers stated that the music player would be enjoyable for the person with dementia and all found the person with dementia to use the radio control sometimes well (one informal carer) or very well (four informal carers). One informal carer suggested adding an option to select radio stations and artists, songs or albums. Another informal carer would like to see a picture of the artist playing and instructions on how to use the function on the screen. As their loved one suggested, one informal carer would like integration with (Windows) media player and one informal carer thought the function could be removed altogether as the Pwd did not listen to music or radio very often.

Belfast

When asked to comment on the radio and music features, two Pwds said that it was not useful and two said that they did not listen to music, although one Pwd mentioned that they did enjoy it. The control button for the radio and music were judged to be appropriate by four Pwds. Four Pwds reported that they enjoyed the music playback function. One Pwd commented that they only watched the television now and did not listen to music or the radio. The experience of using the music or radio features was reported by four Pwds to be not at all stressful. Two Pwds thought that the music and radio service was unpractical while two thought it was practical. When asked to comment on improvements, four Pwds had no suggestions.

Three carers reported the music and radio service to be not useful and one carer thought the service to be useful. Three carers thought the service was an enjoyable experience and one carer thought that it was boring. Four carers were satisfied with the service and three thought the experience was a little inconvenient or stressful.

Lulea

All of the Pwds appreciated the possibility to turn on music and the radio via the touch screen. Two of the Pwds had a special interest in listening to music, and they had for some time not been able to turn on their own CD player. They thought that the function was easy to use even though it required some practice. Three of the Pwds were regular radio listeners and usually switched on the radio without assistance. They thought that the new way of turning on the radio could still be useful provided that it was easy to tune in the right programmes. For one of the Pwds, the possibility of listening to the radio was a rediscovery of an appreciated activity that she had forgotten to use.

For five of the six Pwds, the design of the icons and the buttons on the stationary screen was easy to understand. One of them expressed a problem in relating the icon for music and the icon for radio to the activity. The carer thought that this phenomenon was related to initial problems in learning the concept.

One of the carers found the function interesting and thought that the usefulness of the function would increase if there was a simple way of changing radio stations and programmes directly on the touch screen.

Summery Observations

The reported observations from all three sites confirm the findings in the semi-structured interview that most of the Pwds appreciated the function and could easily learn how to operate both the radio and the music function. The perception of usefulness was divided among both the Pwds and the carers. In Amsterdam and Belfast several of the Pwds perceived the radio and the music function as not useful while four of the Pwds in Lulea found it very useful. The icons for music and radio on the mobile device were difficult for three of the Pwds in Lulea to identify and they also had problems with the many steps involved in turning the function on and off. None of the participants found the activity function in the mobile device useful.

4.4.2 Bottlenecks

Amsterdam

On the CHH the music and radio could be played simultaneously. There was no activity functionality on the CCA.

Belfast

There were no observed bottlenecks with respect to either the radio or the music functions.

Lulea

The function worked well on both the CHH and the CCA when the CCA was stable and had a good internet connection.

4.5 Safety functionality

4.5.1 Semi-structured interviews and observations

Amsterdam

Safety warnings functioned in only two of the five field tests. Persons with dementia thought it would be useful, especially in the kitchen, on the refrigerator or oven door. Both persons with dementia were satisfied with the safety warnings although both thought the warnings sometimes worked and sometimes did not. Likewise, the audibility of the safety warning on the stationary device was sometimes judged easy to hear by one person with dementia and difficult to hear by the other. The visual safety warning on the stationary device was found to be appropriate by both persons with dementia. One person with dementia said the safety warning was a little inconvenient and suggested the option of turning the safety warning on the door off when the person is at home. The other person said it was not inconvenient at all and had no suggestions for improvement.

Informal carers thought the safety warning function was useful and practical for their loved ones. They judged the safety warning easy to hear and the visual safety warning on the stationary device appropriate. Both participating informal carers expected the safety warnings to work very well for the person with dementia and found the warning alarms not at all inconvenient. The informal carers were satisfied with the warning alarms in general. One informal carer suggested a distinction between an open, closed and locked door, in the audio warning alarm and/or in the visual warning alarm.

Belfast

Four Pwds thought that the door sensor was very effective in detecting an open or closed door and that it was very useful. The audibility was judged easy to hear by four Pwds and the visibility of the warning message was said to be very good. When asked to comment on how well the warning alarm was working, four Pwds said that it worked very well. Four Pwds stated that the experience with the safety alarms was not at all inconvenient or stressful.

In determining the effectiveness of the sensor in detecting an open/closed door, four informal carers reported that the sensor was very effective. The safety warning was judged as very useful in three cases and appropriate in one other. The audibility of the safety warning message was considered good by four informal carers. Three informal carers reported that the visibility of the warning message was very good and one reported it as appropriate. When asked to comment on the usefulness of the warning alarm, two informal carers said it could be useful, one commented that it had potential and one said it gave a feeling of security. Three informal carers were very satisfied with the warning alarm and four reported no inconvenience or stress related to it.

Lulea

All participants appreciated the usefulness of a safety function but had problems with the safety warning that was used in the test. For their own security, several of the Pwds wanted to check that the front door was locked in the evenings and preferred such a warning to a warning of an open door. Two of the informal carers had concerns about what to do if the weather was warm and they wanted to keep the door open. They were also concerned about the preset time for the warning function to turn on, and felt that it was important that it could easily be altered or that the function could be switched off.

The safety warning was functional and tested in all test sites, and the Pwds did not express any opinion about this function. Three of the informal carers felt that there were many other security aspects where a warning function would be appropriate. They mentioned warnings for the stove, when the iron is left on and other common security issues in the home.

Summary observations

In all three sites most of the Pwds that tested the warning function understood and reacted at the warnings. The perception of the usefulness of the warning for open door was divided: Both Pwd and carers in Amsterdam and Belfast found the function useful while the participants in Lulea preferred unlocked door warnings instead of open door warnings.

4.5.2 Bottlenecks

Amsterdam

Safety warning continued after closing the door in one test, in three other tests the door sensor didn't work, thus safety warnings couldn't be tested. There was no safety functionality on the CCA.

Belfast

The success of the installation in relation to the door sensor depended heavily upon the living environment of the Pwds home. Corridor width and general hallway space proved to be the primary factor affecting the installation of the sensor given that a wire had to be run to the doorway. To avoid future problems with the door sensor it is suggested that a wireless sensor be deployed in all situations wherever possible and for all sensor types.

Lulea

The door sensor was not working as expected all the time and on three test sites the sensors were very unstable and worked sometimes but later failed. In one case the door sensor fell down on the floor due to problems with the mountings. The safety warning on the CCA did not work.

5 Conclusions, discussion and recommendations

5.1 Conclusions

5.1.1 COGKNOW Day Navigator system and design

User-friendliness

The overall feedback from our informants suggested that the system and design of the COGKNOW Day Navigator met users' needs for applicability. However, the Pwds are divided in their opinions about the user-friendliness of different components of the system and aspects of the design. A significant number of informants found the COGKNOW Day Navigator easy to use. But some of the Pwds felt that the touch screen represents a difficult way of communicating with the system. This was most pronounced for the mobile device. The report from the test site in Belfast stated:

“The most common problem that was observed with regard to operation was in relation to the touch screen on both the stationary and the mobile device”. The touch screen on the mobile device did not function very well.

In general, the informal carers seem to be even more positive about the present user-friendliness of the device than the Pwds.

A majority of the Pwds were able to operate the device independently relatively quickly. The Irish test leader writes: "In general, all the Pwds were able to learn various functions of the system in a short period of time”. The informal carers all found the COGKNOW devices easy to use and learn how to operate.

Most of the informants found the screen size, icons, and texts of the user interface appropriate. The pictures of the dialling system were regarded as clear. However, there are some differences in the evaluation of the home screen and the mobile device in this respect. The display of the mobile device is considerably smaller than that of the stationary device, and for some of the users the mobile device seemed to be difficult to operate.

"Some of the users viewed the mobile device as not being user-friendly, with icons which are difficult to see". Moreover it is the impression of the field observers that Pwds do not react to written messages and reminders as expected. Another approach to messaging will be suggested for field test #2.
The size of the home screen was in general judged as appropriate, but some of the users stated that a wall-mounted device would be preferable.

Charging of the COGKNOW Day Navigator was difficult for some of the users, and needs to be tested further. Also, the SocioXensor and its voice recording system was difficult to use and should be subjected to further development prior to field test #2.

Usefulness

The usefulness of the COGKNOW Day Navigator was in general judged as satisfactory by our informants. Due to a restricted implementation of functionalities in the prototype used in field test #1, some of the Pwds did not feel that the COGKNOW services were useful for their own situation.

In general, usefulness seemed to be judged higher among informal carers than among Pwds.

During this first field test several technical bottlenecks were encountered with respect to, for example, the stand-by mode, the sensitivity of the touch screen, the door sensors and reception of radio programs.

The research questions for three of the four investigation areas were answered successfully. The evaluation of in situ data collection methods and tools was postponed to field test #2 due to technical problems.

In general, our informants responded positively to the research questions related to the evaluation of basic hardware applicability and usefulness. The informal carers were even more positive than the Pwds themselves. However, the user-friendliness of the mobile device was ranked as poorer than that of the stationary component both by Pwds and by the informal carers.

Research questions concerning basic functionality of the COGKNOW Day Navigator received a positive response from our informants, especially regarding picture dialling and media control. The reminding functionality was evaluated as useful by both Pwds and their informal carers. But difficulties with the human/machine interface restricted applicability, in particular for the mobile device. The safety functionality needs further development in order to be tested properly.

5.1.2 Reminding functionality

The reminding system seems to have an appropriate audibility. Some of the users commented that the text reminders should be accompanied by flashing screens and/or a sound signal to attract the attention of the Pwd. The user-friendliness of the text reminders seems to be appropriate on the home screen, but readability decreases on the mobile device. In the report from the Lulea test site, synthetic or digitalised voice machine output in connection with reminders is suggested.

Pwds ranked the usefulness of the reminding functionality as high for events that did not take place every day. Among informal carers, this functionality was also ranked as useful for everyday events. The results from Belfast suggest: "When asked to comment on the most useful function of the COGKNOW system, two Pwds reported that they would benefit from reminders the most while two stated that they could not see how it would be useful in their daily life". The results further suggest that reminders need to be individualised prior to field test #2 to increase their usefulness.

Bottlenecks were encountered in the combinations of reminders and pictures, resetting after configuration of each reminder, confirming the reminders and not functioning reminders on the mobile device.

5.1.3 Communication functionality

The applicability of the communication system, i.e. the picture dialling facility, is evaluated as good both by most of the Pwds and most of the informal carers. Both parties seem to find this functionality easy to operate and easy to learn how to use.

Both Pwds and informal carers rank the usefulness of this service as high. The user-friendliness of the dialling functionality would however increase if individual adaptations of the address book could be made on the COGKNOW device.

Some comments were made on the different steps necessary for dialling (too difficult for some persons with dementia) and there was some confusion between the pictures of the picture dialling and the picture of the help function. Some suggested integrating the telephone into the stationary device.

Bottlenecks during field test #1 were for example that the picture dialling functionality did not work on the mobile device and that the volume of the loudspeakers had to be changed when using the reminding functionality or the picture dialling.

5.1.4 Activity functionality

The activity functionality is evaluated as user-friendly both by Pwds and informal carers. In general, our informants evaluated this service also as useful.

The report from the test site in Lulea stated: "All of the Pwds appreciated the possibility to turn on music and the radio via the touch screen. Two of the Pwds had a special interest in listening to music and they had for some time not been able to turn on their own CD player". The results from Belfast stated: "The icons for phone, music, and radio did not cause any confusion for most of the Pwds. However, one Pwd would hesitate when asked to turn on the music or radio. This resulted in the Pwd hovering with her finger over the phone, music, and radio icons, unsure which one to press. This pausing before selecting the appropriate icon was particularly prevalent during the first couple of attempts; however, after a few tries the Pwd became much more competent".

Among the important bottlenecks we found that the music player and radio sometimes interfered with each other. This was solved prior to the tests at the second and third test site. Also, the quality of the radio receptions was sometimes poor. At one site the mobile device had no activity functionality.

5.1.5 Safety functionality

The safety functionality could not be tested properly in two of the sites of field test #1 due to technical difficulties. In Lulea a door sensor was tested.

In the results from Lulea it was stated: "The door sensor was working and tested at three sites. The function was well understood by the three Pwds, but they had difficulties in relating it to their own situation at the moment. Some of our informants judged the future usefulness of this service as high. This also goes for more specific warning functionalities (e.g. warnings for stoves and iron left on)".

5.2 Discussion

Our conclusions from field test #1 are on line with findings described in the literature about the application of ICT devices by people with dementia. Positive results on the usability of a reminding device were found in several other studies (Holthe et al. 1998, Zanetti et al. 2000, Wilson et al. 2001, Oriani et al. 2003, Baruch et al. 2004, Van den Broek et al. 2004, Gilliard & Hagen 2004, Szymkowiak et al. 2004).

In our field test, some remarks were made about possible difficulties with the visual reminders on the stationary and mobile devices. The reminders did not attract the attention of the users as expected. Inglis (2003) and Szymkowiak (2004) propose reminders accompanied by a form of vibration, to more effectively serve people with visual and hearing impairments. Voice messages are another possibility to attract users' attention more efficiently.

The positive evaluation of the picture dialling functions confirms the general experience that Pictophones are valued as useful by elderly people, and the finding that people with dementia can still learn to use simple equipment (Lekeu et al. 2000, Lauriks et al. 2007). The experience in our field test, which people with dementia have difficulties recognising pictures of family and friends on a mobile phone, confirms the previous findings of S. Kort (Kort 2005). Positive evaluation of a picture

gramophone or other electronic music aids was also reported in studies by R.Olsen and co-workers (Olsen et.al. 2000) and by J.Gilliard and I.Hagen (Gilliard 2000, Gilliard and Hagen 2004).

Though in practice, alarm functions are generally not provided to people with dementia (because of the expected frequent misuse) little research has been done into the understanding of alarm systems by people with dementia (Lauriks et al., 2007). Our field test indicates that the function of the door sensor as well as the message on the home screen was understood by people with dementia. The time allowed for field observations during field test #1 has been relatively short, and more so in Belfast and Amsterdam as compared with Lulea. Hence, our conclusions must be viewed against the background of fairly restricted observation of the users' actual interactions with the COGKNOW system.

For example, the report from Belfast states: "With respect to the mobile device, the general opinion was that it might prove useful if used for a longer period of time and the icons used were not as clear as those used on the stationary device". However, we have collected extensive interview material from all test sites, and our conclusions regarding the overall system functioning and design seem decisive. Even so, as complexity increases, future testing regarding functionality may yield slightly different results from those presented here. Also, the number of informants in the Human Factors Analysis in field test #1 was relatively small (16 Pwds and 16 carers). Some of the research questions, like how easy it is to learn how to operate the COGKNOW device, may require a larger sample of interviewees than some statements about the feasibility of the overall system design. We have however applied strict inclusion criteria for both Pwds and their informal carers, and hence we believe our results exemplify Pwds' interactions with the COGKNOW device fairly well. Still, our conclusions here are suggestive in character, and are meant to indicate improvements for the COGKNOW system prior to field test #2

Though we are aware that some bugs were fixed on the system after the first tests in Amsterdam and hence that the COGKNOW Day Navigator functionalities were not exactly the same during the field tests in Amsterdam, Belfast and Lulea, we do not think this state of affairs has influenced our conclusions about the overall system functionality and design. We have taken particular care to compare the results from Lulea and Belfast concerning the user-friendliness and usefulness of the COGKNOW device with the first results from Amsterdam. We have given the feedback from Pwds and informal carers the same weight when it comes to overall judgement of the user-friendliness of the system design and its usefulness. However, we have given more weight to the Pwds' own judgments when it comes to user-friendliness of the user interface and the specific functionalities tested.

The prototype used during field test #1 had restricted functionality, but we think that the reminders and alarms, the dialling and the media control systems as well as the safety sensors involved, are sufficient to realistically test basic user interactions and overall system functioning. During field test #1 a significant number of interviewees have noted that the interface on the mobile device may be somewhat difficult to handle (texts, icons, and pictures), but this has been less of a problem with the stationary device with a considerably larger screen size. The overall user evaluation of the home screen seems to be that the user interface is approved by Pwds as well as by their informal carers. One way of trying to improve the accessibility to the interface of the mobile as well as of the stationary device, would of course be to allow for auditory machine output, as for example suggested in the Swedish results from field test #1. Several Pwds felt that some icons could be clearer with respect to indicating the functionality.

The usefulness of the present functionalities were sometimes confusing to our informants, probably due to the present preset reminders and fixed dialling lists, which were not easily connected to concrete situations of daily living of the Pwds. We are nevertheless relatively sure that our informants, Pwds and informal carers, approved the overall user-friendliness and usefulness of the functionalities provided for them. The picture dialling system and the media control were ranked as useful by the

majority of the informants. Additional functionalities were suggested, such as TV control and a calendar with activities to remember. The reminder and alarm facilities were in general approved both in terms of user-friendliness and usefulness. The test of the safety door sensor was not completed, due to technical difficulties.

In Lulea, it was suggested that a camera could be connected to the entrance door and linked to the home screen as well as the ward station, allowing for assistance in the identification of visitors. From the Belfast test it was observed that Pwds were relearning how to use the communication function when they were quite capable of making phone calls on a daily basis using traditional methods. Additionally the Pwds don't listen to music while in the home environment and although the music service was considered enjoyable, it was perceived to be not useful. The mobile device in relation to Belfast's cohort of Pwds are considered unnecessary and as a further complication. If GPS functionality should be retained and linked to the home hub, then perhaps a key fob could carry out the same role as the current mobile device.

Personalised reminders whether it is in relation to taking medication, doctors appointments or the front door left open is the way forward, as seen from Belfast.

5.3 Recommendations

The bottlenecks encountered in field test#1 should be resolved prior to field test #2. The most significant of these bottlenecks are:

a. The touch screen on both the stationary and the mobile devices did not detect the Pwds' touches as expected. This problem was most pronounced on the mobile device.

b. A general unstable function of the Day Navigator's screen on the mobile device.

c. Reminding and safety warnings not working properly on the mobile device.

d. The connection between door sensors and CHH did not work properly (See also Annex A1.5).

Charging the battery of the mobile device of the COGKNOW Day Navigator needs to be further developed and tested, as well as the SocioXensor and its voice recording system.

The external design of the stationary device should be adapted to blend better with furniture in a living room environment. A decision should be made whether the mobile device should include all the functionalities of the CDN or only restricted functionality, e.g. to locate a person outdoors.

It should be easy to configure the reminding functionality with personally selected reminders to suit the Pwd's individual needs. As it is the impression of the field observers that Pwds do not react to written messages and reminders as expected, another approach to messaging needs to be investigated for field test #2. The picture dialling functionality should include a possibility to expand the address book. Simplification of the necessary steps to make a phone call should be investigated. The help function should be clearly distinguishable from the picture dialling address book. It should be easy to configure the activity or media control functionality with personally selected music. It would be preferable if different radio programmes could be selected and if a TV control functionality can be added.

The safety functionality should be further developed so as to meet individual choices (e.g. door, kitchen, and bathroom).

6 List of Tables

7 Abbreviations

CCA COGKNOW Cognitive Assistant
CDH Centre for Distance-spanning Healthcare, Lulea, Sweden
CDN COGKNOW Day Navigator
CHH COGKNOW Home Hub
COGKNOW Project title COGKNOW; Helping people with mild dementia navigate their day
CS COGKNOW Server
CSH COGKNOW Sensorised Home
GDS Global Deterioration Scale
LTU Lulea Technical University, Lulea, Sweden
MMSE Mini-Mental State Examination
NST National Centre for Telemedicine, Tromsø, Norway
Pwd Person with Dementia
TI Telematica Institute, Enschede, the Netherlands
VUMC Vrije Universiteit Medical Centre, Amsterdam, the Netherlands
WP Work package

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9 Annexes

A.1. Results of field test #1

A.1.1. Pre-test interview results

		Amsterdam	Belfast	Lulea
Background characteristics informal carer				
	Informal carer			
	Personal details			
1.	Name:	Xxxxxx	xxxxxx	xxxxxx
2.	Sex:	Male : 2 Female: 3	Male :3 Female:2	Male :3 Female:3
3.	Mean age (range)	59,2 (49 - 78)	64.2 (45-72)	..... ( )
4.	What is your current civil status?	Married/cohabiting : 5 Divorced : 0 Widow/Widower : 0 Single : 0	Married/cohabiting : 5 Divorced :0 Widow/Widower :0 Single :0	Married/cohabiting : 4 Divorced : Widow/Widower : Single :
5.	What is your educational background?	Primary school : 0 Junior second. vocational : 1 Second. vocational : 1 Senior second. school : 0 Higher professional : 1 University : 2 Other : 0	Primary school :0 Junior second. vocational :2 Second. vocational : 2 Senior second. school :0 Higher professional :0 University :1 Other :0	Primary school :0 Junior second. vocational :1 Second vocational :0 Senior second. school :2 Higher professional :1 University :2 Other :
6.	Do you currently have any other activities?	No : 2 Paid work : 2 Caring for another person : 1 Volunteer work : 1 Study/training course : 0 Other : 0	No :2 Paid work : 2 Caring for another person : 0 Volunteer work :1 Study/training course :0 Other :0	No :3 Paid work :2 Caring for another person :0 Volunteer work : Study/training course :1 Other :0
		Mean hours per week (total) other activities : 8,08	Mean hours per week (total) other activities :0.4	Mean hours per week (total) other activities :
7.	What is your relationship to the person with dementia?	Partner : 4 Daughter : 1 Son : 0 Friend : 0 Acquaintance : 0 Other : 0	Partner :3 Daughter :0 Son :1 Friend :0 Acquaintance :0 Other :1	Partner :3 Daughter :1 Son :2 Friend :0 Acquaintance :0 Other :0

		Amsterdam	**Belfast**	**Lulea**
8.	How far do you live from your ….?	Shared household : 4 Walking distance : 1 In same municipality : 0 In different municipality : 0	Shared household :3 Walking distance :0 In same municipality :2 In different municipality :0	Shared household :3 Walking distance :0 In same municipality :2 In different municipality :1
9.	How many days per week do you look after your ….?	less1 day : 1 1 day : 0 2 days : 0 3 days : 0 4 days : 0 5 days : 0 6 days : 0 7 days : 4	less 1 day :0 1 day :0 2 days :0 3 days :1 4 days :1 5 days :0 6 days :0 7 days :3	less1 day :2 1 day :0 2 days :0 3 days :0 4 days :0 5 days :0 6 days :0 7 days :4
10.	How many hours per week do you spend (on average) on the care and support of your ….?	Mean : 26,2 Range: 3 - 56	Mean :15.6 Range: 5-30	Mean : 23,5 Range: 5 - 52
11.	Since when are you taking care of your …… in connection with his/her memory problems?	Mean no of months: 12,6 Range : 9-18	Mean no of months:34.8 Range :18-36	Mean no of months: Range :
12.	Which means of transportation do you have at your disposal?	Bicycle : 4 Car : 5 Moped/scooter : 0 Motorcycle : 0 Public transport : 1 Other : 0	Bicycle : 0 Car :5 Moped/scooter :0 Motorcycle :0 Public transport : 0 Other :0	Bicycle : 4 Car : 6 Moped/scooter :0 Motorcycle :0 Public transport : 1 Other :
13.	Is there anyone that you share the (*informal*) care with? If so, with whom and with how many other people? If not, what is the reason you cannot share the care with anyone else?	Share care with 0 : 3 1 : 1 2 : 1 3 : 0 More: 0	Share care with 0 :3 1 :2 2 :0 3 :0 More:0	Share care with 0 :1 1 :3 2 :2 3 :0 More:
14.	Are there any other people who help occasionally? If so, who and how many others? (*e.g. a neighbour that buys groceries every now and then, not structurally)*	Help occasionally: 0 : 5 1 : 0 2 : 0 3 : 0 More : 0	Help occasionally: 0 :3 1 :1 2 :1 3 :0 More:0	Help occasionally: 0 :5 1 :1 2 :0 3 :0 More
15.	Do you have any physical complaints/illnesses that you are being treated for?	Physical complaints: 0 (number)	Physical complaints:1(number)	Physical complaints: (number)
	What type of phys. complaints?	NA.....	Diabetes.....	.....
16.	To what degree do these physical complaints/ illnesses hinder you in your care task?	not at all : 5 to a small degree : 0 somewhat : 0 considerably : 0 very much : 0	not at all :1 to a small degree : somewhat : considerably : very much :	not at all :6 to a small degree :0 somewhat :0 considerably :0 very much : 0
17.	Do you have any psychological complaints/ illnesses you are being treated for?	Psychological complaints: 1 (number)	Psychological complaints: (number)	Psychological complaints: (number)

		Amsterdam	**Belfast**	**Lulea**
	What type of psych. complaints?	Depression		
18.	To what degree do these psychological complaints/ illnesses hinder you in your care task?	not at all : 5 to a small degree : 0 somewhat : 0 considerably : 0 very much : 0	not at all :5 to a small degree :0 somewhat :0 considerably :0 very much : 0	not at all :6 to a small degree :0 somewhat :0 considerably :0 very much : 0
Background characteristics of person with dementia				
	Person with Dementia			
1.	Name:	xxxxxx	Xxxxxx	xxxxxx
2.	Sex:	Male : 2 Female: 3	Male :1 Female:4	Male :2 Female:4
3.	Mean age (range)	64,7 (56 - 78)	70.8 (66-78)	..... ( )
4.	What is the current civil status of your….?	Married/cohabiting : 4 Divorced : 1 Widow/Widower : 0 Single : 0	Married/cohabiting :3 Divorced :0 Widow/Widower :1 Single 1	Married/cohabiting :5 Divorced :1 Widow/Widower :0 Single 0
5.	What is the living situation of your ….?	Lives alone : 1 With partner : 4 With other relatives : 0 With others : 0	Lives alone :1 With partner :3 With other relatives : 1 With others :0	Lives alone :1 With partner :5 With other relatives : 0 With others :0
6.	In what type of housing does your … live?	Flat : 2 House : 3 Assisted living : 0 Care home : 0 Nursing home : 0 Other : 0	Flat :1 House :4 Assisted living :0 Care home :0 Nursing home :0 Other :0	Flat :2 House :4 Assisted living 0 Care home :0 Nursing home :0 Other :0
7.	In what kind of area does your …. live	Countryside : 1 Village : 3 Town/city : 1	Countryside :0 Village :5 Town/city :0	Countryside :1 Village :1 Town/city :4
8.	What is the educational background of your ...?	Primary school : 1 Junior second. vocational : 0 Second. vocational : 2 Senior second. school : 1 Higher professional : 0 University : 1 Other : 1	Primary school :2 Junior second. vocational :3 Second. vocational : 0 Senior second. school :0 Higher professional :0 University :0 Other :0	Primary school :0 Junior second. vocational :3 Second. vocational :2 Senior second. school :0 Higher professional :0 University :1 Other :0
9.	Which hobbies does your ..... have?	Playing the piano, gardening, reading, walking, and listening to music. Pottery and drawing in a group.	Cycling(1), travel (1), word searches(1),knitting (1), watching TV (2), reading (2)	Gardening (1), listening to music (1), fishing (1), walking (2) ....

		Amsterdam	Belfast	Lulea
		Reading. Tennis and golf. Used to do professional dancing.		
	Care			
10.	Does your …. have physical complaints/ illnesses he/she is being treated for?	Physical complaints: 1 (number)	Physical complaints: (number)4	Physical complaints: 3(number)
	What type of phys. complaints?	Pace maker, thyroid gland.	[BP, high cholesterol, headaches, arthritis, stomach ulcer] , [diabetes], [arthritis in hip], [hypertension]	.....Diabetes, back pain and Parkinson's disease.....
11.	Does your …. have psychological complaints/ illnesses he/she is being treated for?	Psychological complaints: 5 (number)	Psychological complaints:0(number)	Psychological complaints: 6 (number)
	What type of psych. complaints?	Alzheimer's (4x) Alzheimer's and Lewy body dementia (1x)		Alzheimer's (5x) Alzheimer's and Lewy body dementia (1x)
12.	What aids does your ….. use to get around?	no aids : 3 cane : 1 walker : 0 rollator : 0 wheelchair : 0 scootmobile: 0 other : 1	no aids :5 cane :0 walker :0 rollator : 0 wheelchair :0 scootmobile:0 other :0	no aids :6 cane :0 walker :0 rollator : 0 wheelchair :0 scootmobile:0 other :0
	Communication			
13.	Does your …. have a mobile phone at his/her disposal?	Yes: 5 No : 0	Yes:1 No :4	Yes:6 No :0
14.	If so, how often does your …. use it?	Several times a week : 0 Several times a month : 1 Several times a year/ never : 4	Several times a week :0 Several times a month :0 Several times a year/ never :1	Several times a week :2 Several times a month :0 Several times a year/ never :4
15.	Does your …. have a computer with internet and e-mail facilities at his/her disposal?	No : 0 Yes, internet and e-mail : 3 Yes, only internet : 2	No :3 Yes, internet and e-mail :2 Yes, only internet :0	No :1 Yes, internet and e-mail :5 Yes, only internet :0
16.	If so, how often does your …. use it?	Several times a week : 1 Several times a month : 0 Several times a year/ never : 3	Several times a week :0 Several times a month :0 Several times a year/ never :2	Several times a week :0 Several times a month :0 Several times a year/ never :6
17.	Does your …. have a PDA at his/her disposal?	Yes: 0 No : 5	Yes:0 No :5	Yes:0 No :6
18.	If so, how often does your …. use it?	Several times a week : 0 Several times a month : 0 Several times a year/ never : 0	Several times a week :0 Several times a month :0 Several times a year/never :0	Several times a week :0 Several times a month :0 Several times a year/ never :6

A.1.2. Results Semi-structured interview people with dementia

Semi-structured interview with person with dementia, Field Test 1

Note: Please pay attention to the response options, the order can be different for different questions!

	Amsterdam	**Belfast**	**Lulea**
General opinion	**Amsterdam**	**Belfast**	**Lulea**

		Amsterdam	Belfast	Lulea
G1.	Can you tell me about your experience of using the COGKNOW day Navigator?	Nice, seems useful. Fine initiative, still in it's early stages but it turned out better than I expected. Interesting, it's a good thing that it is possible. I think the system could be of some use to me. I don't need it at the moment but should start using it early to learn the system.	Great, no problem enjoyed using it I don't want to touch it It was a good experience Very good, interesting I think it would be very useful Favourable experience – overall enjoyable	All think that the stationary device will be useful in the future when it is further developed. All think that they will be able to learn how to use the device on their own provided they got opportunity to practice. Some of the Pwds recognizes that they have problems of remembering and that they need assistance. Some were used to their carer reminding them on activities and it was difficult to perceive how the devices could replace that. The devices can not help me in social activities but they can remind me to take part. If the mobile unit was working well and easy to understand II could feel safer when walking in the neighbourhood Pictures are easier to understand than text

		Amsterdam	Belfast	Lulea
G2.	Which part of the COGKNOW day helps you the most in daily life?	No comment, Pwd doesn't know. At this stage none of the functions makes any difference with the way I live now. Perhaps in the future. Help – function and picture dialling service seem most useful. Radio – function. Picture dialling service.	Reminders would be most useful N/A Wouldn't use it N/A not tested in daily life Reminders would be useful N/A not tested in daily life	The picture dialling is easiest to understand and could be very useful The possibility to listen to music and radio is a very nice function Help function is necessary for me as a safety function I don't need the functions right now but I think I could learn how to use the devices ……
G3.	Which part of the COGKNOW Day Navigator helps you the least in daily life?	No comment, Pwd doesn't know. Picture dialling service. I make phone calls all day, it doesn't present me with any problems. Radio – function. Radio – and music – function. Picture dialling service.	Radio, I don't listen to the radio much N/A not tested N/A Music because I'm not interested in music N/A	The mobile device is not useful for me now since it is too difficult to use… My wife helps me with all the functions so I don't need the device now
Stationary Device		**Amsterdam**	**Belfast**	**Lulea**
S1.	How do you judge the stationary device (design, function, usefulness, user-friendliness, etc.)?	Nice, pleasant. The colour appeals to me. The contrast is not clear enough. Colour and icons look good. Clever, nice, clear.	Satisfactory N/A not tested A good size – easy to see	The stationary device could be very useful. Easy to understand the icons The design looks good, but is difficult to place in the home.

		Amsterdam	Belfast	Lulea
		Nice, pretty fresh colours.	Satisfactory Very easy to see + hopefully easy to use	There are too many cords. . …… …… …… …… …… …… …… …… …… ……
S2.	How do you judge the size of the stationary device?	Too large : 2 Appropriate: 3 Too small : 0	Too large : 0 Appropriate: 4 Too small :0	Too large : 1 Appropriate: 5 Too small :0
S3.	How do you judge the size of the buttons of the stationary device?	Too large : 0 Appropriate: 4 Too small : 1	Too large : 0 Appropriate: 2 Too small :0	Too large : 0 Appropriate: 5 Too small :1
S4.	How do you judge the size of the text on the screen?	Too large : 0 Appropriate: 4 Too small : 1	Too large : 0 Appropriate: 4 Too small :0	Too large : 0 Appropriate: 6 Too small :0
S5.	How do you judge the number of buttons on the device?	Too many buttons : 0 Appropriate : 5 Needs more buttons: 0	Too many buttons : 0 Appropriate :1 Needs more buttons:0	Too many buttons : 0 Appropriate :4 Needs more buttons:2
S6.	How do you judge the icons on the device? Dis-/like them, recognize them, please add remarks to specific icons),	Clear Childish, but recognizable Nice, clear, only the icon for finding the mobile device is not clear. Should be rectangular buttons, the icon for finding the mobile device is not clear. Icon for finding the mobile device	Easy to see + recognise Don't know Easily recognisable Easy to see	The Icon of help function is not clear The icon for finding the mobile device is not clear The icon for time of the day is difficult to understand The pictures in the telephone directory are easy to understand

	Amsterdam	Belfast	Lulea
	and the icon for the picture dialling service are not clear.	All the icons are easy to recognise	It is easier to understand a ordinary clock than just digits…… …… …… …… …… …… …… …… ……
S7. How do you judge the display of the screen?	Too bright : 1 Appropriate: 4 Too dark : 0	Too bright :0 Appropriate:4 Too dark :0	Too bright : 0 Appropriate:6 Too dark :0
S8. How useful do you find the stationary device?	No comments, pws doesn't know. Useable, seems useful. Very useable. Doesn't make any difference with my current routine. I don't really know.	Could be useful Don't know Could be very useful Could be useful Would be very useful	Four Pwds find it useful or very useful. Two feel that it has to be adjusted to their needs and routines in order to become useful…… …… …… …… …… …… …… ……
S9. How do you experience the presence of the stationary device in your home?	Not at all inconvenient : 4 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient :2 A little bit more inconvenient :2 A lot more inconvenient :1	Not at all inconvenient :5 A little bit more inconvenient :1 A lot more inconvenient :0

		Amsterdam	Belfast	Lulea
S10.	How satisfied are you with the stationary device in general?	Very satisfied: 0 Satisfied : 4 Dissatisfied : 0	Very satisfied:2 Satisfied :2 Dissatisfied :1	Very satisfied:2 Satisfied :4 Dissatisfied :0
S11	Do you have any suggestions to improve the form of the stationary device?	If you could hang it from the wall would be better. No suggestions. None. Could be smaller, less present in the home.	No suggestions Not able to give suggestions No suggestions No suggestions No suggestions	It should have a calendar so I know what will happen that day It should fit with the other furniture of the house The touch screen is too sensitive, easy to make mistakes. No suggestions
Mobile Device		**Amsterdam**	**Belfast**	**Lulea**
M1.	How do you judge the mobile device (design, function, usefulness, user-friendliness, etc.)?	Nice, needs a little getting used to. Big enough but to may icons on the screen. Not applicable. Not applicable. Nice, could be a little smaller and the buttons could be removed as you don't need them.	Very good but icons are not as clear as on stationary device Don't know Quite difficult to use Very good easy to use but more difficult to see icons Unable to assess, as mobile device didn't function	Two Pwds have no opinion. There are too many functions on it. It should be simple to use so I dare use it. It is difficult to use
M2.	How do you judge the size of the mobile device?	Too large : 2 Appropriate: 3 Too small : 0	Too large :0 Appropriate:4 Too small :0	Too large : 0 Appropriate: 6 Too small :0

		Amsterdam	**Belfast**	**Lulea**
M3.	How do you judge the screen size of the mobile device?	Too small : 0 Appropriate: 4 Too large : 0	Too small :0 Appropriate:3 Too large :0	Too small :0 Appropriate:5 Too large :1
M4.	How do you judge the size of the text on the screen?	Too large : 0 Appropriate: 3 Too small : 1	Too large :0 Appropriate:2 Too small :0	Too large : 0 Appropriate: 4 Too small :2
M5.	How do you judge the icons on the mobile device? Dis-/like them, recognize them, please add remarks to specific icons),	Not applicable. Clear. Large enough. Recognizable. Icons are big enough, contrast is clear.	No Comment Unable to give opinion A bit difficult to see Not as clear as stationary device N/A	Two Pwds have no comments. Two find the design of icons good. One PWD find the Icons difficult to see and there is too little contrast with background. Three Pwds find the radio icon as difficult to see due to lack of contrast One PWD can not understand the logic in which the icons are presented on the screen ……
M6.	How do you judge the weight of the mobile device?	Too light : 0 Appropriate: 3 Too heavy : 2	Too light :0 Appropriate:4 Too heavy : 0	Too light :0 Appropriate:5 Too heavy : 1
M7.	How do you find the mobile device to carry around?	Too bulky and heavy : 5 Appropriate : 0 Very good to carry : 0	Too bulky and heavy :0 Appropriate :3 Very good to carry :0	Too bulky and heavy :0 Appropriate :6 Very good to carry :0
M8.	How well do you find the mobile device to attach to clothes / body?	Good to attach : 1 Appropriate : 1 Difficult to attach: 2	Good to attach :0 Appropriate :0 Difficult to attach:2	Good to attach :0 Appropriate :4 Difficult to attach:0 No opinion 2

		Amsterdam	**Belfast**	**Lulea**
M9.	Do you loose the mobile device easily?	No : 2 Sometimes: 1 Yes : 0	No :0 Sometimes:0 Yes :0	No :3 Sometimes:0 Yes 0 No opinion 3:
M10.	Do you forget the mobile device easily?	Yes : 0 Sometimes: 3 No : 1	Yes 0 Sometimes:0 No :0	Yes :0 Sometimes:1 No :2 No opinion 3
M11.	How do you judge the chargeability of the mobile device?	Easy to charge : 2 Appropriate : 1 Difficult to charge : 0 My…… takes care of charging : 0	Easy to charge :0 Appropriate :0 Difficult to charge :0 My…… takes care of charging :	Easy to charge : 0 Appropriate : 2 Difficult to charge :0 My…… takes care of charging No opinion 4 :
M12.	What do you think of the frequency that you have to charge the battery with?	Too often : 0 Acceptable frequency: 0 Very good frequency : 0	Too often :0 Acceptable frequency:0 Very good frequency :0	Too often : Acceptable frequency: Very good frequency : No opinion 6
M13.	How do you judge the reminder to charge the battery of the mobile device?	Very good : 0 Appropriate: 0 Insufficient : 0	Very good :0 Appropriate:0 Insufficient :0	Very good : Appropriate: Insufficient : No opinion 6

		Amsterdam	Belfast	Lulea
M14.	How useful do you find the mobile device?	Not applicable. Useful, I think I have a use for it. Useful, but the icons should be clearer. Not applicable. What use do the buttons have?	Would be very useful if tried for longer. It would be useful to be able to use it from the armchair + not have to get up + down with arthritis Unable to give opinion Might be useful particularly at night i.e. To use as a mobile phone Might prove useful Would probably be very helpful particularly at night	It could be good if it is adjusted to my needs. It is needed when being out doors If I can handle it, it would provide increased safety .....
M15.	How do you experience your mobile device?	Not at all inconvenient : 3 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient :2 A little bit more inconvenient :1 A lot more inconvenient :0	Not at all inconvenient :0 A little bit more inconvenient :1 A lot more inconvenient :3 No opinion 2
M16.	How satisfied are you with the mobile device in general?	Very satisfied: 0 Satisfied : 3 Dissatisfied : 0	Very satisfied:1 Satisfied :1 Dissatisfied :1	Very satisfied:0 Satisfied :4 Dissatisfied :0 No opinion 2
M17.	Do you have suggestions to improve form and battery of the mobile device?	Not applicable. None. Smaller, more stylish, more compact. Lighter and smaller.	None Unable to give opinion No suggestions No suggestions	It should be easy to operate No opinion …… …… …… …… ……

		Amsterdam	**Belfast**	**Lulea**
		Not applicable.	No suggestions	.....
Reminding Service		**Amsterdam**	**Belfast**	**Lulea**
R1.	How do you judge the reminding service (function, interaction, experiences, usefulness, user-friendliness, etc.)?	I don't have a need for it yet, maybe in the future. Seems all right. Don't need it, can remember it myself. Not bad at all. The icon is clear.	Very good. Would be very useful for appointments. Unable to give opinion Very useful Very good (useful) This would be very useful	It could be useful in the future but not now It must be adjusted to my needs It could be very useful
R2.	How well do you find the reminder messages to understand?	Not understandable : 0 Understandable with effort: 1 Easy to understand : 4	Not understandable :0 Understandable with effort:3 Easy to understand :1	Not understandable : 0 Understandable with effort: 1 Easy to understand :3 No opinion 2
R3.	Do you find the reminders good to hear, when you are in the same room?	Good to hear : 4 Sometimes good/ not : 0 Difficult to hear : 1	Good to hear :4 Sometimes good/ not :0 Difficult to hear :0	Good to hear :1 Sometimes good/ not :1 Difficult to hear :0 No opinion 4
R4.	Do you find the reminders good to hear, when you are in another room?	Difficult to hear: 2 Sometimes good/ not : 2 Good to hear : 1	Difficult to hear:0 sometimes good/ not :2 Good to hear :3	Difficult to hear: Sometimes good/ not : Good to hear Not tested 6 :

		Amsterdam	**Belfast**	**Lulea**
R5.	How do you judge the frequency of repetition of the reminder?	Too often : 0 Appropriate : 0 Not often enough: 0	Too often : 0 Appropriate :1 Not often enough:0	Too often : 0 Appropriate :3 Not often enough:0 No opinion 3
R6.	How do you judge the acknowledgement of the reminder?	Difficult to acknowledge: 3 Appropriate : 2 Easy to acknowledge : 0	Difficult to acknowledge:3 Appropriate :1 Easy to acknowledge :0	Difficult to acknowledge:0 Appropriate :3 Easy to acknowledge :0 No opinion 3
R7.	How do you judge the working of the reminder on your mobile device when you are outside of the house?	Works very good : 1 Works good : 0 Works not good anymore: 0	Works very good :0 Works good :0 Works not good anymore:0	Works very good : Works good : Works not good anymore: Not tested 6
R8.	How do you judge the timeliness of reminder messages?	Not timely enough : 2 Point of time is appropriate: 3 Reminders are too early : 0	Not timely enough :0 Point of time is appropriate:0 Reminders are too early :0	Not timely enough :0 Point of time is appropriate:3 Reminders are too early :0 No opinion 3
R9.	How do you judge the reminder as a support in remembering to eat?	Not supportive at all : 2 Some supportive, sometimes not: 1 Very supportive : 2	Not supportive at all :0 Some supportive, sometimes not:0 Very supportive :0	Not supportive at all :1 Some supportive, sometimes not: 0 Very supportive :0 No opinion 5
R10.	How do you judge the reminder as a support in remembering phone calls?	Very supportive: 0 Some supportive, sometimes not: 1 Not supportive at all : 3	Very supportive:4 Some supportive, sometimes not:0 Not supportive at all :0	Very supportive:3 Some supportive, sometimes not: 0 Not supportive at all 0 No opinion 3 :
R11.	How do you judge the reminder as a support in remembering to brush your teeth?	Not supportive at all : 3 Some supportive, sometimes not: 0 Very supportive : 0	Not supportive at all :0 Some supportive, sometimes not: 0 Very supportive :4	Not supportive at all 0: Some supportive, sometimes not:1 Very supportive :2 No opinion 3

		Amsterdam	**Belfast**	**Lulea**
R12.	How do you judge the reminder as a means to enhance the control over the activities you have to remember in your everyday life?	Very supportive: 1 Some supportive, sometimes not: 0 Not supportive at all : 3	Very supportive:0 Some supportive, sometimes not:0 Not supportive at all :0	Very supportive:3 Some supportive, sometimes not:0 Not supportive at all :0 No opinion 3
R13.	How well do you think that the reminders work?	Very good : 2 Works sometimes, sometime not: 2 Not well : 0	Very good :4 Works sometimes, sometime not:0 Not well :0	Very good : 0 Works sometimes, sometime not:2 Not well :0 No opinion 4
R14.	How useful do you find the reminder function (in relation to your needs)? Does the system help you remember important things (what and how)?	Not applicable. Useful. Reminder for taking medication would be useful. No need for it. No need for it at the moment, maybe in the future.	Very useful. Could be useful for reminding for e.g. pick up for day centre Refused to comment Could be useful Could be useful for appointments etc. Would be very useful for Pwd + carer to help remember appointments	Three of the Pwds have the opinion that they don't need reminders They have to be adjusted to my needs Reminders on phone calls could be good
R15.	How do you experience the reminder function?	Not at all inconvenient : 5 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient :4 A little bit more inconvenient :0 A lot more inconvenient :0	Not at all inconvenient : A little bit more inconvenient : A lot more inconvenient No opinion 6 :
R16.	How satisfied are you with the reminder in general?	Very satisfied: 0 Satisfied : 4 Dissatisfied : 0	Very satisfied:3 Satisfied :1 Dissatisfied :0	Very satisfied:0 Satisfied :1 Dissatisfied :0 No opinion 5
R17.	Do you have suggestions to improve the reminding service?	Every day is different and for daily activities I don't need it yet.	No suggestions	None of the Pwds had any suggestion

		Amsterdam	Belfast	Lulea
		No suggestions. No suggestions. Maybe the reminder could be the voice of the spouse or carer. The screen has to be touched too hard to confirm the reminder.	Refused to comment No suggestions No suggestions No suggestions	…… …… ….. ....
Picture Dialling		**Amsterdam**	**Belfast**	**Lulea**
P1.	How do you judge the picture dialling service (function, interaction, experiences, usefulness, user-friendliness, etc.)?	Easy enough. Actions on two different devices are confusing. Unclear, too many steps, too many devices. Don't need it yet, I have my own address book on my telephone. Seems functional.	Very useful. Easy to use. Refused to comment Very useful Very useful but have no problem using ordinary phone daily Very useful	Five of the Pwds found the picture dialling function useful or very useful. One PWD had no opinion
P2.	How do you judge the basic audio call function?	Very good : 0 Appropriate: 3 Not good : 1	Very good :4 Appropriate:0 Not good :0	Very good :1 Appropriate:4 Not good :0 No opinion 1
P3.	How do you find the audibility of the audio call?	Too loud : 1 Appropriate: 2	Too loud :0 Appropriate:4	Too loud :1 Appropriate:4

		Amsterdam	Belfast	Lulea
		Too soft : 1	Too soft :0	Too soft :0 No opinion 1
P4.	How do you judge the picture dialling function?	Very helpful : 0 Appropriate : 2 Not very helpful : 3	Very helpful :2 Appropriate :2 Not very helpful :0	Very helpful :1 Appropriate :4 Not very helpful : No opinion 1
P5.	How do you judge the size of the pictures on the stationary device?	Too small : 0 Appropriate: 5 Too large : 0	Too small :0 Appropriate:4 Too large :0	Too small :0 Appropriate:6 Too large :0
P6.	How do you judge the size of the pictures on the mobile device?	Too large : 0 Appropriate: 1 Too small : 0	Too large :0 Appropriate:1 Too small :2	Too large :0 Appropriate:4 Too small :1 No opinion 1
P7.	How do you find using the picture address book on the stationary device?	Difficult to use: 0 Appropriate : 3 Easy to use : 2	Difficult to use:1 Appropriate :3 Easy to use :0	Difficult to use:0 Appropriate :4 Easy to use :2
P8.	How do you find using the picture address book on the mobile device?	Easy to use : 0 Appropriate : 0 Difficult to use: 0	Easy to use :1 Appropriate :1 Difficult to use:1	Easy to use : 0 Appropriate :5 Difficult to use:0 No opinion 1
P9.	How do you find the emergency contact function?	Difficult to use: 0 Appropriate : 1 Easy to use : 2	Difficult to use:0 Appropriate :3 Easy to use :1	Difficult to use:1 Appropriate :2 Easy to use :2 No opinion 1
P10.	How do you judge the picture dialling function as a means to facilitate social contact with family and friends?	Makes it easier to keep in touch : 2 Doesn't make a difference : 1 Makes it more difficult : 1	Makes it easier to keep in touch :3 Doesn't make a difference :1 Makes it more difficult :0	Makes it easier to keep in touch :1 Doesn't make a difference :5 Makes it more difficult :0

		Amsterdam	Belfast	Lulea
P11.	How useful do you find the picture dialling function (in relation to your needs)? Does the system help you keep in contact with people (whom and how)?	Not applicable. Unknown. Seems useful. Emergency call – function should be more in the foreground. I don't need it at the moment.	Useful Unable to give opinion N/A May be useful to others but Pwd is able to make ordinary phone calls N/A	Two of the Pwds had no comments Three found the picture dialling function useful or very useful
P12.	How do you experience the picture dialling function?	Not at all inconvenient : 4 A little bit more inconvenient : 1 A lot more inconvenient : 0	Not at all inconvenient :4 A little bit more inconvenient :0 A lot more inconvenient :0	Not at all inconvenient :6 A little bit more inconvenient :0 A lot more inconvenient :0
P13.	How satisfied are you with the picture dialling in general?	Very satisfied: 0 Satisfied : 3 Dissatisfied : 1	Very satisfied:3 Satisfied :1 Dissatisfied :0	Very satisfied:2 Satisfied :4 Dissatisfied :0
P14.	Do you have suggestions to improve the picture dialling function?	All – in – one. The function should be on one device. No suggestions. None. The screen is rectangular, the buttons are rounded, and this looks strange.	No suggestions Unable to give opinion No suggestions No suggestions	Two Pwds wants a larger directory…… …… ……..... ....
Radio control & music player		**Amsterdam**	**Belfast**	**Lulea**

		Amsterdam	**Belfast**	**Lulea**
T1.	How do you judge the Radio/ music player services (function, interaction, experiences, usefulness, user-friendliness, etc.)?	The picture of radio and music player could be clearer. A function to change the station would be useful. Useful, using the buttons is easy. Nice. Would make listening to the radio easier.	Don't listen much to radio Unable to give opinion Not useful Don't listen to radio Enjoyed being able to control music + radio, but really only watches TV now	One Pwd thinks it is not needed The function is easy to use and useful Two of the Pwds express that thy like music very much
T2.	How do you judge the Radio control function?	Very useful: 0 Useful : 4 Not useful : 1	Very useful:0 Useful :2 Not useful :2	Very useful:3 Useful :3 Not useful :0
T3.	How do you judge the size of the control button?	Too large : 0 Appropriate: 5 Too small : 0	Too large :0 Appropriate: 4 Too small :0	Too large : 0 Appropriate: 6 Too small :0
T4.	How well do you find the Radio control to use?	Not well : 0 Sometimes well /not well: 2 Very well : 3	Not well :0 Sometimes well /not well: 0 Very well :4	Not well :2 Sometimes well /not well: 3 Very well :0 No opinion 1
T5.	How practical do you find the music player to listen to music?	Very practical : 1 Practical : 3 Unpractical : 1	Very practical :0 Practical :2 Unpractical :2	Very practical :10 Practical :4 Unpractical 0 No opinion 1
T7.	How do you appreciate the music player to listen to music?	Boring : 1 Enjoyable : 4 Very enjoyable : 0	Boring : 0 Enjoyable : 4 Very enjoyable : 0	Boring : 1 Enjoyable : 4 Very enjoyable : 0

		Amsterdam	Belfast	Lulea
T8.	How useful do you find the Radio control and music player (in relation to your needs)? Does the system help you in these kinds of daily activities (what and how)?	Useful. Useful, practical. Useful, I would listen to the radio or music more often. No comment. I would use this service.	Don't listen to radio . N/A Not useful Don't listen to radio Not useful carer usually listens to music , only watches TV	Four of the Pwds found the function very useful One had forgotten to use the radio and rediscovered the possibility One had already a system for using the radio
T9.	How do you experience the Radio control and music player?	Not at all inconvenient : 4 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient :0 A little bit more inconvenient :4 A lot more inconvenient :0	Not at all inconvenient : A little bit more inconvenient : A lot more inconvenient :
T10.	How satisfied are you with the Radio control and music player?	Very satisfied: 0 Satisfied : 4 Dissatisfied : 0	Very satisfied:3 Satisfied :1 Dissatisfied :0	Very satisfied:0 Satisfied :4 Dissatisfied : No opinion 2
T11.	Do you have suggestions to improve the Radio control and music player?	None. No suggestions. No comment. Windows media player and internet download - function would be nice.	No suggestions N/A No suggestions N/A No suggestions	It should be adjusted to the kind of music I listen to. …… …… …… …… …… …… …… …… ……
Safety Warnings		**Amsterdam**	**Belfast**	**Lulea**

		Amsterdam	Belfast	Lulea
W1.	How do you judge the safety warning services (function, interaction, experiences, usefulness, user-friendliness, etc.)?	Not applicable. Not applicable. Not applicable. Nice, comforting thought. Would be more useful in the kitchen. Refrigerator and oven door.	Useful N/A Useful Useful Very useful	It must be adjusted to our needs. Better with warning for unlocked doors than open doors…… …… …… …… …… …… …… ……
W2.	How do you judge the sensors effectiveness in detecting an open/closed door?	Ineffective : 0 Sometimes effective /ineffective: 2 Very effective : 0	Ineffective : 0 Sometimes effective /ineffective: 0 Very effective : 4	Ineffective :3 Sometimes effective /ineffective:0 Very effective :1 No opinion 2:
W3.	How do you judge the safety warning of an open door on the stationary device?	Very useful : 0 Appropriate: 2 Not useful : 0	Very useful :4 Appropriate: 0 Not useful : 0	Very useful :0 Appropriate:3 Not useful :2 No opinion 1
W4.	How do you judge the audibility of the safety warning on the stationary device?	Good to hear : 0 Sometimes good/ not good: 1 Difficult to hear : 1	Good to hear : 4 Sometimes good/ not good: 0 Difficult to hear : 0	Good to hear :3 Sometimes good/ not good:1 Difficult to hear :0 No opinion 2:
W5.	How do you judge the visual safety warning on the stationary device?	Very good visible : 0 Appropriate : 2 Difficult to decipher : 0	Very good visible : 4 Appropriate : 0 Difficult to decipher : 0	Very good visible :1 Appropriate :3 Difficult to decipher :0 No opinion 1
W6.	How do you judge the safety warning of an open door on the mobile device?	Not useful : 0 Appropriate: 2	Not useful : 0 Appropriate: 0	Not useful : 5 Appropriate:

		Amsterdam	**Belfast**	**Lulea**
		Very useful : 0	Very useful : 0	Very useful : No opinion 1
W7.	How do you judge the audibility of the safety warning on the mobile device?	Good to hear : 0 Sometimes good/ not: 0 Difficult to hear : 0	Good to hear : 0 Sometimes good/ not: 0 Difficult to hear : 0	Good to hear : Sometimes good/ not: Difficult to hear : No opinion 6
W8.	How do you judge the visual safety warning on the mobile device?	Very good visible : 0 Appropriate : 0 Difficult to decipher : 0	Very good visible : 0 Appropriate : 0 Difficult to decipher : 0	Very good visible : Appropriate : Difficult to decipher : No opinion 6
W9.	How well do you think are the warning alarms working?	Not well : 0 Sometimes correct/ wrong: 2 Very well : 0	Not well : 0 Sometimes correct/ wrong: 0 Very well : 4	Not well : Sometimes correct/ wrong: Very well :
W10.	How useful do you find the warning alarms (in relation to your needs)? Does the system give you a feeling of safety (when and how)?	Not applicable. Not applicable. Not applicable. No comment could be made on usefulness. Seems useful.	Would be useful N/A Would be very reassuring Would be useful Excellent idea, would be very helpful	No opinions 6…… …… …… …… …… …… …… …… …… ….
W11.	How do you experience the safety warning alarms?	Not at all inconvenient : 1 A little bit more inconvenient : 1 A lot more inconvenient : 0	Not at all inconvenient : 4 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient : A little bit more inconvenient : A lot more inconvenient :
W12.	How satisfied are you with the warning alarms in general?	Very satisfied: 0 Satisfied : 2	Very satisfied: 1 Satisfied : 3	Very satisfied:1 Satisfied :2

		Amsterdam	**Belfast**	**Lulea**
		Dissatisfied : 0	Dissatisfied : 0	Dissatisfied :1
W13.	Do you have any suggestions to improve the warning alarms?	Not applicable. Not applicable. Not applicable. No suggestions. You should be able to turn it off when you are at home.	No suggestions N/A No suggestions No suggestions No suggestions	…… Should be adjusted to individual needs
Statements on Learning how to use the device		**Amsterdam**	**Belfast**	**Lulea**
L1.	How do you experience learning how to use the devices and functions ?	No comment. Need a little time to learn, you need to grow in it. Fine, clear, clarifying, not to much buttons to remember. The more you work with it, the easier it gets. It seems ease enough to learn.	Not difficult N/A Not difficult Easy Fairly easy	It takes some training and practice to learn how to use it It will be easy to learn how to use it. The mobile device may be a bit difficult to learn how to use …… …… …… …… …… …… …… …… ……

		Amsterdam	**Belfast**	**Lulea**
L2.	I quickly learned how to use the device	Totally agree : 2 (Dis)agree somewhat: 2 Totally Disagree : 0	Totally agree : 4 (Dis)agree somewhat: 0 Totally Disagree : 0	Totally agree :3 (Dis)agree somewhat:3 Totally Disagree :0
L3.	I needed little support in learning how to use the device	Totally agree : 3 (Dis)agree somewhat: 1 Totally Disagree : 0	Totally agree : 3 (Dis)agree somewhat: 1 Totally Disagree : 0	Totally agree :6 (Dis)agree somewhat:0 Totally Disagree :0
L4.	I find the device easy to use for the functions I need it	Totally agree : 4 (Dis)agree somewhat: 0 Totally Disagree : 0	Totally agree : 3 (Dis)agree somewhat: 1 Totally Disagree : 0	Totally agree :4 (Dis)agree somewhat:2 Totally Disagree :0
L5.	I easily remember the various functions of the device	Totally agree : 1 (Dis)agree somewhat: 3 Totally Disagree : 0	Totally agree : 2 (Dis)agree somewhat: 2 Totally Disagree : 0	Totally agree :3 (Dis)agree somewhat:2 Totally Disagree :1
L6.	I easily remember how to use the device	Totally agree : 3 (Dis)agree somewhat: 0 Totally Disagree : 1	Totally agree : 0 (Dis)agree somewhat: 0 Totally Disagree : 4	Totally agree :1 (Dis)agree somewhat:4 Totally Disagree :1
L7.	I need little support when using the device	Totally agree : 2 (Dis)agree somewhat: 2 Totally Disagree : 0	Totally agree : 4 (Dis)agree somewhat: 0 Totally Disagree : 0	Totally agree :5 (Dis)agree somewhat:1 Totally Disagree :0
L8.	The technical support was sufficient	Totally agree : 0 (Dis)agree somewhat: 0 Totally Disagree : 0	Totally agree : 0 (Dis)agree somewhat: 4 Totally Disagree : 0	Totally agree :3 (Dis)agree somewhat:0 Totally Disagree :1 No opinion 2
L9.	How satisfied are you with the device in general?	Very satisfied: 0 Satisfied : 4 Dissatisfied : 0	Very satisfied: 4 Satisfied : 0 Dissatisfied : 0	Very satisfied:2 Satisfied : 4 Dissatisfied :0

		Amsterdam	Belfast	Lulea
L10.	Do you have suggestions to make the device easier to learn and use?	No comment. None. I can understand this, so I think it's all right. No suggestions. None.	No suggestions N/A No suggestions No suggestions No suggestions	None of the Pwds had any suggestions …… …… ….. ....
Suggestions for Improvement and for Future devices		**Amsterdam**	**Belfast**	**Lulea**
F1.	What do you think about GPS location technique as a mean to help you finding the way in the future?	No comment. It should be very simple to use. Neighbours work better than GPS. I don't need it at the moment, but it seems fun. I don't really know. Could help.	N/A N/A N/A N/A N/A	Two of the Pwds new what GPS was and they thought it would be good to have provided it was not to difficult to use…… …… ……..... ....
F2.	What do you think about GPS location device to feel safer when walking around on your own outside?	No comment. Wouldn't make a difference. I would feel safer, when you ask for directions you don't always know who you're talking to. Possibly practical in the future.	N/A N/A N/A N/A N/A	Two of the Pwds thought they would be safer …… …… ……..... ....

		Amsterdam	Belfast	Lulea
		I don’t feel unsafe.		
F3.	What do you think about your partner being able to locate your position with GPS while you are outside taking a walk?	No comment. I think that would be practical. No need, this is such a small place. When I ask for it, my carer can see where I am. Would be nice and useful.	N/A. N/A N/A N/A N/A	No Pwd had an opinion about this but several of the carers would have liked it if it was easy to use. ....

A.1.3 Results Semi-structured interview carers

Semi-structured interview with Carer, Field Test 1

	Amsterdam	**Belfast**	**Lulea**
General opinion	**Amsterdam**	**Belfast**	**Lulea**

		Amsterdam	Belfast	Lulea
G1.	Can you tell me about your experience of using the COGKNOW day Navigator?	Good development. This is a good time to start learning this kind of system. No comment, I didn't really have an experience yet. This is too difficult to learn when you don't have any previous computer – experience. We don't need it yet but it could be useful in the future. You should start early to learn how to use it.	Simpler to use than anticipated. Although testing for such a short time is maybe not good Disappointed Pwd didn't test it Difficult to assess over 1 days use but I think it has great potential Surprised that the Pwd didn't find it more difficult Easy enough to use	All six carers thought the devices had potential to develop into a useful tool. The day-navigator may assist in helping the PWD to become more independent from me A day navigator would help me to feel safer when I am outside of the home on my own I does not need to many functions as long as they are adjusted to his needs It is difficult to start using an assistive device before it is fully needed it may take away the motivation. There should not be so many options on the mobile device, it should focus on communication. The stationary screen is very useful and easy to learn It will be easier to learn if both of us are using the same device The appearance of the stationary screen can be developed with more contrast, only the active buttons is clearly visible. Not good with a screen saver, the symbols must be seen all the time. The background could change according the time of the day in

		Amsterdam	Belfast	Lulea
G2.	Which part of the COGKNOW day helps your … the most in daily life?	None Music player, as the CD and cassette player are to difficult to operate at the moment. Help – and picture dialling function. Picture dialling function. Picture dialling function.	Reminders e.g. clean your teeth + other appointments etc. in the future N/A Reminders for stimulating Pwds day Reminders Reminders would be most useful particularly if the Pwd was alone for any length of time	The music and radio functions seem easiest to get use to. Picture dialling could be very useful Reminders could work well provided they were adjusted to needs
G3.	Which part of the COGKNOW Day Navigator helps your … the least in daily life?	None. The find mobile device functions, mainly due to the unclear icon. Radio – function Radio – and music function Radio – function.	Radio + music N/A Radio + music Radio + music Music – Pwd doesn't listen to music Radio – Pwd doesn't listen to radio only in car	The mobile devise is to complicated as it is designed at the moment To put on music is not necessary We don't need warnings for open doors, it could even be troublesome in summer time
Stationary Device		**Amsterdam**	**Belfast**	**Lulea**
S1.	How do you judge the stationary device (design, function, usefulness, user-friendliness, etc.)?	Recognizable, clarifying. Nice Nice size, user-friendly enough. Good, clear arrangement, the buttons should be more spread out. Excellent	Well designed. Icons easily recognisable N/A Very satisfactory	It could be very useful The whole thing looks to technical, there are to many cords and things It should not be possible to put off the power to the equipment

		Amsterdam	Belfast	Lulea
			No comment Very user friendly	It seems easy to understand The concept with pictures combined with text is good
S2.	How do you judge the size of the stationary device?	Too large : 0 Appropriate: 5 Too small : 0	Too large : 0 Appropriate: 4 Too small :0	Too large : 1 Appropriate: 5 Too small :0
S3.	How do you judge the size of the buttons of the stationary device?	Too large : 0 Appropriate: 5 Too small : 0	Too large : 0 Appropriate: 0 Too small :0	Too large :0 Appropriate: 6 Too small :0
S4.	How do you judge the size of the text on the screen?	Too large : 0 Appropriate: 5 Too small : 0	Too large :0 Appropriate: 4 Too small :0	Too large :0 Appropriate: 6 Too small :0
S5.	How do you judge the number of buttons on the device?	Too many buttons : 0 Appropriate : 5 Needs more buttons: 0	Too many buttons : 0 Appropriate :3 Needs more buttons:0	Too many buttons : 0 Appropriate :6 Needs more buttons:0
S6.	How do you judge the icons on the device? dis-/like them, recognize them, please add remarks to specific icons),	Fine, maybe the Help – button should be a different colour. Contrast should be higher. The icon for finding the mobile device is unclear. Find mobile device is unclear, maybe only the mobile device should be shown (leave out the magnifying glass). The find mobile device icon with the magnifying glass is not recognizable. The radio icon should be with a different (more modern) radio.	Easily recognisable N/A All the icons are easily recognisable Easily recognisable Easy to recognise	It is good with the combination of icons and text Plain text not good The icon for time of the day is not working well There should be more contrast both in colour and brightness
S7.	How do you judge the display of the screen?	Too bright : 1 Appropriate: 5	Too bright : 0 Appropriate:4	Too bright : 0 Appropriate:6

		Amsterdam	Belfast	Lulea
		Too dark : 0	Too dark :0	Too dark :0
S8.	How useful do you find the stationary device?	How to operate and the functions will not be remembered, the number of functions is too large. Useful. It could not be simpler. Good to use, the contrast should be higher. Not so bad, I think it's useable.	Has good potential N/A Would be very useful Would be useful Very useful	All find the device useful or very useful. Some feel it can be developed in different ways. It would be more useful with a calendar function
S9.	How do you experience the presence of the stationary device in your …. home?	Not at all inconvenient : 5 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient :3 A little bit more inconvenient :1 A lot more inconvenient :0	Not at all inconvenient :4 A little bit more inconvenient :1 A lot more inconvenient :0 No opinion 1
S10.	How satisfied are you with the stationary device in general?	Very satisfied: 2 Satisfied : 3 Dissatisfied : 0	Very satisfied:1 Satisfied :3 Dissatisfied :0	Very satisfied:0 Satisfied :6 Dissatisfied :0
S11	Do you have any suggestions to improve the form of the stationary device?	If you could hang it from the wall would be nice. Hang it from the wall. No suggestions. Logical shape, a separate help – button next to the bed would be useful. The word 'electronic assistant' should be removed, has no use.	No suggestions N/A No suggestions No suggestions Yes reminders could be accompanied with flashing lights as well as a warning sound for people with hearing difficulties	There should be voice prompts for all activities and buttons The dialling function should be simplified, you can talk directly to the screen The help button must stand out much more.

		Amsterdam	Belfast	Lulea
Mobile Device		**Amsterdam**	**Belfast**	**Lulea**
M1.	How do you judge the mobile device (design, function, usefulness, user-friendliness, etc.)?	Not applicable. Useful. Unknown. Looks nice Seems nice, the contrast on the screen is a problem. Would be nice if the buttons were removed.	Not very user friendly. Icons too small Could be useful for other people if they could be taught how to use it Not very user friendly. Difficult to see Not user friendly Mobile device didn't function, questions about mobile device N/A	It has to many functions as it is now It must be very stable and simple to use What do you operate the touch screen when it is winter and you have gloves? The mobile device should focus on security and facilitate communication
M2.	How do you judge the size of the mobile device?	Too large : 0 Appropriate: 4 Too small : 1	Too large : 0 Appropriate: 5 Too small :0	Too large : 0 Appropriate: 6 Too small :0
M3.	How do you judge the screen size of the mobile device?	Too small : 0 Appropriate: 5 Too large : 0	Too small :0 Appropriate:4 Too large :0	Too small :0 Appropriate:6 Too large :0
M4.	How do you judge the size of the text on the screen?	Too large : 0 Appropriate: 3 Too small : 1	Too large : 0 Appropriate: 0 Too small :4	Too large : 0 Appropriate: 5 Too small :1
M5.	How do you judge the icons on the mobile device? dis-/like them, recognize them, please add remarks to specific icons),	Nice. Clear, recognizable. Recognizable, no further comments on icons.	Not clear Ok Difficult to see in general Difficult to see	The icons are good and easy to see The radio icon is particularly difficult to see The help icon is difficult to understand

		Amsterdam	Belfast	Lulea
		Relative to the size of the device it's ok. The contrast should be higher. The radio – icon is less clear than on the stationary device.	N/A	It is a problem with the screen saver that makes the screen dark
M6.	How do you judge the weight of the mobile device?	Too light : 0 Appropriate: 4 Too heavy : 1	Too light :0 Appropriate:5 Too heavy : 0	Too light :0 Appropriate:5 Too heavy : 1
M7.	How do you find the mobile device to carry around for your …?	Too bulky and heavy : 4 Appropriate : 1 Very good to carry : 0	Too bulky and heavy :0 Appropriate :5 Very good to carry :0	Too bulky and heavy : Appropriate : Very good to carry :
M8.	How well do you find the mobile device for your …. to attach to clothes / body?	Good to attach : 2 Appropriate : 2 Difficult to attach: 1	Good to attach :0 Appropriate :0 Difficult to attach:3	Good to attach :0 Appropriate :5 Difficult to attach:0 No opinion 1
M9.	Does your …. loose the mobile device easily?	No : 3 Sometimes: 2 Yes : 0	No :0 Sometimes:0 Yes :0	No :0 Sometimes:1 Yes : 1 No opinion 4
M10.	Do you find the mobile device is easy to forget?	Yes : 1 Sometimes: 2 No : 2	Yes :0 Sometimes:0 No :0	Yes :0 Sometimes: 2 No : 0 No opinion 4
M11.	How do you judge the chargeability of the mobile device?	Easy to charge : 3 Appropriate : 2 Difficult to charge : 0 My…… takes care of charging : 0	Easy to charge : 0 Appropriate : 0 Difficult to charge :0 My…… takes care of charging :0	Easy to charge : 0 Appropriate : 2 Difficult to charge :0 My…… takes care of charging no opinion 4 :

		Amsterdam	**Belfast**	**Lulea**
M12.	What do you think of the frequency that you have to charge the battery with?	Too often : 0 Acceptable frequency: 0 Very good frequency : 0	Too often :0 Acceptable frequency:0 Very good frequency :0	Too often :0 Acceptable frequency:2 Very good frequency :0 No opinion4
M13.	How do you judge the reminder to charge the battery of the mobile device?	Very good : 0 Appropriate: 0 Insufficient : 0	Very good :0 Appropriate:0 Insufficient :0	Very good : Appropriate: Insufficient : No opinion 6
M14.	How useful do you find the mobile device?	I think it could be useful. GPS technology would be practical. I think the mobile device is the most essential part of the system. Would make things easier than at the way we currently do things. Would forget it easily. The contact information of the owner should be in or on the mobile device.	Big screen is better It could be useful for some people but not here unfortunately Would much prefer the stationary device Not as useful as big screen N/A	It could be very useful if it is further developed It may help the PWD to be more independent out doors I could feel safer if he could learn how to use it
M15.	How do you experience the presence of the mobile device for your ….?	Not at all inconvenient : 3 A little bit more inconvenient : 2 A lot more inconvenient : 0	Not at all inconvenient :2 A little bit more inconvenient :1 A lot more inconvenient :1	Not at all inconvenient :1 A little bit more inconvenient :1 A lot more inconvenient :1 No opinion 3
M16.	How satisfied are you with the mobile device in general?	Very satisfied: 0 Satisfied : 4 Dissatisfied : 0	Very satisfied:0 Satisfied :2 Dissatisfied :1	Very satisfied 0 Satisfied :1 Dissatisfied :3 No opinion 2
M17.	Do you have suggestions to improve form and battery of the mobile device?	If the buttons don't have any function than remove them or cover them up.	No suggestions.	There should be very few functions and buttons to pouch on.

		Amsterdam	Belfast	Lulea
		No suggestions. No suggestions. A little smaller and lighter. The charger is fine. I think it's fine.	No suggestions No suggestions No suggestions No Comment	There should not be so many steps in each command
Reminding Service		**Amsterdam**	**Belfast**	**Lulea**
R1.	How do you judge the reminding service (function, interaction, experiences, usefulness, user-friendliness, etc.)?	Useful, practical. Nice, it's clear what has to be done. Not very useful, maybe for keys or medication. Useful, Pwd forgets to eat. Not very useful.	Useful – Pwd needs to be reminded by telephone at present Open door reminder could be useful Could be very useful Useful Excellent	Could be very useful if it is adjusted to personal needs More important to be reminded on such things as medication It should be possible to easy adjust the reminders by the carers
R2.	How well do you think your … understands the reminder messages ?	Not understandable : 0 Understandable with effort: 0 Easy to understand : 5	Not understandable : 1 Understandable with effort: 2 Easy to understand :2	Not understandable : 0 Understandable with effort: 2 Easy to understand :1 No comments 3
R3.	Do you find the reminders good to hear, when you are in the same room?	Good to hear : 4 Sometimes good/ not : 0 Difficult to hear : 1	Good to hear :5 Sometimes good/ not :0 Difficult to hear :0	Good to hear :3 Sometimes good/ not :0 Difficult to hear :0 No opinion 3

		Amsterdam	**Belfast**	**Lulea**
R4.	Do you find the reminders good to hear, when you are in another room?	Difficult to hear: 2 Sometimes good/ not : 3 Good to hear : 0	Difficult to hear:0 Sometimes good/ not :0 Good to hear :4	Difficult to hear: 0 Sometimes good/ not 0 Good to hear :3 No opinion 3
R5.	How do you judge the frequency of repetition of the reminder?	Too often : 0 Appropriate : 1 Not often enough: 0	Too often : 0 Appropriate :0 Not often enough:0	Too often : 0 Appropriate : Not often enough:
R6.	How do you judge the acknowledgement of the reminder by your ….?	Difficult to acknowledge: 4 Appropriate : 1 Easy to acknowledge : 0	Difficult to acknowledge:0 Appropriate :4 Easy to acknowledge :0	Difficult to acknowledge:0 Appropriate :3 Easy to acknowledge 0 No opinion 3
R7.	How do you judge the working of the reminder on your mobile device when your … is outside of the house?	Works very good : 0 Works good : 2 Works not good anymore: 0	Works very good :0 Works good :0 Works not good anymore:0	Works very good : Works good : Works not good anymore: Not tested 6
R8.	How do you judge the timeliness of reminder messages?	Not timely enough : 1 Point of time is appropriate: 1 Reminders are too early : 0	Not timely enough :0 Point of time is appropriate:0 Reminders are too early :0	Not timely enough :0 Point of time is appropriate:3 Reminders are too early :0 No opinion 3
R9.	How do you judge the reminder as a support for your …in remembering to eat?	Not supportive at all : 3 Some supportive, sometimes not: 1 Very supportive : 1	Not supportive at all 0: Some supportive, sometimes not: 0 Very supportive :0	Not supportive at all 0 :Some supportive, sometimes not: 1 Very supportive :0 No opinion 5
R10.	How do you judge the reminder as a support for your … in remembering phone calls?	Very supportive: 1 Some supportive, sometimes not: 2 Not supportive at all : 2	Very supportive:3 Some supportive, sometimes not: 0 Not supportive at all :0	Very supportive:2 Some supportive, sometimes not: 1 Not supportive at all :0 No opinion 3

		Amsterdam	**Belfast**	**Lulea**
R11.	How do you judge the reminder as a support for your …in remembering to brush teeth?	Not supportive at all : 4 Some supportive, sometimes not: 0 Very supportive : 1	Not supportive at all :0 Some supportive, sometimes not: 1 Very supportive :3	Not supportive at all 2 Some supportive, sometimes not: 1 Very supportive :0 No opinion 3
R12.	How do you judge the reminder as a means to enhance the control over the activities your …. has to remember in his/her everyday life?	Very supportive: 1 Some supportive, sometimes not: 3 Not supportive at all : 1	Very supportive:0 Some supportive, sometimes not: 1 Not supportive at all :0	Very supportive:3 Some supportive, sometimes not: 0 Not supportive at al 0 No opinion 3 :
R13.	How well do you think that the reminders for your ….. work?	Very good : 4 Works sometimes, sometime not: 0 Not well : 0	Very good : 4 Works sometimes, sometime not:0 Not well :0	Very good : 2 Works sometimes, sometime not:1 Not well :0 No opinion 3
R14.	How do you find yourself able to set reminders for your ….?	Able : 2 Sometimes difficulties: 2 Unable : 1	Able :0 Sometimes difficulties:0 Unable :0	Able :0 Sometimes difficulties:0 Unable :1 No opinion 5
R15.	How useful do you find the reminder function (in relation to your ….. needs)? Does the system help you remember important things (what and how)?	Useful. Once in possession and functions are learned is could be useful. No need for it at the moment, maybe a reminder to bring the mobile device. Too complicated to learn. Useful for remembering medication.	Could be very useful Won't work at all Could be very useful Could be useful if Pwd was on their own, useful for reminding of appointments Could be useful if Pwd was on their own to remind about appointments	Several of the carers thought that reminders could be very useful if they were meaningful for the PWD
R16.	How do you experience the reminder function for your ….?	Not at all inconvenient : 4 A little bit more inconvenient : 1	Not at all inconvenient :4 A little bit more inconvenient :0	Not at all inconvenient :1 A little bit more inconvenient :2

		Amsterdam	Belfast	Lulea
		A lot more inconvenient : 0	A lot more inconvenient :1	A lot more inconvenient :0 No opinion 3
R17.	How satisfied are you with the reminder in general?	Very satisfied: 0 Satisfied : 4 Dissatisfied : 1	Very satisfied:1 Satisfied :3 Dissatisfied :0	Very satisfied:0 Satisfied :2 Dissatisfied :1 No opinion 3
R18.	Do you have suggestions to improve the reminding service?	Link to audio speakers in other rooms. No suggestions. Help – function should be clearer on the screen. More alternatives for content reminder. The option to set reminders daily.	No suggestions No suggestions No suggestions No suggestions No suggestions	The reminders should be combined with voice messages It should be possible to use a variety of reminders
Picture Dialling		**Amsterdam**	**Belfast**	**Lulea**
P1.	How do you judge the picture dialling service (function, interaction, experiences, usefulness, user-friendliness, etc.)?	Useful. Nice, proceedings are clear. Useful, practical. Too complicated. Looks nice but at the moment it's not easier than the current routine.	Very useful Too difficult for a confused person Very useful Very useful, but Pwd is able to make ordinary phone calls at present Could be useful but Pwd is able to use ordinary phone at present	Most of the carers found the picture dialling useful or very useful There were some problems with the ending of calls. The text instruction of lifting the receiver was not working well. The directory could be bigger in order to include more persons

		Amsterdam	Belfast	Lulea
				The pick up function was not working well The combination of text and pictures worked well.
P2.	How do you judge the basic audio call function?	Very good : 1 Appropriate: 2 Not good : 2	Very good :0 Appropriate:5 Not good :0	Very good :1 Appropriate:4 Not good :0 No opinion 1
P3.	How do you find the audibility of the audio call?	Too loud : 1 Appropriate: 3 Too soft : 1	Too loud :0 Appropriate:5 Too soft :0	Too loud :0 Appropriate:6 Too soft :0
P4.	How do you judge the picture dialling Function for your ….?	Very helpful : 0 Appropriate : 3 Not very helpful : 2	Very helpful :3 Appropriate :1 Not very helpful :1	Very helpful :2 Appropriate :2 Not very helpful :0 No opinion 2
P5.	How do you judge the size of the pictures on the stationary device?	Too small : 1 Appropriate: 4 Too large : 0	Too small :0 Appropriate:5 Too large :0	Too small :0 Appropriate:6 Too large :0
P6.	How do you judge the size of the pictures on the mobile device?	Too large : 0 Appropriate: 0 Too small : 0	Too large :2 Appropriate:1 Too small :1	Too large : Appropriate: Too small :
P7.	How do you find that your …uses the picture address book on the stationary device?	Difficult to use: 2 Appropriate : 2 Easy to use : 1	Difficult to use:1 Appropriate :4 Easy to use :0	Difficult to use:0 Appropriate :6 Easy to use :0 No opinion 0

		Amsterdam	**Belfast**	**Lulea**
P8.	How do you find that your …uses the picture address book on the mobile device?	Easy to use : 0 Appropriate : 0 Difficult to use: 0	Easy to use : 1 Appropriate :1 Difficult to use:2	Easy to use : 0 Appropriate 3 Difficult to use:1 No opinion 2
P9.	How do you find the emergency contact function for your …?	Difficult to use: 1 Appropriate : 2 Easy to use : 1	Difficult to use:1 Appropriate :3 Easy to use :1	Difficult to use:1 Appropriate :2 Easy to use :1 No opinion 2
P10.	How do you judge the picture dialling function as a means to facilitate social contact of your …with family and friends?	Makes it easier to keep in touch : 2 Doesn't make a difference : 2 Makes it more difficult : 1	Makes it easier to keep in touch :2 Doesn't make a difference :2 Makes it more difficult :1	Makes it easier to keep in touch :6 Doesn't make a difference :0 Makes it more difficult :0
P11.	How useful do you find the picture dialling function (in relation to your ….. needs)? Does the system help you keep in contact with people (whom and how)?	Easier, less chance to make a mistake. Difficult to use because of separate devices. Not useful, works fine without. Not useful, current routine works fine. Useful.	Possibly. All too confusing + stressful Possibly Pwd already phones several times a day Not useful at present as Pwd is still able to make phone calls	All carers found the function useful or very useful.
P12.	How do you experience the picture dialling function?	Not at all inconvenient : 2 A little bit more inconvenient : 3 A lot more inconvenient : 0	Not at all inconvenient :0 A little bit more inconvenient :2 A lot more inconvenient :3	Not at all inconvenient :6 A little bit more inconvenient :0 A lot more inconvenient :0
P13.	How satisfied are you with the picture dialling in general?	Very satisfied: 0 Satisfied : 5 Dissatisfied : 0	Very satisfied:1 Satisfied :4 Dissatisfied :1	Very satisfied:2 Satisfied :3 Dissatisfied :0 No opinion 1

		Amsterdam	Belfast	Lulea
P14.	Do you have suggestions to improve the picture dialling function?	Everything should be in one device. The help icon should be renamed. The option to input more contacts (friends, neighbours). More pages in the address book, scroll through the pages. Integrate phone and picture dialling (one device).	No suggestions No suggestions No suggestions No suggestions No suggestions	A possibility to include more persons in the directory The calling should be easier with less steps All calling through the screen and no receiver
Radio control & music player		**Amsterdam**	**Belfast**	**Lulea**
T1.	How do you judge the Radio/ music player services (function, interaction, experiences, usefulness, user-friendliness, etc.)?	More useful than the current system, should have the option to choose stations. Nice, practical. Music function in combination with other functions is not very practical. Good, useful. Would be difficult if there were different radio stations.	Very user friendly N/A Not useful Could be difficult if Pwd was alone Easy to use	The function is easy to use and understand It could help to facilitate to listen to music The function should be used by all members in the family
T2.	How do you judge the Radio control function for your ….?	Very useful: 0 Useful : 4 Not useful : 1	Very useful:0 Useful :1 Not useful :3	Very useful: 3 Useful :2 Not useful :1 No opinion 1

		Amsterdam	**Belfast**	**Lulea**
T3.	How do you judge the size of the control button?	Too large : 0 Appropriate: 4 Too small : 1	Too large : 0 Appropriate: 1 Too small :0	Too large : 0 Appropriate: 6 Too small :0
T4.	How well do you find that your … uses the Radio control?	Not well : 0 Sometimes well /not well: 1 Very well : 4	Not well :0 Sometimes well /not well: 3 Very well :1	Not well 0 Sometimes well /not well: 2 Very well :3 No opinion 1
T5.	How practical for your …do you find the music player to listen to music?	Very practical : 0 Practical : 4 Unpractical : 1	Very practical :0 Practical :3 Unpractical :1	Very practical :0 Practical :3 Unpractical :2
T6.	How do you appreciate the music player for your …. to listen to music?	Boring : 0 Enjoyable : 4 Very enjoyable : 1	Boring : 1 Enjoyable : 3 Very enjoyable : 0	Boring : 0 Enjoyable : 4 Very enjoyable : 1 No opinion 1
T7.	How useful do you find the Radio control and music player (in relation to your …. needs)? Does the system help you in these kind of daily activities (what and how)?	Useful. Useful, the Pwd would possibly listen to music/ radio more often. Integrate windows media player and the option to select albums/ songs/ artists. Music function is practical, radio function is not. Not really a need for it, Pwd doesn't listen to the radio/ music very often.	Not useful All too confusing + stressful Could be difficult to get used to, Pwd is able to use TV control manually. Not useful Doesn't listen to radio much	The music function is very useful if it can be loaded with the right music The radio might be very useful.
T8.	How do you experience the Radio control and music player ?	Not at all inconvenient : 5 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient :1 A little bit more inconvenient :3 A lot more inconvenient :0	Not at all inconvenient : A little bit more inconvenient : A lot more inconvenient :

		Amsterdam	Belfast	Lulea
T9.	How satisfied are you with the Radio control and music player?	Very satisfied: 0 Satisfied : 5 Dissatisfied : 0	Very satisfied:1 Satisfied :3 Dissatisfied :0	Very satisfied:0 Satisfied :4 Dissatisfied :0 No opinion 2
T10.	Do you have suggestions to improve the Radio control and music player?	None. No suggestions. Option to choose radio stations and artists/ songs/ albums. Picture of the artist and an instruction on the screen. No suggestions.	No comment No comment No suggestions No suggestions No suggestions	No suggestions There should be options where you easy choose radio stations ...
Safety Warnings		**Amsterdam**	**Belfast**	**Lulea**
W1.	How do you judge the safety warning services (function, interaction, experiences, usefulness, user-friendliness, etc.)?	Not applicable. Not applicable. Not applicable. Useful, practical. Practical in the kitchen, fridge and over door.	Useful Could be useful if installed before person gets too confused Potentially useful Could be useful User friendly	We have no use of safety warning of open doors but a warning for unlocked doors would be very useful
W2.	How do you judge the sensors effectiveness in detecting an open/closed door?	Ineffective : 0 Sometimes effective /ineffective: 1 Very effective : 1	Ineffective :0 Sometimes effective /ineffective:0 Very effective :5	Ineffective :1 Sometimes effective /ineffective:0 Very effective :1 No opinion 4

		Amsterdam	**Belfast**	**Lulea**
W3.	How do you judge the safety warning of an open door on the stationary device?	Very useful : 1 Appropriate: 1 Not useful : 0	Very useful :2 Appropriate:1 Not useful :2	Very useful :2 Appropriate:1 Not useful :1 No opinion 2
W4.	How do you judge the audibility of the safety warning on the stationary device?	Good to hear : 2 Sometimes good/ not good: 0 Difficult to hear : 0	Good to hear :5 Sometimes good/ not good:0 Difficult to hear :0	Good to hear :0 Sometimes good/ not good:1 Difficult to hear :2 No opinion 3
W5.	How do you judge the visual safety warning on the stationary device?	Very good visible : 0 Appropriate : 2 Difficult to decipher : 0	Very good visible :4 Appropriate :1 Difficult to decipher :0	Very good visible : Appropriate : Difficult to decipher :
W6.	How do you judge the safety warning of an open door on the mobile device?	Not useful : 0 Appropriate: 0 Very useful : 0	Not useful : 1 Appropriate:0 Very useful :1	Not useful : 3 Appropriate:0 Very useful :0 No opinion 3
W7.	How do you judge the audibility of the safety warning on the mobile device?	Good to hear : 0 Sometimes good/ not: 0 Difficult to hear : 0	Good to hear :2 Sometimes good/ not:0 Difficult to hear :0	Good to hear :0 Sometimes good/ not:3 Difficult to hear :0 No opinion 3
W8.	How do you judge the visual safety warning on the mobile device?	Very good visible : 0 Appropriate : 0 Difficult to decipher : 0	Very good visible :1 Appropriate :0 Difficult to decipher :1	Very good visible : Appropriate : Difficult to decipher : Not tested 6
W9.	How well do you think are the warning alarms Working for your ….?	Not well : 0 Sometimes correct/ wrong: 0 Very well : 2	Not well :1 Sometimes correct/ wrong:0 Very well :0	Not well : Sometimes correct/ wrong: Very well : No opinion 6

		Amsterdam	Belfast	Lulea
W10.	How useful do you find the warning alarms (in relation to your …..needs)? Does the system give you a feeling of safety (when and how)?	Not applicable Not applicable Not applicable No comment No comment	Has potential. Not useful Would give a feeling of security Could be useful Could be very useful	All cares found the present warning not useful
W11.	How do you experience the safety warning alarms?	Not at all inconvenient : 2 A little bit more inconvenient : 0 A lot more inconvenient : 0	Not at all inconvenient :4 A little bit more inconvenient :0 A lot more inconvenient :1	Not at all inconvenient : A little bit more inconvenient : A lot more inconvenient : No opinion 6
W12.	How satisfied are you with the warning alarms in general?	Very satisfied: 1 Satisfied : 1 Dissatisfied : 0	Very satisfied:3 Satisfied :1 Dissatisfied :1	Very satisfied:0 Satisfied :2 Dissatisfied :0 No opinion 4
W13.	Do you have any suggestions to improve the warning alarms?	Not applicable. Not applicable. Not applicable. Sensor to detect locked door would be useful. (open, closed, locked, warning alarms).	No suggestions No suggestions No suggestions No suggestions No suggestions	Sensors for locked doors could be useful.....
Statements on Learning how to use the device		**Amsterdam**	**Belfast**	**Lulea**
L1.	How do you experience learning how to use the devices and functions ?	Easy to learn. Easy enough to learn.	Surprised at how easy it was Difficult for carers	It is possible to learn for the Pwds It needs repletion and practice

		Amsterdam	Belfast	Lulea
		Easy to learn, manual is clear. Fine. Fine.	Not difficult Not difficult No problem	
L2.	I quickly learned how to use the device	Totally agree : 5 (Dis)agree somewhat: 0 Totally Disagree : 0	Totally agree :4 (Dis)agree somewhat:1 Totally Disagree :0	Totally agree :3 (Dis)agree somewhat:1 Totally Disagree :1
L3.	I needed little support in learning how to use the device	Totally agree : 3 (Dis)agree somewhat: 2 Totally Disagree : 0	Totally agree :1 (Dis)agree somewhat:4 Totally Disagree :0	Totally agree :5 (Dis)agree somewhat:0 Totally Disagree :0 No opinion 1
L4.	I find the device easy to use for my … for the functions he/she needs	Totally agree : 2 (Dis)agree somewhat: 2 Totally Disagree : 1	Totally agree :0 (Dis)agree somewhat:5 Totally Disagree :0	Totally agree 3 (Dis)agree somewhat:2 Totally Disagree :0 No opinion 1
L5.	My … easily remembers the various functions of the device	Totally agree : 3 (Dis)agree somewhat: 1 Totally Disagree : 1	Totally agree :0 (Dis)agree somewhat:3 Totally Disagree :2	Totally agree :2 (Dis)agree somewhat:2 Totally Disagree :1
L6.	My ….easily remembers how to use the device	Totally agree : 2 (Dis)agree somewhat: 2 Totally Disagree : 1	Totally agree :0 (Dis)agree somewhat:3 Totally Disagree :2	Totally agree :1 (Dis)agree somewhat:2 Totally Disagree :2 No opinion 1
L7.	My … needs little support when using the device	Totally agree : 2 (Dis)agree somewhat: 2 Totally Disagree : 1	Totally agree :0 (Dis)agree somewhat:2 Totally Disagree :3	Totally agree :4 (Dis)agree somewhat:1 Totally Disagree :0 No opinion 1

		Amsterdam	Belfast	Lulea
L8.	The technical support was sufficient	Totally agree : 0 (Dis)agree somewhat: 0 Totally Disagree : 0	Totally agree :4 (Dis)agree somewhat:0 Totally Disagree :1	Totally agree :6 (Dis)agree somewhat:0 Totally Disagree :0
L9.	How satisfied are you with the device in general?	Very satisfied: 0 Satisfied : 5 Dissatisfied : 0	Very satisfied:3 Satisfied :1 Dissatisfied :1	Very satisfied:0 Satisfied : 6 Dissatisfied :0
L10.	Do you have suggestions to make the device more easy to learn and use?	No suggestions. No suggestions. No suggestions, should use the system a little longer. To remember the functions would be difficult for Pwd. Picture dialling, integrate the different devices.	No suggestions No suggestions No suggestions No suggestions No suggestions	It should be designed so that all family members are encouraged to use it There should a minimum of text messages...
Suggestions for Improvement and for Future devices		**Amsterdam**	**Belfast**	**Lulea**
F1.	What do you think about GPS location technique as a mean to help your …finding the way in the future?	Nice. Should be very simple otherwise it would not work. Would not work. Sceptical about usability. I think it could be useful.	N/A. N/A. N/A N/A N/A	GPS can be good provided it is easy to understand and operate It should mainly be used for me to locate the PWD

		Amsterdam	Belfast	Lulea
F2.	What do you think about GPS location device as a means for your ….to feel safer when walking around on his/her own outside?	Possibly useful in the future, no need for it now. Carer would feel safer if Pwd could call. No need for it now. Comforting thought. Seems useful.	N/A. N/A. N/A N/A N/A	It could facilitate a filing of safety for both of us It could make him less dependent if he can learn how to use it
F3.	What do you think about being able to locate your …. position with GPS while he/she is outside taking a walk?	Nice. Very comforting. Very nice and a comforting thought. Not very good. Nice thought.	N/A N/A. N/A N/A N/A	It would be very nice to be able to know that you can find him any time. I have no problem with it

A.1.4 Observation scheme

Observation checklist

Halgeir Holthe, Franka Meiland, Rose-Marie Dröes (26 April 2007)

Instructions for researchers:

- It is important to make the observations as open as possible, and to use the following as a check list.
- The four function areas of the COGKNOW device should be covered, and for reminders and alarms, both the stationary and the mobile unit should be observed.
- It is important to distinguish between hardware and software functionality during observations.

General and procedural information

1. Informant's name
2. Address
3. Date dd/mm/yyyy
4. Date of receiving the device
5. Who is/are present?
6. Where is device stationed in the house?
7. Interruptions during testing of devices?
8. Characteristics of test environment?
9. Sequence of activities (functionality area) during test?
10. Duration of activities (functionality area)?
11. Context: What kind of "home technologies" do the Pwd use on a daily basis?

Product observations

Instructions: write down users' remarks, behaviours and problems.
Please report on which specific function or specific reminder (alarm, etc.) the observation applies to.

12. System (for example speed):

13. Hardware: Can the Pwd use the hardware as expected?
    If any problems, note the Pwd's or carer's remarks.

Functions of the device(s)

14. Reminding (recognizing, understanding, handling, problems, etc.)
15. Picture dialling (recognizing, handling, bottlenecks, etc.)
16. TV/radio control / media playback (recognizing, handling, bottlenecks, etc.)
17. Safety warnings (recognizing, understanding, handling, problems, etc.)
18. Content of the device(s) (linguistic usage, pictures)
19. Reactions to the device as expressed in behaviour (for example mood, nervousness, restless, taking initiative or not, dependent behaviour, satisfaction):
20. Other observations

Application of audio-diary for collecting bottle-necks

21. Can we apply the diary-method for persons with dementia?

a. Do persons with dementia remember to use the audio tool?
b. Do person with dementia know how to use it?

A.1.5 Results Bottleneck-list

Which bottleneck appeared today while using the devices and services? (mark the applicable points)

	Amsterdam	**Belfast**	**Lulea**
Bottle-necks			
1. The device does not work properly (underline your choice): home screen/ mobile device/ door sensor	Home screen : 4 Mobile device: 5 Door sensor : 3 Comments: The Home screen turned in a stand-by mode after which it didn't switch on easily in 4 cases. The Mobile device had no functionality except for audio-recording and date-time indication in all cases.	Home screen : Mobile device: Door sensor : Comments:	Home screen : Mobile device: Door sensor : Comments:

		Amsterdam	Belfast	Lulea
2.	One of the functions is not working properly on the home screen:	Reminding : 2 Picture dialling : 3 Radio/music player : 0 Safety warning: 4 Comments: The reminding function displayed a wrong picture and a wrong message in two separate cases. The Home screen crashed after using the picture dialling function and/or help function in 3 cases. Safety warning continued after closing door in 1 case, in the other 3 cases the door sensor didn't work, thus safety warnings couldn't be tested.	Reminding : Picture dialling : Radio/music player : Safety warning: Comments:	Reminding : Picture dialling : Radio/music player : Safety warning: Comments:
3.	One of the functions is not working properly on the mobile device:	Reminding : 5 Picture dialling : 5 Radio/music player : 5 Safety warning: 5 Comments: Mobile device had no functionality in any of the cases. However, audio recording and date-time indication worked in 3 cases.	Reminding : Picture dialling : Radio/music player : Safety warning: Comments:	Reminding : Picture dialling : Radio/music player : Safety warning: Comments:

		Amsterdam	Belfast	Lulea
4.	The device is distracting:	Home screen : 1 Mobile device : 0 Comments : 1 Pwd commented on the home screen being distracting due to icons and colours used.	Home screen : Mobile device : Comments :	Home screen : Mobile device : Comments :
5.	The mobile device is lost:	Yes : NA Comments: As the system was tested 1 day in the presence of the research-team, the mobile device was never lost.	Yes : Comments:	Yes : Comments:
6.	The sound of the device is too high/low	Mobile device too high: NA Mobile device too low: NA Home screen too high: 0 Home screen too low: 0 Comments : The mobile device didn't make a sound in any of the cases. No comments were made on the pitch of the sound from the home screen by either Pwd or carer. However, comments were made on the content of the sound.	Mobile device too high: Mobile device too low: Home screen too high: Home screen too low: Comments :	Mobile device too high: Mobile device too low: Home screen too high: Home screen too low: Comments :

	Amsterdam	**Belfast**	**Lulea**
7. Forgot to charge the mobile device	Yes : NA Comments : As the system was tested 1 day the mobile device did not need charging by Pwd or carer.	Yes : Comments :	Yes : Comments :
8. Other issues:	Sensitivity of the home screen was a topic of discussion when confirming reminders in all cases. Touch screen had to be pushed relatively hard according to all Pwd's. Active buttons underneath the reminder caused some confusion. As confirming the reminder would activate another function (e.g. radio).		

A.1.6 Test task

COGKNOW Field Trial One (2007)
Test tasks

Field trial one aims to evaluate the user-friendliness and usefulness of the COGKNOW home hub and mobile prototype devices.
The test starts with an introduction to and training with the home screen and the mobile device. For each Pwd different reminders have been set in the devices (based on their preferences as expressed during the pre-trial interview). If Pwd receive a reminder for a specific task during the test, the Pwd has to follow the accompanying instructions. Besides reacting on reminders and performing tasks, prescribed tasks have been compiled to assist with testing the functionalities of the devices (see below). These tasks have to be administered only when they are not performed in reaction to reminders that were configured.

Task 1	Identify the home screen
Task 2	Identify the mobile device
Task 3	Remove the mobile device from the charger
Task 4	Move away from the home hub with the mobile device
Task 5	Place the mobile device in a preferred location on the person i.e. in a trouser pocket or a handbag
Task 6	Home screen; PD moves to home screen to turn on music selection
Task 7	Pwd goes to front door, leaves the door open and goes back inside
Task 8	Home screen: Pwd turns music off.
Task 9	Home hub; PD initiates and completes a call to a carer
Task 10	Mobile device; Pwd initiates and completes a call to a carer.
Task 11	Home screen; PD turns on the radio.
Task 12	Home screen; Pwd asks home screen to find the mobile device
Task 13	Home screen; Pwd turns the radio off.
Task 14	Home screen; Pwd performs an emergency call
Task 15	Mobile device: Pwd audio records a (‘fake’) bottle-neck
Task 16	Mobile device: carer audio records a (‘fake’) bottle-neck
Task 17	Mobile device; Return the mobile device to the charger
Task 18	PD moves away from home hub and mobile device as per retiring at night to bed.

A.2 Information booklet for filed test #1 and consent form

Procedure and confidentiality

You as a participant in this project are very important to us and you can be reassured that we will do our very best to take into account your wishes, so that the project is as smooth and as enjoyable as possible. Your participation is totally voluntary and you are free to withdraw from the project at any time.

All personal data that are collected during this project will be handled confidentially and destroyed at the project's termination. Participants have the right to inspection. All personal data will be security encoded preventing access by third parties. Experienced doctors and researchers will manage all confidential data. The results of the evaluation will be documented in scientific papers and reports

If you have any questions regarding your participation in the test, or the function of the devices, please contact:

Stefan Sävenstedt
Researcher
Phone 0920-493919

Kurt Blomgren
Technical support
0920- 493218

An independent expert informant (Dr. ……) will be available during business hours at tel. nr ……. … or email: ……

COGKNOW

Helping people with mild dementia navigate their day

COGKNOW

A study into the use of electronic supportive instruments

Information for participants

Explanation of the purpose of the project

Dementia frequently occurs in elderly people. Most people prefer to stay in their own home as long as possible. Often they need help to do so.

The European COGKNOW project aims to develop technological solutions to help people with mild dementia experience greater autonomy and feelings of empowerment and enjoy an enhanced quality of life.

COGKNOW focuses on electronic means of support that will help people remember, maintain contact with family and friends, perform daily activities and enhance feelings of safety. Up to now little research has been done into technical solutions specifically from the point of view of people with dementia themselves. For instance, little is known about the person's individual needs and wishes. We feel it is very important that technical means of support are developed alongside the sufferer so that solutions actually fit their needs.

We are seeking participants to collaborate in this project to develop adequate support solutions that are user-friendly, useful and effective. The results of the project could help many people with dementia live at home in a safer and more enjoyable way and for a longer period of time.

Participation in test 1

The first phase of assessing needs is now completed and we are asking you to participate in the test of the first version of the assistive electronic devices. The test will be held in June, 2007 and is aimed at testing the user-friendliness and usefulness of the devices. Based on information from this first test, the device will be adapted where necessary. In total, two of these preliminary tests and one final test will be conducted during the time period of June, 2006 until October, 2009. The final test focuses mainly on the effectiveness of the developed device in daily functioning. You as a participant can join one or more test phases if you want.

We are asking you and your next of kin/primary informal caregiver for explicit consent to participate in the project. Participation includes an initial home visit to discuss your present situation and to check information that is needed by the technical staff in order to install devices. Some weeks later the devices will be installed in your home and you and your next of kin will be trained in how to use them. The testing of the devices will take place during one or several days. Both during the test and after two researchers will ask you and your next of kin many questions related to the use of the devices.

The technical devices will be installed in your home only during the test period. During this time you have access to a helpdesk that can answer all questions on the devices and assist you (See phone numbers at the back of this brochure). 3

COGKNOW

Helping people with mild dementia navigate their day

CONSENT FORM

I hereby declare I have been informed, orally and in writing, and I understand the nature, method and goal of the study. My questions have been answered to my satisfaction. I have received the written information booklet which accompanies this consent form. I give my permission to obtain, if necessary, information from other caregivers. I voluntarily consent to participate in this study. I reserve the right to withdraw my consent at any time and I am not obliged to give a reason.

signature participant:	signature legal representative /informal carer:
.....	.....
name participant:	name legal representative /informal carer:
.....	.....
date:	date: .....

Being the *informal carer* of (name) . ..... I consent to participate in the abovementioned study. I hereby declare I have been informed, orally and in writing, and I understand the nature, method and goal of the study. My questions have been answered to my satisfaction. I have received the written information which accompanies this consent form. I give my permission to obtain, if necessary, information from other caregivers. I voluntarily consent to participate in this study. I reserve the right to withdraw my consent at any time and I am not obliged to give a reason.

signature: .....

name: .....

date: .....

You have received oral and written information on the study. I will answer any additional questions you may have about the study to the best of my ability.

researcher: .....

place of test site: .....

telephone number: …… date: ……

A.3 Research questions Field trial #1

Preliminary integrated list of research questions and methods in field trial #1 from the perspective of WP1,2,3,5

Field trial #1			
Aims	**Questions**	**Methods**	**WP/Who**
1. Evaluate basic user-friendliness of mobile and stationary devices with a focus on hardware-related factors such as form factor, basic interactions, wearability, charging, etc.	a. What do people with dementia think about the device(s), in terms of user-friendliness factors such as form factor, basic interactions, easy to learn wearability, charging, etc.	• Semi-structured interview during and post field trial with people with dementia	WP1, group 2
	b. What do informal caregivers think about the device(s), in terms of user-friendliness factors such as form factor, basic interactions, easy to learn, wearability, charging, etc. (Possibility for caregiver to configure the device will be evaluated in field trial #2 by WP1 and 2)	• Semi-structured interview during and post field trial with informal carers	WP1, group 2
	c. Where/how often is the device taken along with the person (both indoors and outdoors) and how often is the device forgotten	• Semi-structured interview post field trial with informal carers	WP1, group 2
	d. What is the battery life of the mobile device in practice?	• In situ measurement: log battery level regularly, log when device goes on/off	WP3 (SeniorXensor)
	e. When/how often is the device charged? How often do people forget to recharge	• In situ measurement, log when charging starts and stops	WP3 (SeniorXensor)
	f. What are the effects if charging is forgotten? How can we help our users not to forget recharging the device?	• Semi-structured interview post field trial people with dementia and carers	WP1, group 2

Field trial #1			
Aims	**Questions**	**Methods**	**WP/Who**
2. Evaluate assumptions about the user-friendliness and usefulness of basic concepts used in COGKNOW Day Navigator (e.g., reminders)	a. To what extent are messages/ reminders of the COGKNOW Day Navigator heard/attended to? How often & when/where not? To what extent does this depend on: - the device that offers the message/reminder (stationary or mobile), - where the reminding device is (relative to the location of the user) - the time of the message/reminder, - the volume of the message/reminder, - where people are when the message/reminder is raised (e.g. In the living vs. other places in the house, vs. outdoors) ?	• Observation during field trial • Bottle-necks list • Semi-structured interview post field trial with people with dementia and carers	WP1, group 3 Group 4 Group 2
		In situ measurement • Audio diary (for bottle-necks list)	WP1 & WP3 (SeniorXensor)
		In situ measurement; Log: - which device(s) notified - time of notification start - modality of notification (volume/vibrate/screen) - location of mobile device (indoors/outdoors: GPS coordinates) - time of confirmation by person with dementia / timeout,	WP2 & WP3
	b. What do people with dementia think about the messages/reminders in terms of user-friendliness and usefulness in their daily life	• Semi-structured interview during and post field trial with people with dementia	WP1, group 2
		• In situ measurement: log reminder contents AND a basic usefulness report to each reminder, integrated with the confirmation of the reminder (e.g. two ways to stop notification: Thanks! / This reminder was not needed)	WP2 & WP3
	c. What do informal caregivers think about messages/reminders in terms of user-friendliness and usefulness in the daily life of the person with dementia	• Semi-structured interview post field trial with carers	WP1, group 2

Field trial #1			
Aims	**Questions**	**Methods**	**WP/Who**
	d. Do people with dementia find the COGKNOW Day Navigator useful? How do they value the different functionalities within the four COGKNOW areas (support for memory, social contact, daily activities and perceived safety)? Are they expected to improve their (feelings of) autonomy and quality of life?	• Semi-structured interview during and post field trial with person with dementia	WP1, group 2
	e. Do carers find the COGKNOW Day Navigator useful? How do they value the different functionalities within the four COGKNOW areas (support for memory, social contact, daily activities and perceived safety)? Are they expected to improve their (feelings of) autonomy and quality of life?	• Semi-structured interview during and post field trial with informal carers and professional carers (clinical researchers)	WP1, group 2
	f. How effective do the different components of the COGKNOW Day Navigator interact? To be judged by people with dementia, carers and researchers. Aim to estimate the user-friendliness for users	• Observation during field trial • Bottle-neck list • Semi-structured interview post field trial with people with dementia and carers	WP1, group 3 group 4 group 2
		• In situ measurement - Audio diary study (for bottle-neck list)	WP1 & WP3 (SeniorXensor)

Field trial #1			
Aims	**Questions**	**Methods**	**WP/Who**
3. Collect basic data about activities and context in order to inform the design of context-aware features of the COGKNOW Day Navigator (e.g. location detection, activity recognition, anomaly detection)	a. General question: which device sensors provide sufficiently informative information for the context-aware algorithms foreseen in the COGKNOW Day Navigator application?	• Pre-trial interview: Questionnaire on activities and context to be administered from people with dementia and carers	WP1
	b. Specific questions in field trial #1 (from WP2 and 3; the bold numbers correspond with numbers used in 2.1.1. and 3.1.1.):		
	<u>Reminding functionality</u>: - How often does it happen that the Pwd is reminded *in*correctly not to forget the mobile device? (**3a**)	• Post-test interview	WP1
		• In situ measurement: - Log a basic usefulness report for each "don't forget your mobile"-reminder, integrated with the confirmation of the reminder (e.g. Thanks!/ this reminder was not useful) or log timeout - Location of mobile device (indoors/outdoors: GPS coordinates)	WP2 & WP3 (SeniorXensor)
	<u>Communication functionality:</u> - How often did the Pwd communicate using the phone, with whom, and where? (**3i**) - Under which circumstances/situations does the Pwd (wants to) communicate? (**3j**)	• In situ measurement: - Log phone communication patterns via COGKNOW Stationary & Mobile Device (time of day, person dialled, duration of call) - Log location of PD when call is made or received (at home or inside	WP2 and WP3

Field trial #1			
Aims	**Questions**	**Methods**	**WP/Who**
	- Can/should the picture dialling interface be improved (in field test #2)? (**3k**)	• Interview about what people would like to know about the status of the person to be called; • Post-trial interview about visualization of contacts (picture dialling interface), opinion on alternative (more dynamic) interface styles using mock-ups	WP1
	- How often does the need to recognize a relevant other occur? (**3b**) - Which people (& how many) need to be recognized (spouse, children, other relatives, neighbours, familiar strangers, total strangers, etc.)? (**3c**) When do they need to be recognized? (**3d**) - To what extent is cooperation from these relevant others desired or needed? (e.g. turning on Bluetooth on their phone?) (**3e**)	• Semi-structured interview post trial	WP1, group 2
	- Which technology (Bluetooth, RFID, audio (speaker recognition), video), is accurate enough to establish the identity hint (in field trial #2)? (**3f**)	In situ measurement: • Log visible Bluetooth WP2 and WP3devices (who's around?)	WP3 (SeniorXensor)
	<u>Activity functionality</u> No questions for field trial #1		
	<u>Safety functionality</u>: No questions for field trial #1		
4. Evaluate in situ data collection methods and tools (e.g. SeniorXensor	a. Do the data collected by pre-test, during test and post test interviews and by observation, bottle-neck list and in situ measurement offer the information that is relevant for evaluation of the COGKNOW Day Navigator?	Researchers opinion by comparing data collected by different methods	WP1,2,3,4,5,7

Field trial #1			
Aims	**Questions**	**Methods**	**WP/Who**
, diaries, day reconstruction method, etc.).	b. Specific question: does the diary method work for people with dementia (people may forget), and/or should we use experience sampling as well (people may be surprised)?	• In situ measurement: Diary method (Pwd takes initiative by recording experiences in voice recorder) ; this is used to create the bottle-necks list. Experience sampling is not used in field trial #1	WP3 (SeniorXensor)
	c. Specific question: To what extent can the day reconstruction method be applied?	N/A in field trial #1	WP1,2

A.4. Results of field test #1 observations

A.4.1 COGKNOW Day Navigator System and design

Results from Amsterdam, Belfast and Lulea

Amsterdam

Design issues regarding the COGKNOW Home screen: One Pwd was dissatisfied with the design and size of the screen and the form of buttons on it. This 'overall aesthetical disharmonic design' she would not want to have in her living room. She also found the overall screen slightly unclear, even when she was wearing glasses). She had difficulties in deciphering pictures and text on the screen. Another Pwd and his informal carer also found the design insufficiently clear because of lack of contrast in the screen and the pictures, making pictures more difficult to recognise. One Pwd could read the text and buttons at a distance of about one meter and did not need glasses then. She also found the text of the reminders was easy to read. One Pwd thought the text should 'stand out' more, and another Pwd found the text underneath the pictures too small, but the words to describe the functions were clear. Two Pwd complained about the colours: one perceived the overall colour of the screen and the different colours of the buttons as 'distracting'; the other found the colours 'not aesthetic'. One Pwd would prefer a less conspicuous, smaller size of the screen. Another Pwd found the size of the screen and buttons appropriate.

As for the icons, the 'Find icon' was not clear for two Pwds; one interpreted the magnifying glass as a tennis racket and did not recognise the mobile device. She thought she would get used to the other icons easily. One Pwd found the 'Help icon' a bit scary because the picture of the informal carer and the text "help" implied that the informal carer needed help. The informal carer reacted similarly: 'I don't need help, do I?' A Pwd and his informal carer found it confusing that the emergency button had the same photo of the informal carer as in the picture dialling address book. One informal carer found the radio picture was not clear and suggested adding an antenna. A Pwd found the picture for radio 'unrealistic' and also disliked the pictures for music and telephone, as he found it difficult to decipher them at first glance. However, he liked the clarity of the photos of his relatives in the picture address book. Another Pwd was positive about the clarity of the photos and thought the pictures were appropriate. The pictures for the reminders were easily recognised by two Pwds. One Pwd found the pictures 'childish'.

The sound of the alarm was loud enough for one Pwd and his informal carer, and they appreciated the repetition of sounds (until the door was closed). Another Pwd and informal carer reacted with amusement to the sound (and picture) of the reminder. Two Pwds thought it should be louder, sharper and more alarming. The sound of the reminders was not heard by one of the Pwds, and was not loud enough for two Pwds when they were further away (one Pwd did not hear it when she was outside in the garden, but did hear it when she went upstairs; another Pwd did not hear it upstairs). Two Pwds considered the sound itself annoying and irritating. One Pwd said it reminded him of an emergency. One Pwd could not place the sound or its meaning; another Pwd and informal carer said they easily recognised what the alarm was for. One informal carer said it would be good if the reminder was a recognisable melody or a piece of music that stimulated the Pwd to act upon the reminder.

Design issues of the Mobile device: The buttons for making the audio recording were perceived as small by two Pwds. One Pwd considered it confusing to have extra buttons on the CCA that were not used. One Pwd had to put on reading glasses to see the text and icons. The mobile phone clip was easily attached and carried around by one Pwd; another had difficulties attaching it to her belt.

The System's characteristics: The system allowed for the radio and music to play simultaneously. The CHH fell into a stand-by mode three times, which had to be fixed by the technician. A scheduled

reminder was not shown on the CHH when the system was warning at the same time that the door had been left open. The CCA had the time set to the Irish time zone as well as the format of the date. The reminder to make a phone call showed the right picture but not the matching text underneath it. The text of one reminder was in English. Under the reminders, the other buttons were active, which made it difficult to confirm the reminder properly because the Pwd did not know where to touch the screen. The researcher noticed that it might be confusing for the Pwd to have a picture of the informal carer on the help button as well as on the picture dialling address book.

Regarding the connections, there were several problems with getting a good telephone connection. The computer crashed several times after the picture dialling function was tested. One Pwd received a telephone call during the test, which caused some confusion. She picked up the phone, but did not get a connection. Later, the Pwd was not able to get a proper telephone connection; she did not know what to do, the system was making beeping noises and the telephone of the informal carer was ringing. She then picked up the phone and seemed to be somewhat startled by the beeping noises in her ear. Another time, the phone seemed dysfunctional (no connecting sound was heard by the Pwd), the CHH and laptop crashed and the technician rebooted the system. In two tests, the emergency call function did not work while the dialling function worked.

During one of the two tests with the door sensor, it showed limited functionality. When the door was open, an ongoing repetition of sound was given. Then the screen automatically returned to the default screen. The display disappeared shortly afterward, and the technician touched the screen. The alarm went off even though the door was closed.

Ease of learning. One Pwd was very hesitant and insecure when having to use the system in the beginning. She had comprehension problems and imagining scenarios which included the use of a given function being difficult to her. She very often only understood what was meant after the interviewer demonstrated a given function. Frequently she repeated in her own words what she understood; the interviewer and the informal carer then corrected or added explanations.

Ease of operation: The sensitivity of the touch screen of the CHH was not high enough for four of the five Pwds. They touched the screen too gently and were not or only after several attempts able to confirm the reminder. When the technician came in to confirm a reminder, questions were raised on how hard one had to touch the screen. At another time one of these Pwds considered the sensitivity high and it bothered her that the system reacted so promptly. She thought it would discomfort her if she accidentally touched the radio button and the radio started playing immediately. Later during the test, this actually happened and in a slight panic, she was unable to switch off the music; the informal carer had to help her. Another Pwd accidentally pushed the music button twice, and the music started playing again, this time with another song. This enabled the Pwd to choose between songs.

Usefulness of the system: Because of environmental issues, one Pwd disliked the idea that the system would be running all day and night. Another Pwd said he had no need for the system yet, but could see the usefulness of such a system in the future. Another Pwd thought it could be very helpful and useful in his everyday life when the system functioned as intended.

The charger was tested in one case, and there were some difficulties with it. When placing the CCA in the charger, the informal carer accidentally touched the bar at the top of the screen and opened a Windows menu. When the Pwd placed the CCA in the charger, the Pwd pushed reasonably hard on the devices. With the second attempt, the Pwd tried to put the CCA in the socket for the spare battery, but eventually succeeded in placing the CCA on the charger. The Pwd had also some difficulty in removing the CCA from the charger; she moved the CCA back and forth on the pin a few times to get it off.

The audio recording was received positively by two Pwds and their informal carers. One of the Pwds immediately knew how to use it; the other had some difficulties with it. The buttons for making the audio recording were considered small. Another limitation was that the audio message could not be played back and the visual confirmation of successful recording came rather late, after the recording had stopped.

As for new functionalities: One Pwd did not miss any function on the system. She wondered what else could be necessary to have in everyday life. One Pwd suggested an extra function to allow choosing pieces of music manually and an informal carer suggested an extra button with a picture of the artist or album to choose from. One informal carer suggested guidance for using the remote control of the TV, as the Pwd seemed to have difficulties with this (the Pwd did not agree). One informal carer suggested that the reminders could be accompanied by a recognisable melody or a verbal reminder (recorded by the informal carer) that stimulated the Pwd to act upon the reminder. Another informal carer suggested recording the content of calls, so that they could be played back to check whether appointments and the like had been made. When asked about the usefulness of the GPS technique allowing the carer to see where the Pwd is, the Pwd joked to the informal carer that she did not feel unsafe on the streets. However, the informal carer would feel more at ease when the Pwd went out if a “locator” function was available.

Belfast

All the persons were able to read the text on the home screen with no problems. The icons for the telephone, music and radio did not cause any confusion for most of the Pwds. However, one Pwd would hesitate when asked to turn on the music or radio. This resulted in the Pwd hovering with his finger over the phone, music and radio icons, unsure which one to press. This pausing before selecting the appropriate icon was particularly prevalent during the first couple of attempts; however, after a few tries the Pwd became much more competent. All the Pwds recognised their relatives right away, and in most cases this was the first thing that was recognised, particularly the picture in the help function. There were no complaints about the colours or icons used in the interface design. However, one Pwd suggested that the word ‘stop’ be used instead of ‘back’ when exploring the phone menus.

The design issues of the mobile device made a much stronger impression on the Pwds and their informal carers. The icons were reported to be less clear than those used on the stationary device, and it was also more difficult to read the text on the mobile device. The external buttons proved to get in the way and on some occasions features were activated by mistake, such as the audio recording function. In addition, the mouse roller button was often activated, resulting in the roller being illuminated. This caused confusion and the feeling that the Pwd had done something wrong, upon which they would gesture with the device to the closest person, hoping that this person could fix it. As the majority of the Pwds were female, attaching the mobile device to the body was not really an issue – all the female Pwds preferred to store or carry the device in their handbag.

The phone connection was problematic, as a continuous beep would sound throughout the call and would continue even after the handset had been reset. This caused some confusion, and in some cases the Pwd thought that the beeping noise was to signal that the call was in progress. In general the Pwds were able to make calls and connect to their intended recipient even with the technical problems that this feature presented.

Ease of learning: The majority of the Pwds were able to learn the various features of the system with few problems, and in some cases were operating features such as music and radio without any direction. One Pwd in particular had some difficulties in learning how the functions operated and where they were located on the screen.

: The most common problem that was observed with regard to operation was in relation to the touch screen on both the stationary and mobile device. The primary concern for the majority of the Pwds was the difference in tactile feedback given by both devices. The Pwds reported that in order to get a correct press on both the stationary and mobile screens, two different types of presses had to be performed. The stationary device seemed to require a short sharp nudge with the soft tip of the forefinger. The mobile device required a press using the nail of the finger rather than the soft tip. These solutions came about after a trial-and-error approach, with some direction from the informal carers. On one occasion the Pwd pressed the phone button on the home screen twice in quick succession, which resulted in the first contact being called irrespective of whether this was the intended recipient.

Usefulness of the system: The system was envisaged to be potentially useful by all the Pwds and their informal carers. However, they felt that in its current testing format it would not be that useful. Some of the informal carers felt that the system would become more useful if placed in the Pwds' home for a longer period of time. Informal carers also felt that greater potential for remote control both of the types of reminders and of the way in which they were delivered would be valuable.

The charger was present during the trial to hold the mobile device, but there was no interaction testing involving persons or informal carers.

The audio recording feature was not tested, as the concept was too difficult for Pwds to grasp.

New functionalities: When they saw the radio feature demonstrated, some informal carers suggested that it would be useful to control other devices such as the television. The same informal carer suggested that reminders could be accompanied by some form of visual flashing in addition to a sound, to accommodate those with hearing difficulties. Another feature that was suggested by an informal carer was to monitor whether the rubbish bin had been taken out and if not to remind the Pwd to do so.

Lulea

All of the participants found the stationary device easy to handle, understand and accept. One observation made by several informal carers was that it was interesting for them to use some of the functions on the COGKNOW navigator themselves, such as the radio and music player, and they thought that it would be easier to learn and to integrate it in daily life if it was useful for all family members. Informal carers also observed that the devices did not fit in well in their homes, and one felt that it looked too technical. They thought that it would have to be designed in such way that it would blend in with other furniture and home appliances. Two of the participants were disturbed by the screen being on the whole night, since they were used to switching off all appliances consuming electricity.

The concept of using text and pictures on buttons worked well, but could be improved if there had also been a voice prompt supporting the activity. This was obvious for one of the Pwds who had great problems with apraxia. She could understand the icons and the picture, could read the text messages, but was still not able to initiate the requested action. When prompted with a verbal instruction by the informal carer she was able to perform the action. On some level all participants had similar problems, but in different degrees. One of the Pwds was distracted by the small icons/buttons, beside the day navigator functions, on the screen.

Many of the participants felt the lack of a function to customise the reminders and safety warnings according to their personal needs. This made the evaluation of the reminders less meaningful. The Pwds observed the reminders but seemed to think they had nothing to do with them. On the other hand, all carers expressed a need for reminders.

The mobile device was difficult to handle for all of the participants. Two of the Pwds were using cell phones every day and were used to pressing buttons. Since the mobile device had both a touch screen and buttons, this became confusing. There were too many functions displayed on the mobile unit and none of the Pwds or carers found the functions of music and radio useful on the mobile device. When these functions were used, all participants preferred to use the stationary device. Most of the Pwds had problems in managing the touch screen function on the mobile device. It seemed both difficult to see the icons and to activate them by pressing with their fingers. They had great difficulties with the many steps of each command.

The screen saver made it difficult to see icons when they were activated, and some of the Pwds did not comprehend how to deactivate the screen saver. The lack of contrast in the colours of icons and background also made it difficult to see and identify them. When the screen saver was deactivated by a touch, it often happened that an icon was pressed by accident and an unwanted action was initiated.

A.4.2 Reminding functionality

Results from Amsterdam, Belfast and Lulea

Amsterdam

Design issues regarding the COGKNOW Home screen: One Pwd was dissatisfied with the design and size of the screen and the form of buttons on it. This 'overall aesthetical disharmonic design' she would not want to have in her living room. She also found the overall screen slightly unclear, even when she was wearing glasses). She had difficulties in deciphering pictures and text on the screen. Another Pwd and his informal carer also found the design insufficiently clear because of lack of contrast in the screen and the pictures, making pictures more difficult to recognise. One Pwd could read the text and buttons at a distance of about one meter and did not need glasses then. She also found the text of the reminders was easy to read. One Pwd thought the text should 'stand out' more, and another Pwd found the text underneath the pictures too small, but the words to describe the functions were clear. Two Pwd complained about the colours: one perceived the overall colour of the screen and the different colours of the buttons as 'distracting'; the other found the colours 'not aesthetic'. One Pwd would prefer a less conspicuous, smaller size of the screen. Another Pwd found the size of the screen and buttons appropriate.

As for the icons, the 'Find icon' was not clear for two Pwds; one interpreted the magnifying glass as a tennis racket and did not recognise the mobile device. She thought she would get used to the other icons easily. One Pwd found the 'Help icon' a bit scary because the picture of the informal carer and the text "help" implied that the informal carer needed help. The informal carer reacted similarly: 'I don't need help, do I?' A Pwd and his informal carer found it confusing that the emergency button had the same photo of the informal carer as in the picture dialling address book. One informal carer found the radio picture was not clear and suggested adding an antenna. A Pwd found the picture for radio 'unrealistic' and also disliked the pictures for music and telephone, as he found it difficult to decipher them at first glance. However, he liked the clarity of the photos of his relatives in the picture address book. Another Pwd was positive about the clarity of the photos and thought the pictures were appropriate. The pictures for the reminders were easily recognised by two Pwds. One Pwd found the pictures 'childish'.

The sound of the alarm was loud enough for one Pwd and his informal carer, and they appreciated the repetition of sounds (until the door was closed). Another Pwd and informal carer reacted with amusement to the sound (and picture) of the reminder. Two Pwds thought it should be louder, sharper and more alarming. The sound of the reminders was not heard by one of the Pwds, and was not loud enough for two Pwds when they were further away (one Pwd did not hear it when she was outside in the garden, but did hear it when she went upstairs; another Pwd did not hear it upstairs). Two Pwds

considered the sound itself annoying and irritating. One Pwd said it reminded him of an emergency. One Pwd could not place the sound or its meaning; another Pwd and informal carer said they easily recognised what the alarm was for. One informal carer said it would be good if the reminder was a recognisable melody or a piece of music that stimulated the Pwd to act upon the reminder.

Design issues of the Mobile device: The buttons for making the audio recording were perceived as small by two Pwds. One Pwd considered it confusing to have extra buttons on the CCA that were not used. One Pwd had to put on reading glasses to see the text and icons. The mobile phone clip was easily attached and carried around by one Pwd; another had difficulties attaching it to her belt.

The System's characteristics: The system allowed for the radio and music to play simultaneously. The CHH fell into a stand-by mode three times, which had to be fixed by the technician. A scheduled reminder was not shown on the CHH when the system was warning at the same time that the door had been left open. The CCA had the time set to the Irish time zone as well as the format of the date. The reminder to make a phone call showed the right picture but not the matching text underneath it. The text of one reminder was in English. Under the reminders, the other buttons were active, which made it difficult to confirm the reminder properly because the Pwd did not know where to touch the screen. The researcher noticed that it might be confusing for the Pwd to have a picture of the informal carer on the help button as well as on the picture dialling address book.

Regarding the connections, there were several problems with getting a good telephone connection. The computer crashed several times after the picture dialling function was tested. One Pwd received a telephone call during the test, which caused some confusion. She picked up the phone, but did not get a connection. Later, the Pwd was not able to get a proper telephone connection; she did not know what to do, the system was making beeping noises and the telephone of the informal carer was ringing. She then picked up the phone and seemed to be somewhat startled by the beeping noises in her ear. Another time, the phone seemed dysfunctional (no connecting sound was heard by the Pwd), the CHH and laptop crashed and the technician rebooted the system. In two tests, the emergency call function did not work while the dialling function worked.

During one of the two tests with the door sensor, it showed limited functionality. When the door was open, an ongoing repetition of sound was given. Then the screen automatically returned to the default screen. The display disappeared shortly afterward, and the technician touched the screen. The alarm went off even though the door was closed.

Ease of learning. One Pwd was very hesitant and insecure when having to use the system in the beginning. She had comprehension problems and imagining scenarios which included the use of a given function being difficult to her. She very often only understood what was meant after the interviewer demonstrated a given function. Frequently she repeated in her own words what she understood; the interviewer and the informal carer then corrected or added explanations.

Ease of operation: The sensitivity of the touch screen of the CHH was not high enough for four of the five Pwds. They touched the screen too gently and were not or only after several attempts able to confirm the reminder. When the technician came in to confirm a reminder, questions were raised on how hard one had to touch the screen. At another time one of these Pwds considered the sensitivity high and it bothered her that the system reacted so promptly. She thought it would discomfort her if she accidentally touched the radio button and the radio started playing immediately. Later during the test, this actually happened and in a slight panic, she was unable to switch off the music; the informal carer had to help her. Another Pwd accidentally pushed the music button twice, and the music started playing again, this time with another song. This enabled the Pwd to choose between songs.

Usefulness of the system: Because of environmental issues, one Pwd disliked the idea that the system would be running all day and night. Another Pwd said he had no need for the system yet, but could

see the usefulness of such a system in the future. Another Pwd thought it could be very helpful and useful in his everyday life when the system functioned as intended.

The charger was tested in one case, and there were some difficulties with it. When placing the CCA in the charger, the informal carer accidentally touched the bar at the top of the screen and opened a Windows menu. When the Pwd placed the CCA in the charger, the Pwd pushed reasonably hard on the devices. With the second attempt, the Pwd tried to put the CCA in the socket for the spare battery, but eventually succeeded in placing the CCA on the charger. The Pwd had also some difficulty in removing the CCA from the charger; she moved the CCA back and forth on the pin a few times to get it off.

The audio recording was received positively by two Pwds and their informal carers. One of the Pwds immediately knew how to use it; the other had some difficulties with it. The buttons for making the audio recording were considered small. Another limitation was that the audio message could not be played back and the visual confirmation of successful recording came rather late, after the recording had stopped.

As for new functionalities: One Pwd did not miss any function on the system. She wondered what else could be necessary to have in everyday life. One Pwd suggested an extra function to allow choosing pieces of music manually and an informal carer suggested an extra button with a picture of the artist or album to choose from. One informal carer suggested guidance for using the remote control of the TV, as the Pwd seemed to have difficulties with this (the Pwd did not agree). One informal carer suggested that the reminders could be accompanied by a recognisable melody or a verbal reminder (recorded by the informal carer) that stimulated the Pwd to act upon the reminder. Another informal carer suggested recording the content of calls, so that they could be played back to check whether appointments and the like had been made. When asked about the usefulness of the GPS technique allowing the carer to see where the Pwd is, the Pwd joked to the informal carer that she did not feel unsafe on the streets. However, the informal carer would feel more at ease when the Pwd went out if a “locator” function was available.

Belfast

All the persons were able to read the text on the home screen with no problems. The icons for the telephone, music and radio did not cause any confusion for most of the Pwds. However, one Pwd would hesitate when asked to turn on the music or radio. This resulted in the Pwd hovering with his finger over the phone, music and radio icons, unsure which one to press. This pausing before selecting the appropriate icon was particularly prevalent during the first couple of attempts; however, after a few tries the Pwd became much more competent. All the Pwds recognised their relatives right away, and in most cases this was the first thing that was recognised, particularly the picture in the help function. There were no complaints about the colours or icons used in the interface design. However, one Pwd suggested that the word ‘stop’ be used instead of ‘back’ when exploring the phone menus.

The design issues of the mobile device made a much stronger impression on the Pwds and their informal carers. The icons were reported to be less clear than those used on the stationary device, and it was also more difficult to read the text on the mobile device. The external buttons proved to get in the way and on some occasions features were activated by mistake, such as the audio recording function. In addition, the mouse roller button was often activated, resulting in the roller being illuminated. This caused confusion and the feeling that the Pwd had done something wrong, upon which they would gesture with the device to the closest person, hoping that this person could fix it. As the majority of the Pwds were female, attaching the mobile device to the body was not really an issue – all the female Pwds preferred to store or carry the device in their handbag.

The phone connection was problematic, as a continuous beep would sound throughout the call and would continue even after the handset had been reset. This caused some confusion, and in some cases the Pwd thought that the beeping noise was to signal that the call was in progress. In general the Pwds were able to make calls and connect to their intended recipient even with the technical problems that this feature presented.

Ease of learning: The majority of the Pwds were able to learn the various features of the system with few problems, and in some cases were operating features such as music and radio without any direction. One Pwd in particular had some difficulties in learning how the functions operated and where they were located on the screen.

: The most common problem that was observed with regard to operation was in relation to the touch screen on both the stationary and mobile device. The primary concern for the majority of the Pwds was the difference in tactile feedback given by both devices. The Pwds reported that in order to get a correct press on both the stationary and mobile screens, two different types of presses had to be performed. The stationary device seemed to require a short sharp nudge with the soft tip of the forefinger. The mobile device required a press using the nail of the finger rather than the soft tip. These solutions came about after a trial-and-error approach, with some direction from the informal carers. On one occasion the Pwd pressed the phone button on the home screen twice in quick succession, which resulted in the first contact being called irrespective of whether this was the intended recipient.

Usefulness of the system: The system was envisaged to be potentially useful by all the Pwds and their informal carers. However, they felt that in its current testing format it would not be that useful. Some of the informal carers felt that the system would become more useful if placed in the Pwds' home for a longer period of time. Informal carers also felt that greater potential for remote control both of the types of reminders and of the way in which they were delivered would be valuable.

The charger was present during the trial to hold the mobile device, but there was no interaction testing involving persons or informal carers.

The audio recording feature was not tested, as the concept was too difficult for Pwds to grasp.

New functionalities: When they saw the radio feature demonstrated, some informal carers suggested that it would be useful to control other devices such as the television. The same informal carer suggested that reminders could be accompanied by some form of visual flashing in addition to a sound, to accommodate those with hearing difficulties. Another feature that was suggested by an informal carer was to monitor whether the rubbish bin had been taken out and if not to remind the Pwd to do so.

Lulea

All of the participants found the stationary device easy to handle, understand and accept. One observation made by several informal carers was that it was interesting for them to use some of the functions on the COGKNOW navigator themselves, such as the radio and music player, and they thought that it would be easier to learn and to integrate it in daily life if it was useful for all family members. Informal carers also observed that the devices did not fit in well in their homes, and one felt that it looked too technical. They thought that it would have to be designed in such way that it would blend in with other furniture and home appliances. Two of the participants were disturbed by the screen being on the whole night, since they were used to switching off all appliances consuming electricity.

The concept of using text and pictures on buttons worked well, but could be improved if there had also been a voice prompt supporting the activity. This was obvious for one of the Pwds who had great problems with apraxia. She could understand the icons and the picture, could read the text messages, but was still not able to initiate the requested action. When prompted with a verbal instruction by the informal carer she was able to perform the action. On some level all participants had similar problems, but in different degrees. One of the Pwds was distracted by the small icons/buttons, beside the day navigator functions, on the screen.

Many of the participants felt the lack of a function to customise the reminders and safety warnings according to their personal needs. This made the evaluation of the reminders less meaningful. The Pwds observed the reminders but seemed to think they had nothing to do with them. On the other hand, all carers expressed a need for reminders.

The mobile device was difficult to handle for all of the participants. Two of the Pwds were using cell phones every day and were used to pressing buttons. Since the mobile device had both a touch screen and buttons, this became confusing. There were too many functions displayed on the mobile unit and none of the Pwds or carers found the functions of music and radio useful on the mobile device. When these functions were used, all participants preferred to use the stationary device. Most of the Pwds had problems in managing the touch screen function on the mobile device. It seemed both difficult to see the icons and to activate them by pressing with their fingers. They had great difficulties with the many steps of each command.

The screen saver made it difficult to see icons when they were activated, and some of the Pwds did not comprehend how to deactivate the screen saver. The lack of contrast in the colours of icons and background also made it difficult to see and identify them. When the screen saver was deactivated by a touch, it often happened that an icon was pressed by accident and an unwanted action was initiated.

A.4.3 Communication functionality

Results from Amsterdam, Belfast and Lulea

Amsterdam:

Four of the five Pwds did not find it easy to **understand** the picture dialling function and they used the Help button (sometimes after hesitation) instead of the picture dialling address book. One Pwd did this several times; he seemed to know how to use the picture dialling book, but he just used the easiest way to call his wife. One Pwd recognised the functionality of storing phone numbers in a picture address book, as the telephone she currently uses also has pictures of her relatives on the keyboard.

One Pwd was very much surprised that pictures of her children together with their phone numbers were already configured in the system.

When asked to use the picture dialling function, three Pwds did not know immediately how to operate it**.** One Pwd found it confusing that several steps had to be taken before the call was made. Another Pwd explained that it was confusing to perform different steps by having to push the picture on the screen first and then use the phone to actually make the call. On a second attempt, this Pwd made the call without hesitation. One Pwd picked up the phone too late after she had pressed the picture, and it was not possible to make a connection. Returning to the main screen was easy after instructions had been given.

With respect to the usefulness of this function, one Pwd found worked very well for her. Although it looked like her usual phone, she would prefer the COGKNOW picture dialling as it struck her as more modern. One Pwd did not need this function now but thought it might be helpful when her illness

progresses. The carer confronted her with the fact that she already sometimes forgot the names of her grandchildren. One Pwd found the normal way of calling easier and thought “it’s a lot of hassle to call with this picture dialling service”.

Belfast

In general four Pwds were able to make a phone call using the picture dialling service. One Pwd had some problems and would show signs of being hesitant after selecting a contact from the picture address book. This resulted in verbal reminders from both the carer and researchers present to tell the Pwd to pick up the handset. After a few attempts at phone calls the Pwd was able to learn this procedure with no problems. Additionally on the first attempt the same Pwd, upon selecting the phone book, accidentally pressed the screen twice in quick succession. This resulted in the first person in the phone book being dialled irrespective of the desired contact. Two persons were competent enough with the phone in general that using the picture dialling service was simple for them to use. However it should be noted that four Pwds all showed some signs of confusion at first when asked to dial a contact. The four Pwds all immediately recognised the pictures of their family members and were surprised to see them there, at least in the first instance. On several occasions, usually on the first call, some Pwds found that by the time the picture dialling was being explained to them during the first attempt that the handset was not being lifted quickly enough and the software would hang up before they even had a chance to lift the receiver.

Lulea

The help button on both the stationary and the mobile device was not well understood by any of the participants. The problem seemed related to the fact that it had the same design and colour as the other buttons. One Pwd commented –“does he need help”? Referring to the person in the picture. It was easy to use after instructions had been provided, and for several of the Pwds this became the easy way to make calls instead of using the directory. All carers and many of the Pwds thought that this function was very useful. Four of the Pwds already had an established system for whom to call when they faced problems in daily life.

The picture dialling was the function that was easiest for the Pwds to comprehend, and all found it useful. The system with a combination of text and pictures seems to work well. Two of the carers had the experience that written instructions did not work well. The return function was difficult to understand for some of the participants. Three of the participants, who had more pronounced problems with apraxia, felt confused by the written instruction to pick up the phone at the same time that the person was speaking through the loudspeakers. There seemed to be too many steps, and it was not confusing to speak directly with the screen. The important step seemed to be to establish the connection with the person on the other side; when that had been done, they concentrated on the communication.

The picture directory system worked well. All Pwds need repeated verbal instructions and practice before they could manage the directory on their own. After some practice, three of the Pwds succeeded in completing all steps in the calling procedure on their own.

A.4.4 Activity functionality

Results from Amsterdam, Belfast and Lulea

Amsterdam:

Arrangement of the music player: one Pwd accidentally touched the music button (and turned on music) when trying to confirm a reminder.

The *Music function* was easy to **understand** for one Pwd; it was easy for him to switch music on and off. Three Pwds clearly knew how to **operate** it by switching it on and off, and another Pwd did not have any problems in turning the music on, but was very unsure about switching it off. In the end, he managed to do this and he was surprised that he had remembered correctly how to do it.

As for the **usefulness**, one Pwd said she would not use it often because she preferred reading. However, if this were to become possible in the future, such a function would probably facilitate listening to the music. Another Pwd liked the function very much; his facial expression showed a positive impression. One Pwd wondered how to choose her own preference of music and remarked about the necessity of preventing monotony in the music that the system offers.

Also the Radio function was easy to **operate** for four Pwds. It was easy to find and touch the right button. Turning it off was a bit more difficult for one Pwd; he hesitated and was surprised when the radio was actually turned off. He appreciated the fact that the COGKNOW radio function was easier to use than his own radio. One carer thought the radio function was more difficult than the Pwd's own radio, because its use was familiar: "that's the way it is in the head".

Three Pwds did not find this radio function **useful.** One said she preferred reading, but she might appreciate it in the future (see above), another Pwd said she could easily turn on the radio on her own stereo (this is the only button on it she is able to use), and one Pwd evaluated the radio function as annoying and impractical. He found the picture for the radio unrealistic. Another Pwd thought it was useful; he liked the ease of use and the novelty of the function.

Belfast

Four Pwds had no problems in using both the music and radio features and were able to operate in an efficient manner. The four Pwds enjoyed these two services the most; however, they all said that they did not really listen to music that much while in the house and really only watched television.

Lulea

This function was easy to understand and appreciated by most of the Pwds. Four of them thought that the function was very useful, while two Pwds already had a system for listening to radio and music that worked well for them. The four Pwds who appreciated the function as useful had lost the ability or the initiative to switch on the radio or the music player even though they liked to listen to them. These functions were used by other family members and their interest supported the Pwd in using the function.

It seemed that both the radio and the music functions were easy to operate after practicing a few times. None of the Pwds found it easy to learn how to switch between the pre-recorded music sections, but when the music they liked was identified, with the assistance of the carers, they could easily switch the function off and on. The icons for music and radio on the mobile device were difficult for three of the Pwds to identify and all had problems with the many steps involved in turning the function on and off. None of the participants found the function in the mobile device useful.

A.4.5 Safety functionality

Results from Amsterdam, Belfast and Lulea

Amsterdam (CHH):

Arrangement: One carer asked how the *Help function* works when two numbers (a fixed and mobile) are used by the primary carer.

The Help function was not easy to **understand** for one Pwd because he mixed up this function with the picture address book. One Pwd liked the function because it's easy to operate.

With respect to **usefulness**, one Pwd remarked that she currently uses a list of carers next to her telephone in the living- and bedroom, which is very simple. She would like a system where during the night she would not have to search for the light switch to read the telephone numbers. Then it would be an improvement compared to the current routine.

The *door sensors* were easy to **understand** for one Pwd and the carer: they recognized what the alarm is for and were able to connect the sound with the fact that the door is left open. Another Pwd was interviewed and was slightly surprised when she hared the alarm. When she looked on the CHH, she remembered what the signal is for.

The door sensors were appreciated as **useful**, one Pwd and carer were amused and found the sensors very effective. Another Pwd was also positive about this function, even more so when the interviewer explained about the compatibility with fridge and oven.

Belfast

During the one of the tests the prompt to close the front door was displayed on the stationary device and the Pwd went to close the front door. Upon carrying out this action the door sensor fell off its mounting position due to the small width of the corridor. The patient noticed that something had happened but did not know what had happened. When prompted with the alarm to close the front door, a few of the Pwds were surprised to see that the door had been left open when they went to close it.

Lulea

The function of the door sensor was well understood among the three Pwds where it was tested, even though they could not understand the usefulness of the function. The symbol for an open door was well recognized and it seemed easy to connect the warning with the fact that the door was open. One of the Pwds immediately stood up and went to close the door when warning sound and the symbol of the open door was showing on the screen.

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