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AAL Joint Programme Project

HEREiAM

An interoperable platform for self care, social networking and managing of daily activities at home

D1.1: System specification and definition of utilities

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Contents

1. Introduction

The aim of the HEREiAM project is to help older adults to stay longer and independent at home by providing an innovative user-friendly technology able to support them during daily life activities. The project is structured for developing an integrated, smart platform which will allow elders to have access to a set of services directly from their TV set at home.

The report presents the activities and the key outcomes of the HEREiAM Consortium related to the workpackage WP1 – Specification. The purpose of this deliverable is to provide an accurate investigation of users' needs which are the basis for further development in technical specifications. The objectives of the work package WP1, can be summarized by the following topics:

- identification of elderly people's needs
- assessment of potential services that should be provided to help older persons to live longer independently and safety at home
- definition of the most effective technical solution to deliver the identified services

The deliverable is organized as follows. After a brief introduction to the characteristics, needs and interests of the primary and secondary user groups (contextualized in rural and urban areas), emphasis is put on which care services can be provided at home (Chapter 3) and on the service platforms already available in the market (Chapter 4). Chapter 5 provides a description of the user sessions performed in the Netherland and in Italy in order to find out service platform requirements and target group profile. Then, Chapter 6 looks at issues to consider in the development of the HEREiAM platform for an efficient management and control. This includes usability, feasibility and reliability aspects. Lastly, in Chapter 7 we present the HEREiAM architecture and its technical specifications.

2. User research

2.1 Introduction

The focus for system specification started with the identification of the users and their needs. Identifying the range of people who might be likely to use the HEREiAM platform was a crucial first step. The system was designed for a specific target group of self-sufficient older adults who want to be independent in the management of their daily activities. For this reason, the user research process involved a literature review to determine elders' attitudes, beliefs, desires, and reactions to ICT concepts in the various countries. Moreover, since the platform was designed to be an invaluable resource also for care professionals and for many family members acting as carers for their relative or friends/neighbours (that can be influenced either directly or indirectly by the system use), an analysis of secondary user needs was acknowledged as part of this research process. Finally, additional requirements were gathered for people who live in remote areas (the end-user group of the pilot in the Netherlands) and in urban areas (the end-user group of the pilot in Italy). The key questions to take into consideration during the user needs analysis are:

- What are the user needs?
- How are they structured?
- Why, when and where do they exist?

In the following sections, findings from user research studies related to The Netherlands, Belgium and Italy are presented.

2.2 User needs

2.2.1 Clients

To develop a digital platform that fits into the lives of older people and their environment, it is necessary to first gather an understanding about the needs of these elderly.

To gain insight into the needs of older people, we based our information on the elderly needs assessment that research AGOG of VUB carried out by 35,565 Flemings in the period from 2004 to 2007 (Vertè, De Witte, & De Donder, 2007) and on the needs assessment that was carried out in the city of Turnhout in 2012 (De Doner, 2012). Furthermore, this document is supplemented with information that has surfaced during user sessions with 26 elderly, 65% older than 75 years, that we have carried out in the framework of WP1.

In the user needs assessment performed in Turnhout, people older than 60 years were interviewed, of which 45% men and 55% women. The vast majority of these people are low educated, with a maximum degree of lower secondary education. Within the focus group 46% has a degree of higher secondary and 31% has a higher non-university degree. This difference in level of education will later be reflected in various issues. The 6% of the interviewees in Turnhout had an income less than € 1000 per month, 36,1% between € 1000 and € 1499 per month and 57,3% had an income higher than € 1500 per month. In Flanders the income is lower: 27,2% < € 1000 per month, 33,8% between € 1000 and € 1499 per month, 39% higher than € 1500 per month. Yet, a small majority reported that they get around easy and research in Turnhout shows that the older the senior, the more he/she indicates easy to get around. This is probably explained by the fact that the vast majority owns the house in which he/she lives.

Most older people are married, but we note that a considerable number have lost their partner.

About 25% of the elderly live alone, as well in the needs assessment of the VUB as in the focus group. Finally, more than 90% of the elderly has at least one child and more than 80% at least one grandchild.

2.2.1.1 Elderly, living and neighbourhood

Living

75 to 80% of the elderly own his house and 95% live independently. Because elderly do not like to move, we often talk about older family houses and 80% of the respondents indicate that the house is maladapted. Examples that were reported: stairs in the house or at the front door, distance to facilities, house too large, and large travel distance to the children. Basic comfort is present in most homes. Despite the fact that the house is often inadequate, the older people are not inclined to move. In Turnhout 15% would consider a service flat, for approximately only 6% a retirement and nursing home is eligible. We can hereby conclude that most older people want to stay as long as possible in their own home, despite the fact that their property is no longer adapted in many cases.

The neighbourhood

A vast majority of seniors find it pleasant to live in their neighbourhood and feel involved. They often miss the presence of their children, family and friends and also near amenities such as public toilets, benches, grocery, post and bank. The neighbourhood should be considered in supporting the live of older people. The study in Turnhout shows that the higher the age, the more they need help, the more they feel lonely and insecure, and the less they are involved in their neighbourhood.

Mobility

In terms of mobility, 40% of the seniors travel daily by car and a lot of seniors go by bike or on foot. The 12.5% of the seniors sometimes or often experiences transport problems. Most seniors are rarely related to traffic insecurity.

2.2.1.2 Health and social care

Health

More than half of the Flemish elderly experiences limitations in strenuous activities imposed by his health and the older one gets, the more problems they are experiencing. It also appears that lifting, bending, stooping and climbing stairs provides some problems for a third of the seniors. The Turnhout research even learns that, with the exception of heavy efforts, with an increase in income, less restriction is identified. The worse the constraints seniors encounter because of their health, the more lonely and insecure they feel. About half of the seniors indicate they sometimes or often have health problems; one in four never has. In the focus group 86% feels healthy and about 91% lives fully independently, despite the fact that 75% of the interviewed elderly is over 75 years old. A vast majority of the interviewees has occasional memory problems, mainly with certain words and personal names.

Falling is still a problem with seniors (2.200 deaths per year and 43.000 hospital admissions in The Netherlands (Veiligheid, 2014)) and this increases with age and with the amount of care they need. Women are more likely to fall than men, but also tend to be older. And finally: the higher the income, the less chance of falling.

Assistance

On the question of who the older people can appeal in the context of care if needed, spouse, children, neighbours and children in low take, in order of importance, a very vital role. A small minority of less than 5% say they can't appeal any other party. On average, nearly 25% of the elderly need help for the household, 20% for transport and 11% for personal care by an average of 6 hours per week.

Some findings from the Turnhout senior research:

- The older, the more help they need
- Women need more help than men (and are on average older to)
- Seniors without a partner and / or without children are more dependent on care
- Seniors who have a higher income and / or easier come around, need less help
- Seniors who need help, also feel lonelier than those who do not need help
- The informal network decreases with age and is smaller when the elder has no partner.

If the senior is to be effectively helped, firstly the informal network springs into action and particularly the children and/or the partner. The neighbours, grandchildren and other family members will help to. What formal assistance concerns the General Practitioner plays the most important role. Also, elderly care and home care are addressed. Older people are moreover very pleased with both the informal and formal help, and if there are already complaints, often it is about the price. Finally, seniors are often self-carer (1 to 3) for help or care of sick, disabled or older neighbours, or for the care of grandchildren

2.2.1.3 Well-being

Social contacts

The social network of the elderly is very important in the context of the care for them. A 90% of the elderly have children on their own and 85% have weekly contact with children and children in low. Contacts with the grandkids and then with friends and neighbours come in the second place. Half of the elderly have weekly or almost daily contacts with the neighbours. Older people are moreover very satisfied with these contacts.

In the focus group the elderly were interviewed about their specific social contacts. For 80% of these older people, the nearest family lives within 20 km. 92% of the focus group has smoothly contacts with their immediate family and 88% of the interviewees feels happy as their family visits often. In the focus group 80% has more than five friends and 72% even received additional friends after retirement. A majority of 84% has contact with their friends and neighbours once or twice a week and 88% of the focus group has a person who he can trust for personal matters. Finally the vast majority of these elderly is very satisfied with their social contacts.

Still, in the elderly needs assessment of VUB 20% of the older people experiences serious feelings of loneliness. Moreover, the Turnhout research tells us, that these feelings of loneliness are greater with age and/or help to be needed, with women and the elderly who has no partner and/or children. Feelings of loneliness go hand in hand with insecurity. Finally, 10% are signalling that they feel abandoned and nearly 18% find that there is not always someone in their environment to which they can go.

Psychological well-being

Three-quarters of the elderly do not suffer from depression or unhappiness has enough self-confidence and can handle problems quickly. In the focus group even 89% says he/she has control

over his/her life and that they are very satisfied with their life.

Sense of insecurity

Feeling safe is an important item for the well-being of the elderly, for insecurity affects mobility, activity patterns and quality of life. Half of the seniors struggle with insecurity. The Turnhout research learns that insecurity increases with age and care dependency of the elderly and women suffer more than men from insecurity.

Perception of the elderly

1 in 3 older people feel that they are no longer counting in society and 2 in 3 believe that older people themselves must have more influence in matters relating to the elderly.
That image of the elderly is more positive among the younger seniors, the men, the highest income bracket, people who come around easily and those that are not dependent on care. The image is more negative in the elderly who feel lonely and/ or insecure.

2.2.1.4 Social participation

Participation in social life

Social participation contributes at two levels: both for the collective as personal well being of the elderly. Indeed, social participation has a positive effect on physical and mental health and active aging increases the feeling of well-being. It is gratifying to know that a majority of the elderly are members of an association.

Volunteering

About 16% of seniors are doing volunteer work and nearly 1 in 5 seniors consider volunteering in the future. These 'potential' volunteers are mainly found in the younger seniors, men, those with a partner, with an average income and those who are not dependent on care.
It is important that we appeal the elderly individual and focus on the experience and knowledge that older people have and that has to be respected. Retirement is a key moment for the elderly to step within volunteering. However, young seniors cannot identify with those traditional organizations that present the elderly. Furthermore, young seniors are often the sandwich generation that care for their parents and collect the grandchildren.

Culture and leisure

Slightly more than half of the seniors have participated in the past year at least once in culture activities. Fairs and flea markets disregarded, the most cherished cultural activities for seniors are film, exhibitions, classical music, contemporary theatre, Flemish music and comedy.
The higher the income, the higher the level of participation in culture. This was confirmed by the focus group where 52% monthly participates in cultural activities. Those who are helpless and feel lonely will participate less in cultural activities.
The focus group was also interviewed about their leisure. 88% is satisfied and spends free time on activities as well indoor (68%) as outdoor (80%). The 62% weekly goes out with friends and family and 71% even organises once a month a diner or a meeting. Most of the elderly of the focus group (80%) do sports. With regard to the use of the computer, it is noteworthy that 33% never and 33% use the Internet daily. The 52% of the interviewees like cultural activities and 80% of the focus group travel once a year. Finally, handicrafts, puzzles, mind- and card games are very popular with

the elderly.

Political participation

More than half of seniors are moderate to very interested in politics. Top 5 of the policy on which older feel to have an impact, in decreasing order of importance: home health agencies - organizations that organize activities for the elderly - OCMW policy - health care organizations - municipal policy. Less than 10% is a member of a political party and even less of a municipal advisory. Older people are generally very satisfied with municipal services, social services, police, culture and sports, municipal infrastructure, waste collection and recycling.

Use of media and technology

People spend on average about three-quarters of their free time on two main activities: media behaviour and social interaction. Older people spend a little more time with media than in social interaction and as health is worse, the media use is more important. Older people watch an average of 4 hours of TV a day. A majority of the elderly reads to daily newspapers weekly. More than three-quarters of the elderly do not use the Internet.

In the focus group the number of hours watching TV was less and 70% weekly uses the Internet. 50% of the interviewees daily uses the PC, but 62% does not use technology for measuring their health condition. The use of the iPad has not yet penetrated to the elderly of the focus group, but most of the people are familiar with the mobile phone.

Health and social contacts are the most important areas for the elderly. There are also many opportunities in the use of ICT, but older people are of the opinion that this should not lead to less social contact.

Moreover, the Turnhout research comes to the following findings:

- The younger, the more seniors use the Internet.
- Men are surfing more than women and those who have a partner use more the Internet than those who have none.
- The seniors from the highest income bracket are more on the Internet than the others. This was confirmed by the focus group.
- Who is helpless are surfing less than those who are not
- Very striking is the fact that seniors who feel lonely use the internet more compared to those who feel less lonely.

Elderly and screen care

Vilans, the knowledge centre of the long-term care, has published “Care remotely via screen" which describes that screen care as a combination of technology and related care and service arrangements, offers new possibilities for defining the relationship between client and caregiver.

Clients call as major strengths of the various functions of screen care:

- Eye contact means added value compared to telephone contact.
- On-screen care clients get more control over their own lives and conduct rehabilitation or condition.
- By combining personal alarm and on-screen care, clients feel safer, less lonely and are more involved in their social environment.

Clients should be given support, while getting used to and learning the technology by providing

information, instruction and training, help desk and service support.

2.2.2 Informal carers

According to OECD report, more than one in ten adults (family and friends) is involved in informal, typically unpaid, caregiving, defined as providing help with personal care or basic activities of daily living (ADL) to people with functional limitations (Colombo F. et al., 2011). There are significant variations in the percentage of the population involved in this type of caregiving across countries. In The Netherlands more than 50 percent of all care hours is offered by informal carers (Mandemaker T., 2008). In Italy both as a consequence of the limited supply of home care services and of traditional culture, the percentage is higher (Polverini & Lamura, 2004). Recent estimates suggest there are 600/700,000 people engaged in home help care as personal assistants hired by Italian families, most of whom are female foreign migrants from central and eastern Europe (called "badanti") (Di Rosa, Melchiorre, Lucchetti, & Lamura, 2012).

Although in most European countries informal carers play a predominant role in the provision of elder care, their role is poorly recognised, their needs are unknown, and they have little access to the available formal services. Informal carers see "caregiving" obvious. They feel obliged because of the relationship they have with the care recipient and the love and commitment they feel for him or her. It is not a free choice to take care of another person: that person needs you, so you take the responsibility to take care of him or her. The need for care and support can grow gradually or can arise suddenly. The changing roles can have implications for the relation between caregiver and care recipient. In this section we focus on the services informal carers need to enable them in keeping their beloved ones longer (quantitative) at home and providing better (qualitative) care. Informal care is perceived as positive, the chance to give something in return. Caring for can strengthen the bond with the care recipient and with the other carers in the network. When care recipients show their thankfulness, informal carers feel satisfied. Since "caring for" is seen as a responsibility rather than as a free choice, it is often hard to release it when care is becoming more complex and more time consuming. Many informal carers report to have a double or triple duty. This might lead to a high burden on informal carers and could cause physical and mental complaints.

According to Vilans – the Dutch centre for long term care – 35% of the informal carers of people with MCI suffer from physical or mental problems. For informal carers of people with serious dementia this percentages increases up to 45% (Mandemaker T., 2008). Overloading informal carers is a realistic risk when people stay at home longer. Therefore, there is a growing need for informal care support, but for the informal carer the care for the "patient" is obviously paramount.

Based on a study concerning various informal carer groups (young and working informal carers, informal carers for care recipients with either cognitive, mental or physical disabilities, immigrant informal carers, etc.) various informal carer needs have been analyzed, and converged into overarching themes. Informal carers take mainly care of housekeeping, supporting the care recipient, arranging practicalities, administrative work and financial matters. Tasks differ from one to another group. Young and immigrant informal carers do a lot of housekeeping chores, and informal carers for older adults suffering from cognitive or mental decline focus in particular on support and guidance (Martens & Uitterhoeve, 2013).

The informal carers' needs can be described as follows:

- **Clear information** about the care recipient's condition, how to deal with it, and the existing equipment and services. Therefore it is important to stay in contact with care professionals, preferably accessible through one central contact point.
- **Balance between capacity and burden of care**. Similar to a work situation, it is important to find a balance between work capacity and work load. Building a network of informal carers on the one hand and professionals can help to divide all the tasks, including care, wellbeing services, personal hygiene, domestic help, mobility support, small chores and administration.
- **Relief of carers.** Dealing with people that need more and more care and support can be rather difficult. Besides all the practicalities and tasks, it can also be grievous to see that the health situation of a beloved one is deteriorating. Professional mental and emotional support or peer-to-peer contact can be helpful. Besides, it is important that informal caregivers take also time for themselves. Due to respite services (care in daytime for example) can lower the continuous burden on the informal carer. In some situations, a safety-net (back-up) would be welcome to temporarily and immediately take over care when necessary.
- **Acceptance and involvement of informal care.** Care organisations admit the importance of informal care and see the added value of an integrated care approach. Nevertheless, they focus only on the care recipient. Informal carers would like to stay in direct contact to the care professionals and to actively take part in the care processes.

Screen care can support informal carers by means of information provision, communication with care professionals, other informal carers and the care recipient. Additionally, when an informal carer needs to stay at home to take care of someone else, he can also make use of platform services to stay in contact with others and to take part in society.

Vilans assessed the attitudes of caregivers concerning screen care. They appoint the following advantages of screen care functions:

- Eye-contact with care professionals and other informal carers in the network leads to more personal contact and confidence.
- Access to relevant information has a positive effect on the knowledge and skills of the informal carers. Therefore they can execute their tasks with more confidence.
- Temporarily forwarding care and surveillance gives the opportunity for the informal carer to maintain social contacts.

2.2.3 Care professionals

The older people get, the more chance to suffer from one or more medical conditions. For the treatment and/or support of these medical conditions, older adults are often confronted with one or more care professionals, each of them responsible for different tasks. Besides health care, older people make frequently use of social services (housekeeping, meals-on-wheels, laundry, etc.) to preserve their independency. In this way, the client/patient is surrounded by a wide variety of professionals for care, cure and wellbeing.

In the coming years care will change drastically for the client, but also for care professionals and organizations. Changes in long-term care are required to cope with changing care demand and rising care expenditures. Whereas care budgets were originally used for both care delivery and housing, the costs for housing and living are nowadays more and more shifted towards the client and to local authorities (like WMO in the Netherlands). Older adults are empowered and even forced to live independent. Only those people that have a high score on a – often country specific – dependency scale, have the right to live in care institutes. The others have to rely on theirselves, their social network, and public or commercial services.

Therefore, clients are no longer just a passive care consumer. They take an active role in organizing their life and care. This leads to a change in the relation between client and carer. Together they develop a care plan that fits the care recipient's needs. Rather than on cure, the focus is on wellbeing, independence and social participation. The role, tasks and competences of care professionals change over time. A broad expertise, flexibility and responsibility are required to collaborate with other care professionals, local authorities, informal carers and voluntary workers. Via digital platforms the care professionals communicate and exchange data with other parties in the network. Care professionals need:

- Dedicated and reliable software that facilitates communication and information exchange with other care professionals.
- Efficient systems and care processes to enable taking care of as many patients as possible in a limited time span, by automating activities and facilitating self-management.
- Information gathering about the evolution of the patient´s health condition, and automatic alert system to appoint deterioration.
- Access to correct and filtered patient data when necessary, presented in a manner that facilitates decision making.

2.2.4 Specific user needs in rural areas - The Netherlands and Belgium

According to the central office of statistics in The Netherlands, the number of Dutch households will increase strongly in the coming decades. From 2010 till 2045, the amount of households in the Netherlands will rise from 7.3 million to 8.5 million, resulting in a higher demand for housing. Part of this need can be fulfilled by making use of rural areas. Due to the economic crisis, the demand for new housing and infrastructure is less urgent, but it will become more important in the near future (Exsin, 2014). To guarantee the quality of life in rural areas, it is crucial to have a clear and well-thought vision. Liveableness in rural areas focuses on the health and safety of humans and animals and on a good quality of landscape, nature and environment. Economical changes have to respect the existing environment and improve social interaction (Stichting Leefbaar buitengebied, 2014). The combination of the green environment (nature) and humans (culture) in the rural areas offers opportunities for the agricultural sector, living and housing, tourism and leisure, and non-agricultural business. However, rural areas are also confronted with a wide variety of challenges to fit all these different activities in the peaceful country-life

2.2.4.1 Agriculture

Rural areas have always been dominated by agriculture. However, more and more farmers are forced to quit their activities. Whereas the Netherlands counted a 100.000 agricultural farms in 2000, only 70.000 remained in 2012. The amount will decrease further in the coming years. Often,

farmers quit their activities because there is no successor. Another reason to quit is the legislation that is becoming more strict year after year, and the growing budgets required to be in line with the rules. For small farms it takes too long to meet the break-even point, that they either have to make the farm much larger, do other activities besides, or to quit. Adding non-agricultural activities – like selling local products, running a B&B or exploiting a biogas installation – is only possible if you get permission (Exsin, 2014). The trend towards large-scale agriculture, however, could also be a threat to the quality of living in rural areas (Stichting Leefbaar buitengebied, 2014).

Agriculture and farming leads to beautiful landscapes. Innovation and scaling-up needs to fit the rural and quiet atmosphere and landscape. Older farms and infrastructure are no longer used. It is important to prevent that these areas pauperize due to a lot of unoccupied agricultural buildings (Exsin, 2014), and to make sure that rural areas remain an area to live, work and relax in a healthy and pleasant way (Winterswijk, 2005).

2.2.4.2 Non-agricultural activities in rural areas

Rural areas offer a wide variety of opportunities for non agricultural activities. Many people in remote areas are used to nature, spaciousness and quietness. Also other people sometimes long for these aspects. Therefore it is important that remote areas keep their rural character, so to have a pleasurable environment for both inhabitants and tourists. Leisure is an activity that can bring together economical business on the one hand and relaxing on the other hand. To reconcile these two, it is important to keep the nature and the cultural and historical landscape, and to make use of existing but typical buildings and infrastructure. Small scale touristic initiatives like hotels, b&b's, camping sites, hospitality sector, sell of local products, and so on can lead to more employment for the local people.

2.2.4.3 Living and housing

Due to the decrease of agriculture and the desire to live in a rural and quiet area, the type of inhabitants changes from farmer to citizen. Whereas rural areas were originally a place to do agricultural activities, it now becomes an environment for living, working and enjoying. It is important to create symbiosis (Winterswijk, 2005). Living and housing is not only good for the economy, but also for social reasons. In rural areas we see small local communities with social and cultural activities. Social connectedness and societal functions contribute to the quality of life in rural areas. To maintain the social activities, it is important to have a differentiated population. To make sure that also young families and older adults can afford a house in rural areas, it is important to foresee a divers offer of housing. Besides, the number of people living in a certain area is strongly related to the presence of facilities and services, like education, shops, public transportation. According to Steenbekkers and Vermeij (Steenbekkers & Vermeij, 2013) mainly the accessibility – rather than the presence – plays a crucial role. Good Internet connectivity and remote care delivery for example can improve quality of life as well. Living in rural areas is often seen as one of the economical drivers to enhance livability. Old farms are transformed into new housing facilities. Housing, however, is not always the best option for the re-use of agricultural buildings. The requirements people have for their house could harm the character of the buildings. Many of them are indeed appreciated because they are part of the environment. Therefore, it is important to look for a function that fits best a building's shape and position.

2.2.4.4 Work

Employment in the agricultural sector has decreased over the last decades due to efficiency gains. Realizing new business opportunities is crucial to avoid that people leave, the area pauperizes and cultural heritage is lost. New business, however, needs to be adapted to the area (Winterswijk, 2005):

- No drastic traffic increase
- Limited pollution
- Symbiosis with the agricultural sector
- Re-use of former agricultural infrastructure

Due to the spaciousness and the size of existing agricultural buildings makes it possible to combine living and working in the same building. Working at home requires a good infrastructure.

2.2.5 Specific user needs in urban areas - Italy

The 68% of Italy's population live in and around urban areas (World Population Data Sheet, 2012) like cities and towns, while only a small part of the population lives in the rural areas, where a lot of farming takes place. The Quality of Life (QOL) of rural elderly population can be better in physical and psychological domains but in terms of availability of having public services, employment, shopping, transport, culture and sport facilities as well as space to live, living in urban areas is preferable (European Environmental Agency, 2009). Although almost all Italians in the cities live in apartment buildings (with no access to outside spaces or gardens for exercises and recreation) and cannot enjoy nature, spaciousness and quietness, they prefer living in urban environments to benefit social relationships and cultural interactions.

It must be highlighted that a great proportion of the Italian elderly is still playing social roles, such as continuing with their economic activities, caring for grandchildren, attending social and cultural events (such as concerts, cinema, museum, theater, clubs), actively participating in regular physical activities, whether individual or organized. For this reason, living in or around the city is of vital importance to seniors. In an urban area, the social environment provide multiple and diverse types of activities and bring a positive influence on their mental and cognitive health. The elderly have many options and feel free to take the initiative to engage in activities.

Investigation of leisure activities and the use of new technologies conducted by Marcellini et al. (Marcellini, Giuli, Gagliardi, & Papa, 2007) revealed that elderly urban dwellers are not only more active than their rural peers, but also more technologically minded. Elderly urban people have multiple choices for learning courses and acquire digital skills. Elder learning initiatives are mainly provided by seniors associations and social services centers and focus on computer and Internet use, language courses and recreational activities. To guarantee the quality of life in urban areas, it is crucial for seniors to strengthen social relationships and keep active with productive activities. It is important to provide services that fit these needs in order to fight loneliness and increase their participation in the community.

3. Service definition

The mission of the HEREiAM project is keep European elderly independent at home. Therefore we focus on a combination physical, mental and social wellbeing to enable the older people to manage daily activities and live in their own homes as long as it's possible. Services must meet needs expressed by older people, giving them a sense of security, a sense of belonging and a feeling of health and well-being at home. Furthermore, services must evolve in order to continue to meet the needs of its users over time and respond to technological changes and advances.

HEREiAM is conceived for those who have difficulty to complete daily activities related to independent living that involve interaction with the physical and social environment. These include shopping for groceries, preparing meals, contacting family and friends, taking drugs as instructed, monitoring health status, managing appointments and meetings, getting news from TV, radio or newspaper. Elderly needs can vary widely according to both personal (age, mobility impairment, activity level) and living situation (rural or urban areas, country). However, it has been observed during the previous user research (see section 2.2) that quality of life relies on a range of components such as safe housing, appropriate access to health care services, social networks, nutritional and educational support.

Even in Europe, we notice a difference between countries in health care, leisure, laws and regulations. Because of these differences, it is almost impossible to create a general European digital platform for the elderly. On the other hand, in all countries of the European Union, there are several local business or public companies that are working on platforms that cover the needs of the local residents. The power of the HEREiAM platform should exist in standardizing and uniting these local applications. As mentioned above, it is obvious that these different applications can communicate and share information. These platforms have to be built on the needs of an individual user, but of course, the relatives, health care professionals and social network stays the same throughout the platform. Each individual will define preferable services based on personal characteristics and the current situation. HEREiAM should provide customized services suitable to individual user needs at the right time. Needs are dependent on the current timeframe, country, health condition, living situation, social network, income,…

Goal is to develop a general, interoperable platform with a wide variety of services where people can choose from. Doctor visits and nursing, but also services related with home maintenance like hot meal delivery, housekeeping and laundry cannot be replaced by an ICT platform. Nevertheless, some services can support older users to:

- Manage a certain task themselves (e.g. telemonitoring)
- Order some goods or services themselves (hot meal, laundry)
- Find a solution within their own social network (mobility)

Taking into account the fact that we are dealing with a generation who have not grown up with digital technology and assuming that a virtual platform can no longer be ignored in the future care of the elderly, one must:

- start with the introduction of a virtual platform when the older person is not yet care dependent

- start with every day and fun things and not just link to the "frail elderly" as this is stigmatizing
- involve the environment: carers, health professionals, neighbourhood, …
- provide a simple platform with only a few applications that can be expended later and adapted to the degree of dependence on care of the elderly
- provide a price friendly system: starting with a subscription and the possibility for expansion and additional costs that have be (co)funded by the government

In the following sections an overview of the services that should be foreseen to be part of the HEREiAM platform.

3.1 Health care services

For elderly people who want to maintain their independence within the comfort of their own home, health care services might be the ideal solution. We can distinguish some groups of services.

3.1.1 Multi-Disciplinary Health care application

All health care practitioners have to be able to log in to a unique multi-disciplinary healthcare application. It is the patient or a counsellor that gives access to this information by using the HEREiAM platform. Safety procedures, as mentioned by the local authorisations, have to be taken into account. All data concerning the health care status are collected in this application. The different health care professionals can get access to the information they need, by searching it their self's, or to ask for standardized reports.

3.1.2 Nursing

All appointments that are planned by the nurses have to be visualised in the HEREiAM agenda.
On the other hand, it is not ideal that all data concerning health status and care, are visualised in the HEREiAM platform. The nurses, as other care providers, use their own software for scheduling appointments, but use a specific multidisciplinary health care platform to register important and shareable data.
The HEREiAM platform creates a link to these different applications, so an exchange of data in both ways can be provided. The platform has to be able to connect with the back office of the 'home nursing organization'. If there is a specific need, the users can communicate with the back office to have some more visits organized.

3.1.3 Doctors visit

The general practitioner is able to create an overview of the registrations made in the 'multidisciplinary health care platform'. He can use this information to alter therapy if necessary and can directly give orders to other care givers (professionals).
If he wants to make an appointment with the patient, he can schedule it in his own agenda, and this will automatically be synchronised with the HEREiAM agenda.

3.1.4 Medication control / pharmacologist

The user can consult his medication schedule by using the HEREiAM platform. The registration itself is made on an external application. The system can be programmed that if important medication is not taken, the user gets an alert or reminder. Different stages of alerting are foreseen.

- Auditory and visual reminders on the system screen and satellite device (HEREiAM

platform).

- Alert to the application of a supervising health care provider, who is be able to contact the patient.
- Automatically generated alert to the near care giver to try to contact the user. Perhaps something is wrong?

This means there is a continuously sharing of information between HEREiAM and the medication application.

The application alerts the pharmacist when medication supply runs low. The pharmacist can view which medication at which dosage is needed. If a medication prescription is needed, the pharmacist can contact the general practitioner by using the 'multidisciplinary health care platform'. Medication can be delivered to the patient. An appointment to deliver new medication at home, can be pushed to the HEREiAM Agenda.

3.1.5 Remote Monitoring

Different types of devices can be connected to the application: scale, glucometer, blood pressure monitor, ... All data are automatically converted to the multidisciplinary health care system.

3.1.6 Diet compliance

The application provides a tool in which the user can easily indicate what he has eaten and how much he has eaten. This information is converted in an amount of calories , fat and carbohydrates intake. Also the amount of salt and proteins can be calculated. This information is stored in the multidisciplinary health care system and can be used by clinicians or dieticians to adapt the user's diet. Because the calculation is made for all different nutrition's, it can be used for different clinical pathways for the treatment of chronicle diseases. Also the fluid intake can be monitored. When the diet compliance application notices there was not enough food or fluid intake, an alert can be pushed on regularly moments to stimulate the user to eat or drink.

3.2 Welfare services

3.2.1 Agenda Management

It will be a huge challenge to integrate all services in the agenda of the user. Therefore, in the HEREiAM platform, we need to foresee an agenda that can be managed by the user or his near relatives, but that also allows synchronisation of appointments of external caregivers. If a conflicting appointment has been made, it is the responsibility of the user to see which appointment has to be moved, and to take action to get it solved.

The HEREiAM platform informs the user or his relatives of the double booking that has been made. Not all double bookings have to be a problem. A nurse visit can be organized on the moment one of the children comes by. The agenda can be shared with children of near care givers. Indirectly they can stay in touch with everything their parents do.

The HEREiAM platform can be programmed to generate reminders before the next appointment. It has to be possible to configure these personal preferences in a settings screen.

3.2.2 Communication services

The social network of the elderly is very important in the context of their care. Spouse, children (children in low) and neighbours take, in order of importance, a very vital role in the caring for the older person. Different kinds of communication will be offered by the HEREiAM platform:

- Video Telephony = interesting to maintain social contacts, not to build them (especially with children and grandchildren)
- Ability to group calls (additional)
- Video Telephony with professionals (doctor, nursing , bank, ...)
- Text messages

The user can use the system to make secured video calls. He can communicate with relatives or friends, or with professionals. The user can choose if he wants to use the smart TV or the satellite device. He is able to catalogue his different contacts. The satellite device and TV can be used for internal communication as well.

3.3 Safety services

Feeling safe is an important item for the well-being of the elderly, since insecurity affects mobility, activity patterns and quality of life. Half of the seniors struggle with insecurity. Falling is still a problem for seniors and this increases with age and with the amount of care they need. This is the reason why these services are very important.

3.3.1 Personal alarm system

In all European countries, there is a well organized infrastructure concerning personal alarm systems. The HEREiAM platform does not provide this service itself, but of course the hardware of the HEREiAM platform can be used to improve the personal alarm services. The cameras used by the HEREiAM platform can make it possible to look into the house of the user. The alarm central is able to get a more precise view on the situation.

3.3.2 Controlled living on your own

The system keeps an eye on a user's behaviour, supported by different systems. The platform can, on moments determined in advance or randomly, ask for information. 'Is everything all right for the moment?' or 'you want to play some music?'. If the user doesn't respond, the system tries to catch the attention and invites the user to register.

On the other hand, the system can be extended with movement or heat sensors that show that the user is still moving around the house. If something is wrong, a cascade of interventions will enrol. Neighbours or family will be contacted, health care professionals get an alert. The system can stay in a code 'orange' till someone indicates that everything is fine. If nobody reacts, the emergency services will be enabled, this results in a code red.

- Telephone circle, alarm (chose order: children, neighbours, good friends, …)
- Near carers are often the children, but also the neighbours are important to increase the feelings of safety

3.4 Comfort services

When older people start using a digital platform, the services offered must not be based on care-dependent elderly only. Older people have to learn through comfort services (shopping, video calls, games, social networking), so they can get used to the time that they really have the need to use a system for health purposes. In the following sections a few services that should be foreseen in a digital platform.

3.4.1 Shopping and groceries

Elderly people like to do their shopping themselves but, if necessary, they need to be delivered. The application can communicate with an online grocery shop to place an order and arrange delivery. Users can add items to the shopping list before they approve it to be transferred to a shop. Users can also choose to add items automatically to a shopping list by scanning empty products so they are added to the list as well.

Users can also make a list of favourites so they can create a new shopping list easily. If certain product are not for sale or out of stock, a message can be pushed from the external application to the HEREiAM platform. As soon as the order is confirmed by the deliverer, the moment of the expected delivery is visualized in the HEREiAM Agenda.

3.4.2 Hot meals

The application features the possibility to get hot meals delivered by a home care service. It's a dynamic system and easy to cancel an order if necessary. This makes it possible for users to go out to eat with family when they want to. Ordering meals also makes it easier to follow dietary constraints.

3.4.3 House Hold services

In accordance with the nursing services, the HEREiAM system provides an application for 'house hold services'. The application can be used to make a demand for 'house hold services'. The user can select which chores he would like help with. A list of to do's can be shared between user and his/her family and the house hold service (cleaning windows, bathroom, ironing, …).

A handyman service can also be added to the list of services needed (painting, gardening, ...). The house hold organisation can communicate when these tasks will be scheduled. All visits are pushed from the external application towards the HEREiAM Agenda.

3.4.4 Home automation

For certain needs, industry provides a lot of applications that can be used by domotics. Most of these systems are computer-controlled. Because of the investments for the users, it is necessary that the HEREiAM system can be adapted to domotic applications as well. Door openers, closing shutters of curtains, ...

3.4.5 Other additional services

It should be possible to expand the application so it can be adapted to the specific needs of a user. Other optional services (pedicure, hairdressers, laundry, ...) can be added to the system on demand of the user. All these appointments can be shown in the HEREiAM Agenda.

3.4.6 TV, Radio and games

The system should offer different applications. In one way, the system can be used as an ordinary television, radio or personal computer. On the other hand it can be programmed by relatives with all kind of information's; medication alerts**,** agenda topics. Otherwise, there is the possibility to play games (chess, cards, ...). A couple who use the same platform can play against each other (using the satellite device), or against a relative or the computer.

- Exchanging recipes
- Sport exercises, movement exercises, …
- Reading the newspaper, news, current affairs, e-mail, ...

- (Local) Social activities: what am I doing today? Where do I go with whom?
- Information about programs on TV
- Find friends, people with the same interests
- Pictures of the children

3.4.7 External activities

The HEREiAM platform can be linked with local applications as well. In the HEREiAM platform, there are possibilities to link personal favourite external websites; are there any trips organised by the local community or parish, are there any expositions in the neighbourhood.

4. Learn from the Dutch service platform market

4.1 Introduction

In the past, caregivers and care recipients had to physically meet each other. Nowadays, some kinds of care can be provided remotely, making use of technological solutions. Both caregiver and care recipient are no longer forced to go outside, resulting in efficiency and flexibility gains for both parties. In addition, clients might be able to stay independent for a longer time, thanks to these technologies.

In some countries the need for eHealth is more profound than in others, for example because people live far away from a doctor. The US, Canada, Japan and Australia were the first countries who started to use remote care delivery. Finland and France were the European frontrunners in the field of cure technologies (Van Lier & Willems, 2009). On the other hand, the Netherlands play a pioneer role in developing and using service platforms for long term care. Such an ICT-platform is a well-integrated set of hardware and software components to support the execution of tele-health and tele-care services (Krijgsman, Eertink, van der Leeuw, & Zondervan, 2012). No other country has more experience in this field. Large-scale exploitation, however, appears to be rather difficult.

The HEREiAM project can – for the developments of its platform – greatly benefit from the Dutch expertise built up in this market during the last years. Therefore, a thorough investigation was done to collect as much information as possible. At first, an inventory of the service platform market in the Netherlands is made. Secondly, Dutch service platform providers were asked to fill out a questionnaire to present the philosophy, functionalities and interface of their platform, and to highlight possible opportunities and threads. Thirdly, user sessions have been organized. Users were invited to test a variety of service platforms, in order to inspire the target users in thinking about how such a platform can enhance their lives, and to discover problems and shortcomings of the current generation service platforms. Similar user sessions have been organized in Italy as well.

4.2 Inventory of the Dutch service platform market

The accessibility of broadband Internet and the transition towards a demand-driven care sector asks for technologies to realize remote care delivery. Also the greying society and the wish for care recipients to stay in control have positive impacts on the trend towards more eHealth (Van Lier & Willems, 2009).

All over the Netherlands, projects have been and are currently executed in which ICT-solutions for telehealth and telecare are applied and evaluated. Key success factors appear to be a market-driven approach and an integrated approach in which housing, care and wellbeing are combined. In the framework of “Toekomst Thuis” 19 innovative pilot projects have been started in the province of Utrecht since 2005. In the program “Thuisgeven in Gelderland” much experience is gained in the field of house automation, and a test is developed to investigate whether people can benefit from home technologies. In the province of North Brabant, 90 organizations collaborated in 16 projects to establish smart care delivery (Krijgsman, Eertink, van der Leeuw, & Zondervan, 2012).

After 10 years of developing and experimenting in this field, the current Dutch service platform market consists out of a wide variety of systems to offer comfort services, wellbeing, safety and/or

care, ranging from pure research projects to market ready products. Whereas some platforms focus on vulnerable elderly in general, other systems focus on specific target groups, each with its own selection of relevant stakeholders involved. Besides pure Internet-like services, more and more systems are linked with house sensors and house automation. Some of these platforms make use of ordinary PC's and laptops, others are offered via touch PC's, tablets, television or even robots.

A brief overview of existing service platforms in the Netherlands:

Service platform	Device	Character
ABC TV (Brevidius)	TV, touch PC, tablet	Market product
Carescreen	Tablet	Market product
Comficare (Van Dorp)	TV, tablet	Market product
CompanionAble	Robot	Research
Connectedcare	PC, laptop, tablet	Market product
Cubigo	Touch PC, tablet, laptop	Market product
Minddistrict E-health platform	Tablet, smartphone	Market product
Life XS	TV, touch PC, tablet	Market product
MiBida	Touch PC	Market product
Mobiserv	Robot	Research
Netcarity	Touch PC	Research
OnsNet	PC, laptop	Market product
Pal4	Touch PC	Market product
Philips Amigo	TV	Research
Soprano	TV	Research
Vicasa	Touch PC	Market product
Viedome	Touch PC, TV, laptop	Market product
ViePlus	Touch PC	Market product
WikiWijk	Internet service	Market product
ZorgTV Proteion	TV	Market product
Zuster Ria (Techxx)	Internet service	Market product

Table 1 Overview of existing service platforms

4.3 Service platform provider questionnaires

In order to learn more about the rationale behind the different service platforms, to abstract trends in the market, to understand technicalities and to find out what the future will bring, a questionnaire was developed and sent out to 15 Dutch service platform providers. The questionnaire can be found in ATTACHMENT 1. In total 5 providers returned a filled-out questionnaire, and together with the researchers from Smart Homes a more in-depth analysis was performed. According to answers from the providers, they are confident to say that their service platforms are the ideal solution for clients with no computer skills or ICT background at all. The systems are simple and make use of a user-friendly interface. Most of them think that using the platform is self-explanatory and education or training are unnecessary.

From this research we have found some trends:

- **Involve the social network around the client.** A service platform is often used as a tool to interconnect all relevant parties in the care network of the clients, living either intramural or extramural. Depending on the kind of target user, the network can vary as well. In the

last few years more and more parties are motivated to hook up to the platform, ranging from formal and informal caregivers to municipalities and communities. But also schools, banking companies and local entrepreneurs.

- **Offer a wide range of services.** Whereas in the beginning service platforms were simple and offered limited functionality, most of today's platforms offers a combination of comfort services, wellbeing, safety and care. To provide all these functionalities platforms are linked with external websites and systems from third parties. The user can choose for himself which services to install and use.
- **Enhance interoperability.** As a service platform provider you cannot know everything and do everything yourself. By making use of standards and open software architecture it is easier to collaborate with third parties.
- **Make your platform accessible on each device.** Users already have ICT-equipment at home and/or they prefer to choose their own brand and type of device. Therefore, service platform providers make their systems accessible on each device.
- **Take into account age-related changes and individual situations.** Besides large screens, large font sizes and large buttons, more and more attention is paid to overcome age-related restrictions. Certain touch screen interactions like right mouse click, double click and swiping are enabled on some platforms and even solutions like eye-tracking and speech input are applied to make systems usable for paralyzed users.
- **Allocate tasks to formal carers, informal carers and volunteers.** Professionals (home care or care institutions) can put services and information online for specific user groups. The informal carers – friends and family – can add extra enjoyable and personal content like messages, pictures, music and so on. One of the service platform providers talks about a new kind of voluntary work, where people provide content for others and help each other out.

These trends clearly show that today's service platforms play a central and dominant role in the life of elderly people. The platforms are the tool to communicate, to have entertainment, to take part in the community, to be social active, and so on. Many functionalities, communication channels and network members are combined in one single screen. Easy to have everything in one place, but the question is whether older users are able to handle the quantity and complexity.

Whereas many people, organizations, communities and entrepreneurs see added value in this new medium, healthcare professionals are a bit reluctant. For them the available data and functionality seems to be insufficient.

5. Learn from users

Based on the overview of service platforms and current trends presented in Section 4, it is clear that find out how users experience these technologies, and whether their findings and opinions match the information gathered from the service platform providers is of emerging importance. Therefore, older adults were invited to evaluate the usability of existing service platforms and to give feedback that will be of interest for the development of the HEREiAM platform. Two user sessions were performed, one in The Netherlands and another in Italy, consisting of a combination of user profiling questionnaires, service platform testing, usability questionnaires and a focus group.

5.1 Protocol

In the following sections all the details of the protocol used for user sessions are described.

5.1.1 Target groups

The HEREiAM project aims at improving the autonomy and quality of life of older adults, providing them with a TV-based platform that enables access services for self-care, social networking and managing daily activities at home. The choice for a TV-based system is based upon the familiarity older adults have in using the TV and the digital divide caused by the lack of broadband Internet connectivity in certain areas. Based on these aims, three target groups have been identified:

- In The Netherlands, older adults (65+) with higher incomes living in rural areas.
- In Belgium, older adults (75+) with a Katz score for support dependency of 3 or higher.
- In Italy, older adults (65+) living in autonomy, with no severe physical or cognitive impairments.

5.1.2 Research questions and goals

As described above, the service platform to be developed in HEREiAM will be provided on a TV. Interaction will be done with either a standard remote control or an input device that is better suitable for the tasks at hand for older adults.

The user sessions were organized in order to find out user requirements and user needs. The study aimed at gathering a deeper insight in:

- The user profile of the identified target groups.
- The perceptions of existing service platforms by the identified target groups.
    - The perceived design aesthetics.
    - The perceived usability of the menu.
    - The perceived usability of the services/applications.
- The overall acceptance of a service platform by the identified target groups.
- The user needs for additional services.

5.1.3 Methods

The user sessions with older people were conducted in the Netherlands (for Dutch and Belgian older adults) and in Italy. The study consisted of two related parts. The first part was focused on gathering demographic and personal information from each participant by means of a general questionnaire (see ATTACHMENT 2), in order to identify an in-depth profile of the identified target

groups and its needs. The second part was dedicated to the evaluation of existing service platforms and to perform a number of pre-defined tasks and open tasks. The purpose was to find out what constitutes an obstacle to an effective and efficient interaction with the selected types of interfaces and to identify any usability problem. Furthermore, the study ended with a focus group in which the participants discussed their experiences with the service platform and provided suggestions for future services and designs. The main focus of the user tests was on:

- user profiles
- user perceptions
- design aesthetics
- usability
- user acceptance
- additional user needs

The studies took place at two locations in Europe: in the Smartest House of the Netherlands (Dutch & Belgian older adults) and in local elderly association centers in Italy.

5.1.4 Experimenters / Interviewers

The user studies were prepared and organized by experimenters in each country. Smart Homes provided online support about the procedure (e.g., Skype, email, etc.). It was important for experimenters to gather knowledge about the subject-pool (e.g., what experiences do they share, are they family/friends, i.e. anything unique about the group that participates).
Ideally, four experimenters are recommended to run the studies. The experimenter(s) focused on the instructions, questionnaires and tasks, the equipment (e.g., service platforms, cameras, etc.). In addition, the experimenters filled in a structured report for the evaluation of the experiments.

5.1.5 Tasks

During the service platform testing, participants performed menu and service tasks (see ATTACHMENT 3) with the purpose of testing usability, acceptance, user needs, etc. in respect to the available systems. The sessions were within-subjects in which the participants performed tasks on all platforms – repeated measures – and the order was counterbalanced. Tasks were given on separate sheets of paper. Experimenters were present during these trials, supporting the participants and noting down relevant observations and quotes.

5.1.6 Location and equipment

Location: The Dutch and Belgian user sessions took place at the Smart House of The Netherlands. This test and demonstration facility was equipped with the required hard and software, but looks like a home environment.

Figure 1 Smart House of the Netherlands

The Italian user session took place at the conference room of two different local elderly associations operative in Cagliari: "Società di Sant'Anna ONLUS" and "ANTEAS Associazione Nazionale Terza Età Attiva per la Solidarietà". The test room was equipped with the required hardware and software.

Equipment: In The Netherlands, several service platforms were presented and used during the user sessions with a variety of input and control possibilities. Besides touchscreen-based systems (Viedome, Vicasa and MiBida), also a Digital TV with set-top-box was available at the location to demonstrate and use a service platform (ABC TV). In Italy, two existing service platforms were presented and used during the user sessions, one was a TV-based system (KeepInTouch) and the other a touchscreen-based system (Eldy).

Additionally, at least one audio-recorder was used for the interviews and focus groups. A digital camera was used to take high-resolution images of the users and user-test setting.

5.1.7 Measurements

The above mentioned user research questions were answered by collecting data by using different measurement instruments and with different data collection modes. During the user sessions we measured the following aspects:

- **User profiles** (measured by a general questionnaire and reported by experimenters). Background information, such as socio-demographic characteristics, cognitive abilities, experience with computer technology is gathered by a general questionnaire, filled in when giving informed consent. More specifically: general demographics, current use of technology, social connectedness & loneliness, health status, ADL, living situation, financial situation, open questions. In addition, the experimenters will gather knowledge about the subject-pool (e.g., what experiences do they share, are they family/friends, i.e. anything unique about the group that participates).

- **User perceptions** (gathered through interviews, questionnaires, and focus groups).
  An appropriate method to study user acceptance is by means of interviews/focus groups and diary studies. The interview/focus group moderator can elicit in-depth information of the perceptions, opinions, beliefs, and attitudes (Puchta & Potter, 2004) of users about the system.

- **Design aesthetics** (gathered through interviews, questionnaires, and focus groups).
  Similar to the user perceptions, design aesthetics were gathered during the focus groups, eliciting perceptions on specific and overall design aspects (e.g., colour use, icon design, etc.)

- **Usability** (gathered through interviews, questionnaires, and focus groups).
  The interviewees can comment on specific UI flaws, but also on their likes about certain aspects of the functionality of the system. The usability of the UI was further studied by means of the (translated) IBM usability questionnaire (Lewis, 1995). The questionnaire contains nineteen usability items that have to be rated on a scale, running from one to seven (an example item: "I feel comfortable using this system").

- **User acceptance** (gathered through interviews, questionnaires, and focus groups).
  User acceptance was gathered gathered during the focus groups, eliciting perceptions on the acceptance of specific services and service platforms in general (e.g., in respect to usage, privacy, etc.)

- **Additional user needs**
  Additional user needs were also gathered during the focus groups, eliciting additional needs in respect to the services that were provided by the various service platforms (e.g., need for comfort services, groceries, e-mail, etc.)

5.1.8 Procedure for the evaluations

In both user sessions, participants were welcomed and a plenary introduction (+/- 15 minutes) was given by one of the experimenters to introduce the study procedure. It was emphasized that the session aimed to test service systems and not users performances. After this, participants were asked to read and sign an informed consent form (see ATTACHMENT 4). If necessary, participants were supported by the experimenters in filling in the forms. The informed consent stated what was being studied, ensured anonymous analysis, announced that audio and image recordings were going to be made, and made clear to the participants that they could withdraw their consent and cooperation at any given point in time during or after the study.

Then, participants were invited to complete well-defined tasks with the platforms, while their behaviours were observed. No extra documentation or user manuals were provided because we wanted to evaluate for each platform the interface itself and its intuitiveness. Before starting with the test, users were encouraged to become familiar with the system for a few minutes. Then, participants were conducted step by step through the execution of tasks assigned and were asked to express their thoughts aloud while interacting with systems. One experimenter sat next to the participant while he/she was performing the tasks (pre-defined and open) and objectively took notes of everything that users said, without attempting to interpret their actions and words. The experimenter noted down all relevant behaviours (incl. problems) while interacting with the platform. After performing tasks, participants were invited to complete the Post-Study System Usability Questionnaire (PSSUQ) to provide an overall evaluation of the system they used (see ATTACHMENT 5). The questionnaire contains 19 items that are 7-point graphic scales, anchored at the end points with the terms ”Strongly agree” for 1, ”Strongly disagree” for 7, and a ”Not applicable” (N/A) point outside the scale. At the end of all user sessions participants were debriefed

and received an information sheet about the goals and following steps within the HEREiAM project.

In the Netherlands the user sessions (6 participants) took 5 hours. Each participant spend 30 minutes per service platform (total 2 hours), 2x 30 minutes on the questionnaires (total 1 hour), 1 hour break, and then 1 hour in the shared focus group. The sessions of the Dutch and Belgian target groups were performed in four days, starting at 10:30 and ending at 15:30. Due to limited time and available participants, seniors were recruited by means of convenience sampling, yet, screened if their profile matched the identified target groups. Special attention was paid to the informed consent and ethical considerations when conducting the research.

The participants performed a series of predefined tasks (e.g., 'call the nurse', 'make an appointment with your friend on the 12th of December', etc.). The tasks were balanced across the platforms as such that all services per platform could in potential be used within the time limit of 30 minutes.

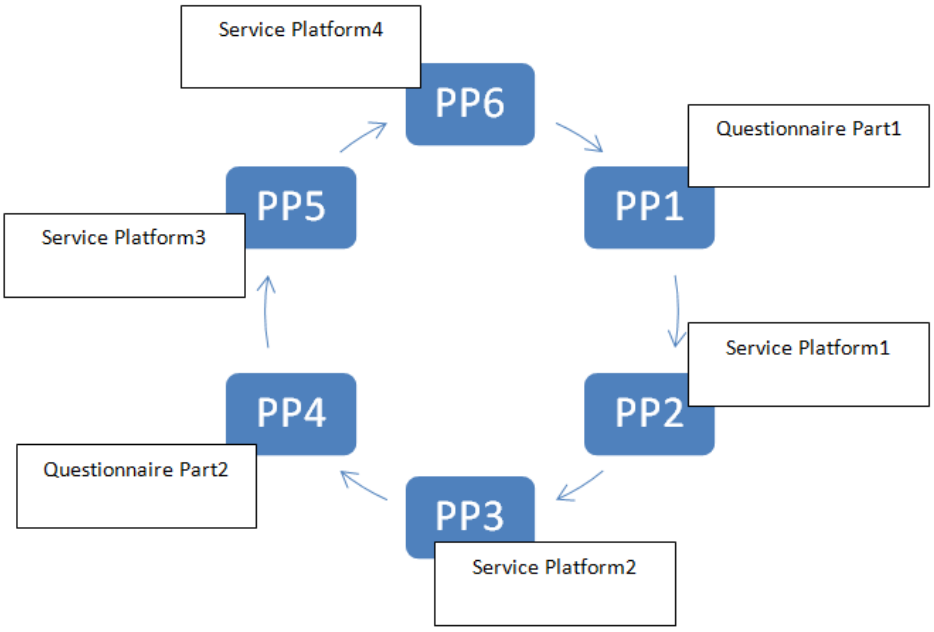


Figure 2 Structure of the user session in the Netherlands

Four participants performed tasks on the service platforms and two participants fill in the general questionnaire (paper-and-pencil questionnaire), if they have not already done this. The service platform and input devices (controls) were also introduced before they started to work with the platform and they also received a short manual.

After 4 time slots, there was a one hour lunch break. After the break there were 2 more time slots. After that the participants discussed the research questions/points during a focus group of one hour. The experimenters involved all participants in the focus groups. An interview or a focus group provides users with means to 'step outside the box' of pre-construed questionnaires. At the end of all user sessions there is a small gift for participation (box of chocolates) and the participants were debriefed and received an information sheet about the goals and following steps within the HEREiAM project.

In Italy the user sessions were performed in two days, starting at 15:00 and ending at 19:00. Each participant spent 20 minutes per service platform (total 40 minutes) and 30 minutes on the questionnaires. For each system under test, users were asked to perform a set of specific tasks.

5.1.9 Data and analysis

All data from the different sources was merged in order to make proper analysis and interpretation. These data include:

- A report from experimenters; an MS Word document in which the observations and quotes from the participants are noted down by the experimenters for each individual task.
- A report from experimenters on the analysis of interviews/focus groups. The interviews are analyzed and translated by the end-user sites due to language barriers. Relevant reports about the usability, usefulness, acceptance of the service platforms and needs are summarized and translated to English. Relevant and remarkable citations/comments are gathered under a theme (e.g., if a number of participants mention that the input device is hard to use, then, these are put under the theme 'controls'). Relevant quotes are noted down as: "I liked the interface of service platform X, especially the colours and buttons were very nice and the interface was easy to operate." (Participant 3, 76 years old, female).
- Data from the paper-and-pencil general questionnaires.
- Data from the paper-and-pencil questionnaires after performing the tasks (IBM usability questionnaire, design aesthetics).
- The image/video recordings.

Smart Homes and UNICA combined and analyzed the data – using SPSS - and reported the results. Linear Mixed Models Analysis were used to analyze the quantitative data, which also 'corrects' for missing values.

5.1.10 Documents and materials

The following materials have been prepared for the user sessions. The ones marked with a * can be found in the appendices.

- Script – scenario with the procedure for the user session.
- Informed consent form.*
- Description of tasks for each service platform.*
- General questionnaire – self-administered paper-and-pencil form.*
- Service platform questionnaire – paper-and-pencil form. *
- Focus group questions. *
- Excel and SPSS spreadsheet to enter data from general and service platform questionnaires.
- Word template to report on observations during service platform test.

5.2 User sessions in the Netherlands

Users were invited to test a variety of service platforms, in order to inspire the target users in thinking about how such a platform can enhance their lives, and to discover problems and shortcomings of the current generation service platforms.

5.2.1 Demographics Participants

November 2013, first 2 days of testing: thirteen seniors (M_{age} = 71.24; SD_{age} = 6.88; 5 female) from the Netherlands were invited for the testing of the four service platforms in the Smart Homes demonstration house. Nine of the participants had a college or university degree, i.e. the group was relatively highly educated. Eleven of the participants lived together with their partner. In respect to computer usage, all participants used a computer (5 weekly, 7 on a daily basis), about all used the Internet (1 never, 1 less than once a month, 4 weekly, and 6 daily). Four of the participants used a tablet computer and eight never used a tablet. Ten of the participants used a mobile phone and everybody watched TV on a regular basis (10 daily, 2 weekly, 1 missing).

November 2013, last 2 days of testing: thirteen seniors (M_{age} = 78.15; SD_{age} = 4.26; 7 female) from Belgium were invited for the testing of the four service platforms in the Smart Homes demonstration house. Ten of the participants had a college or university degree, again the group was relatively highly educated. Eight of the participants lived together with their partner. In respect to computer usage, the frequency of usage was lower than the participants from the Netherlands (5 never, 1 more than once a month, 4 daily, and 3 missing). Three participants never used the Internet and one participant reported to have used a tablet. Nine of the participants used a mobile phone and nine reported that they watched TV on a daily basis (4 missing).

5.2.2 Findings

Although the convenience sample does not match the elderly population in the Netherlands and Belgium for 100%, we have a mixed participant group with a variation gender, age, education, family situation and affinity with technology. Therefore, we are confident that the findings can be extrapolated to the target population.

In general the participants were enthusiastic about the functionality of the systems and about the added value a service platform could offer them. For some people, it was rather difficult to use the systems, but the majority of participant did manage quite well. Various participants were surprised about their skills in dealing with unfamiliar technology.

In the following sections we will first go through the four different individual service platforms. Based on heuristic evaluation techniques, the observations of the experimenters and comments from the participants during the user sessions, each platform is evaluated qualitatively. Second, the user-friendliness (measured via the IBM usability questionnaire (Lewis, 1995)) of the different platforms is compared. Third, the outcomes of the focus group will be presented in terms of general impression, added value, preferred technology, and desirable services and features.

5.2.2.1 ABC TV (KempenLIFE)

Older adults could largely benefit from modern technologies. Of course there are some 95 year olds that can handle a computer or iPad easily, but many older adults do not understand the whole new concept of tablets, computers, buttons, hotspots, menus and the like. Their low levels of computer

skills and confidence of being able to deal with technology are main barriers for not adopting technological innovations, consequently missing the added value and enjoyment of what Internet technology can offer. Therefore, ABC TV develops software to lower the threshold for these kind of human-technology interactions. The online systems facilitates video-communication, photo and video sharing, information search, digital agenda, care services, shopping, and many more. The goal of the software is to support seniors and/or mentally disabled people, and their social and care networks.

- Enabling and empowering them to make use of Internet technology, without the need for computer skills.
- Combining care and welfare services in 1 platform.
- Lowering the burden on informal carers by providing tools for remote support.
- Decreasing the need for care by increasing clients' level of wellbeing.

For each client a community is built up, in which professionals, informal carers, friends and relatives can add content, communicate online, send video messages and help organizing the client's life through a shared agenda. Each client can choose whether to use the system via TV, laptop, touch PC or tablet. Additionally, the system can be linked to different kinds of infrastructures for house automation and e-health.

Thanks to ABC TV, users are less bored, less lonely, more active, more healthy, better informed and feel more independent. All these aspects lead to an increase of quality of life and a lowered burden on health, social and informal carers.

ABC TV divides the target population in 3 subgroups:

A. People that cannot handle a device with buttons at all. For this group of people ABC TV offers a personal TV channel. Informal carers can set up a daily schedule with interesting TV programs, family videos and training/education material. Besides the informal carer is able to set reminders for medication or for appointments and the informal carer can make video calls to the client.

Figure 3 ABC TV - Screenshot A

B. People that are able to make simple decisions. For these people ABC TV developed a simple interactive user interface. Clients can chose themselves which videos to watch, which music to listen to, which games to play or who to call with. Similar to the A variant, informal carers can set reminders or suggest interesting content.

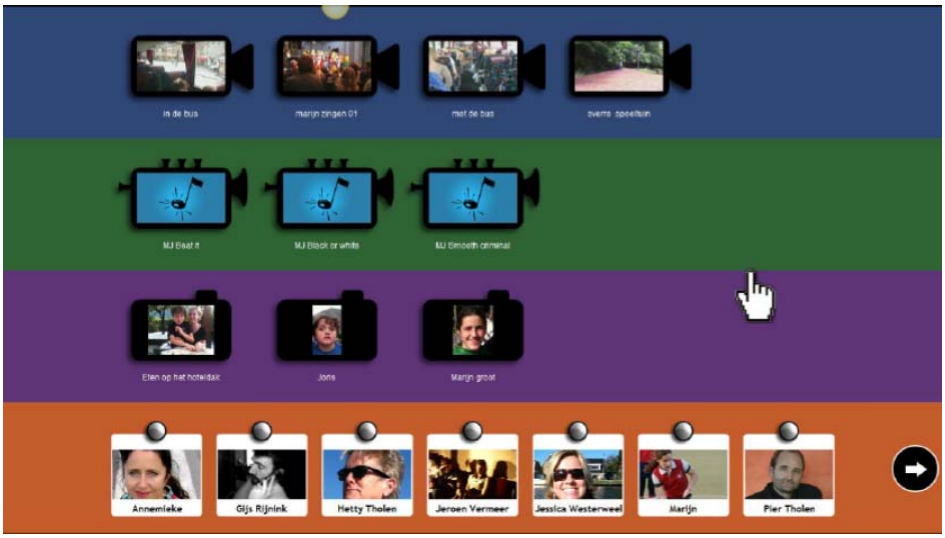


Figure 4 ABC TV - Screenshot B

C. People that are able to deal with computers, but are unable to understand the complexity and risks of Internet. For this group, ABC TV offers an interactive system with more features and a protected Internet environment. Since these clients are used to tab pages and folders, much more content can be uploaded into the system. Informal carers can again set reminders, and make videocalls. Additionally, interesting websites can be approved for the client to visit.

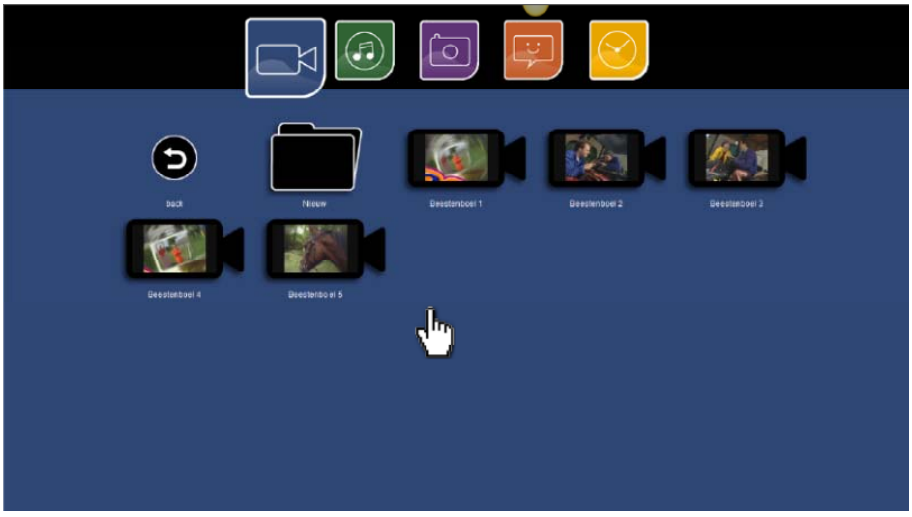


Figure 5 ABC TV – Screenshot C

Whereas ABC TV offers different solutions to different users, we have decided to use only one variant for the user test sessions. Due to time constraints an in-depth investigation of persons' computer skills was not feasible, and would go beyond the targets of this study. We have chosen to

present the C variant to the participants because this one has more differences and complexity in comparison with the other test platforms. Since HEREiAM focuses on a services platform on TV, we have chosen to present ABC on the television, using a dedicated remote control for interaction.

Figure 6 ABC TV – Test system

By using the arrow keys (⬅, ⬆, ➡, ⬇) on the remote control, the user can move a hand (cursor) over the screen. The **OK** button is used to select a service, a certain picture or video on the screen. On the remote control 4 more function keys (**PLAY** ► , **PAUSE** ■■ , **STOP** ■ and **M**) have been placed to control content like photo slideshows, movies, music, etc.

Beside hardware buttons on the remote control, also virtual buttons are displayed on the screen. By using the cursor hand to a virtual button and confirming by pressing **OK**, the system can be controlled as well.

Figure 7 ABC TV controls

Evaluation based on heuristics and user feedback.

The majority of the respondents in the study was enthusiastic about the user friendliness of the ABC TV system. Whereas the GUI (graphical user interface) was perceived as simple, clear, intuitive and easy to use, handling the remote control was evaluated rather cumbersome and slow. The cozy atmosphere of the living room/TV corner helps to set people at ease. One of the respondents explained as follows: "I am completely relaxed in my couch. This helps me to feel at ease and to easily execute tasks". Another respondent explained how she usually shifts responsibility for using technology to her husband, but that she believed in being able to cope with this system.

Whereas most participants were neutral to very positive about the ABC TV system, many of them reported concerns, difficulties and/or possible improvements. One of the respondents was extremely critical and negative, and one respondent did not manage at all to execute the predefined tasks. After testing two touch screen-based systems, he constantly walked to the TV to interact with it, he did not understand the concept of having interactive elements on the screen, and repeated the story of his life over and over again. Therefore, dementia was suspected.

Although learning to use a new system always costs an extra effort, most of the people were used to the system rather quickly. In general they understood the concept of "pointing and clicking" in a few seconds, and were accustomed to the navigation through the services and intuitive menu structures rapidly as well. Many quotes from the tests show that they understand the system:

- "Okay, so then I first have to go back to the previous page, isn't it?"
- "Now, I know where to find the **BACK** ➲ button."
- "So, I just go to the picture and I press **OK**."
- "Probably, I have to point the cursor hand to one of the radio stations and press **OK** to confirm, right?"

The major challenge with the ABC TV system is to understand that the television not only an output device, but that it also incorporates interactive elements. People are used to the television as output device and the remote control as input device, but pressing virtual buttons on the TV screen is for many of them an unfamiliar concept. Keeping this in mind, it is easy to explain that people look for a solution on the remote control first. When unsure about the way to go, the start pressing randomly all buttons on the remote control to figure out the solution, while the solution is often displayed on the TV-screen. For example, whereas the **BACK** ➲ button is displayed on the screen, people try to return to a previous page by pressing all the buttons on the remote control. In this way, some accidently find out that they can return to the photo overview page, by pressing the **M** button on the remote.

Age-related changes

When designing technology for older adults, it is of great importance to take into consideration age-related changes in perceptual, motor and cognitive abilities in order to guarantee accessibility. Although service platforms are mostly developed for and used by active and rather healthy people, the goal is that they will be able to work with this technology for many more years. Therefore, we also included people in the test that are older, and encounter more serious health issues. Thus, it is crucial to keep in mind the consequences of sensory thinning, decreases in motor control and

cognitive decline. However, awareness of the importance of these aspects must be coupled with the acknowledgement of the relevance of the compensatory processes that older people develop to adapt to the changes, and by the crucial role played by motivation, affection, and experience in supporting them.

The ABC TV GUI is well designed. In general, the ABC TV modules make use of high contrast, large icons and visuals, and a large font sizes. Nevertheless, in some services we find some minor conflicts with guidelines for graphic design in general or in particular for older users. A serif font type is extremely useful for longer texts, because the characters do mold a visual line that increases the readability. However, for an interface and individual words, a serif font type is less suitable. In some cases, e.g. in the agenda, the font size is to small and the contrast to low. One of the respondents even talked about “nagging the reader” because of yellow text on a grey background. To understand and learn a new interface cognitive abilities come into play. It is crucial to understand certain symbols, icons and concepts. Additionally, it is important to take into account that older people have a limited attention span, and lower memory capabilities.

By making the interface consistent and familiar, the learning curve can be shortened. All the issues concerning cognitive abilities will be discussed one by one, further in this report. Handling the remote control can be effected by motoric decline and a decreased level of eye-hand coordination. Due to ageing – arthritis for example – people can have difficulties in pressing buttons. Some respondents experienced problems that one button press was seen as two or three button presses, making it extremely hard to select one specific photo or button on the screen. Moreover, people often look at the remote control when pressing a button. Since the buttons itself do not give any feedback, it is hard to control the system accurately.

The ABC TV system embeds some external websites like news website (http://www.nu.nl), weather forecast (www.buienradar.nl) and internet radio (www.nederland.fm). The structure and control of these websites is not in line with the rest of the system, making it harder to understand and control these modules.

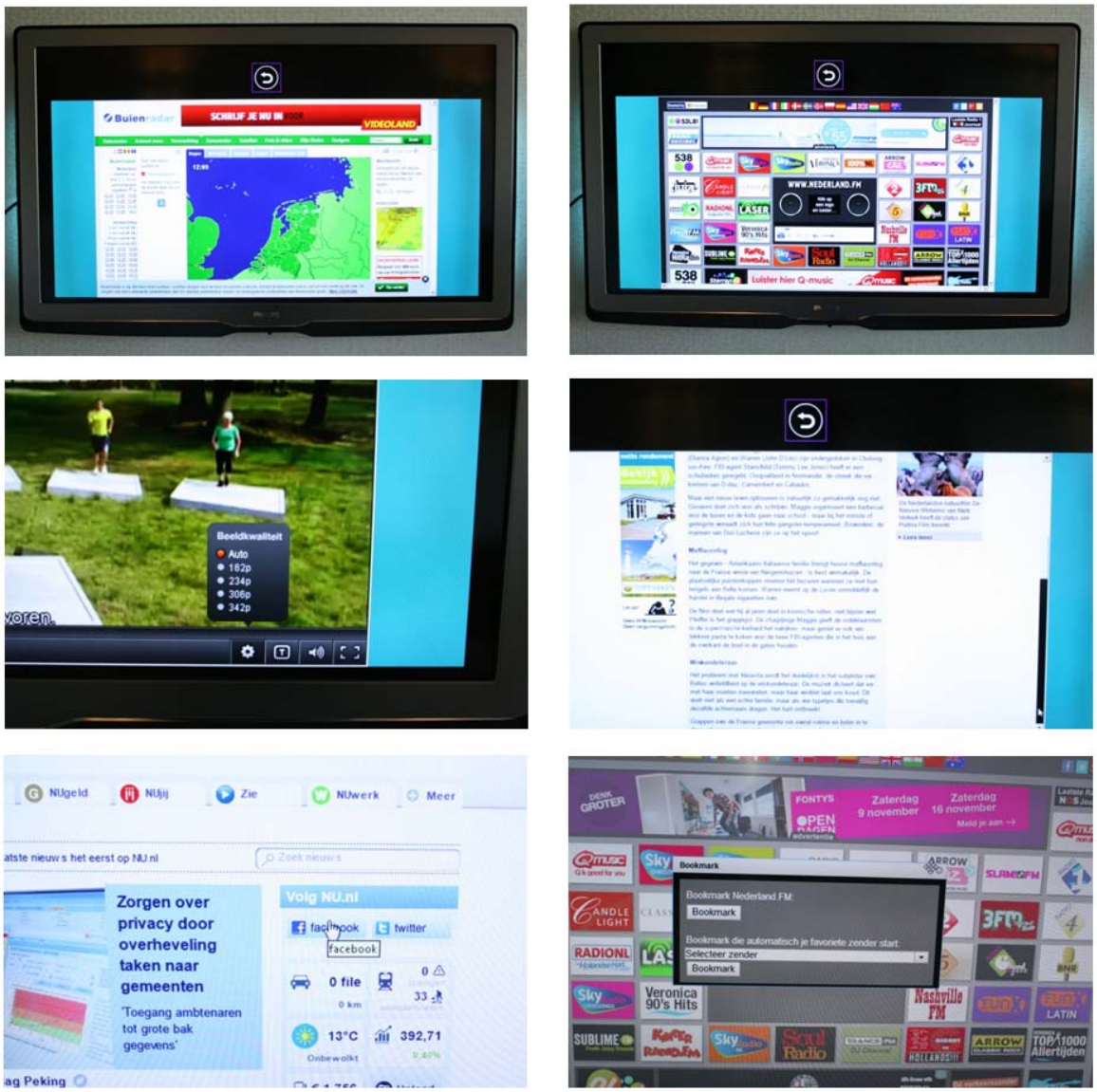


Figure 8 ABC TV External Websites: Layout and problems

A few examples:

- The cursor hand is much smaller, and the background color of these websites is mainly white. Consequently, more than 50% of the respondents could not find the cursor.
- Buttons and links are much smaller in size, making it hard – sometimes even impossible – to click on a certain item on the screen.
- The hand cursor gives feedback when hovering over interactive elements or textboxes. This can confuse the users or give them the impression that they can click on it, but they can not.
- The lay-out of the web pages is – in the contrary to the rest of the ABC TV system – quite overwhelming.
- Function keys (**PLAY** ► , **PAUSE** ■■ , **STOP** ■ and **M**) are not used to control music or video content in the Webpages. For the Internet radio website, each radio channel makes use of a differently designed control panel.

- Each website uses different designs of loaders, of scrollbars, and of buttons making the interface and feedback less consistent, and more difficult to understand.
- When hovering over a heading an extra menu appears, often with information they do not understand (video quality, download options, rss feeds,…). Confusing and difficult to cope with for unexperienced users.
- Logo's, advertisement, links and buttons confuses the user, and draws too much attention. Although many options are blocked, people tend to get lost.
- People can browse through the web pages, but they lose track, because there is no option anymore to return to the previous page.

Navigation:

The 4 arrow keys (⬅, ⬆, ➡, ⬇) on the remote control are used to move a hand (cursor) over the screen, and to point at one specific service, photo or video. When pressing the **OK** button the service, a picture or video is launched on the screen.

Besides the fact that the target population is not used in controlling a cursor. When pressing the **right arrow key ➡**, the hand cursor on the screen moves a few cm to the right. Various participants were frustrated about the way to control the cursor. Firstly, controlling a cursor is rather slow, especially in comparison with touch screen interaction, or function keys. Secondly, some of the respondents had difficulties in pressing the arrow key buttons short (a long press causes multiple input signals), resulting in difficulties to select an item on the screen. When using external websites with smaller objects and buttons to click on, this problem even increased. Frustration reached quite high levels from time to time. Thirdly, some control tools on the external websites, for example a volume slider, requires "click and drag" interaction, which is not supported by the remote control. Additionally, the cursor hand does not work well close to the edges of the TV screen. When the cursor was moved too far, the link between the cursor and the cursor hand was broken, disabling to move the cursor hand on the screen. Sometimes the cursor even disappeared from the screen, causing doubts, difficulties and irritation.

Figure 9 ABC TV – Cursor problem

Visibility of system status

In order to understand and use a system correctly, it is important to give appropriate feedback about the system status. For example where users are in the menu, what is happening on the screen, and when they have to wait.

Figure 10

The system exists out of 5 explicit services, presented by 5 large buttons on the top of the screen, each with a different color. When a service is selected, this button is enlarged and the background color change to the color of the button. In this way, it is always clear where users are situated in the menu structure. Also, when users go one level deeper – when opening a folder – the background color remains the same. However, the top screen button shrinks to its original size, and only limited feedback gives an indication that the user is currently inside a folder.

When enlarging one of the photos from the library, a slideshow is started automatically. The system does not give any feedback about the fact that a slideshow is started. In the bottom of the screen a virtual button is presented with a ■■ sign to pause the slideshow. This indirectly give feedback that a slideshow is running. The fact that various people are unfamiliar with these signs, the unknown concept of virtual buttons on the screen (people interpret it more as a status that the system is currently paused), and the fact that the buttons constantly disappear, makes it very hard for the user to understand that a slideshow is started.

In some services the user has to wait for a reaction from the system or from another user, e.g. when making a video call. The system gives clear feedback to the user by showing a loader. Unfortunately, on the external websites other designs of loaders are used. In the videocall service the loader is supported by a ringing tone. Playing a different tone when calling (telephone waiting tone) or when being called (ringing tone) might be even better. Besides, the time you have to grab your remote control, navigate to the right on-screen button and press **OK** is rather limited, when receiving an unforeseen call. A dedicated button on the remote control to answer a videocall might be an alternative solution.

When starting the online videos “Nederland in beweging” also a loader is shown. In some cases, launching the service appears not to work correctly, and the loader keeps on turning. An extra message would be useful to inform the user that the service is currently unavailable.

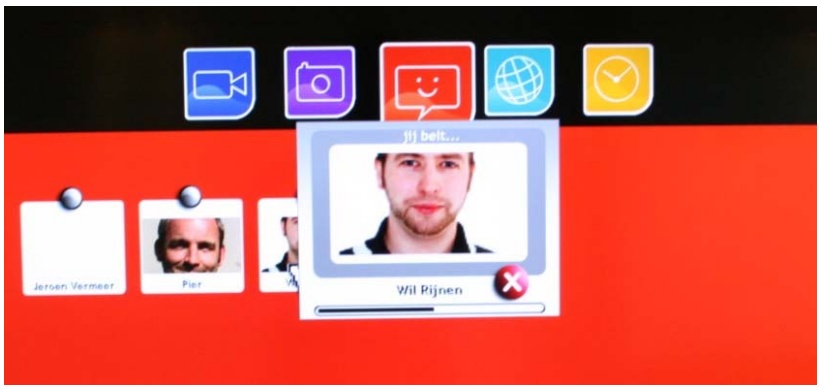


Figure 11 ABC TV – Videocall loader

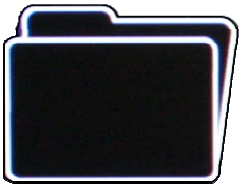
In the video and photo libraries, the title starts to run over the screen when too long. This confuses some people, cause they thing the system is doing something and they have to wait.

Match between system and the real world

To make the usage of a new system easy, it is important that people see similarities with logos and concepts they are used to. Concepts that are self-evident to experienced computer users, are not necessarily understandable for older users that lack computer skills.

In the table below, you can find the diverse answers from various respondents about the pictograms used in ABC TV:

	• Video camera: movies • Webcam: videocalls • Speaker (music) • Medicine bottle • Projector • When looking for videocalling, many people clicked on this button • When looking for the radio, many people clicked on this button
	• Photo • Radio • TV-screen, • Grocery shopping • Brief case
	• People / Acquaintances • Smile / happy • Videocall

	• TV • Talking • Leasure
	• World • News • Videocalling • Nobody mentioned weather forecast, but when looking for it, many people clicked on this button • Nobody mentioned recorded TV shows or radio (2 services you can find here)
	• Time • Clock • Nobody explicitly mentioned Agenda, but when looking for it, all people were sure to find it here.
	• Folder • Empty folder (black) • Purse
	• I do not like this • I do not feel well, I need help

Although the pictograms look familiar and unambiguous, they are absolutely not. It is important to keep that in mind. Of course, you get used to the symbols when you make use of the system more frequently, but as you will read further in the text: recognition rather than recall.

Besides pictograms on the screen, also the on-screen buttons can cause some ambiguity or even

problems. First of all, the target group is not used to virtual buttons on the TV screen. When they see a flat image on the screen, many do not expect it to be an interactive button. In general, when making the virtual buttons 3D, people observe it as being "clickable". For example the 3D designed status indicator in the video call service was sometimes perceived as a button.

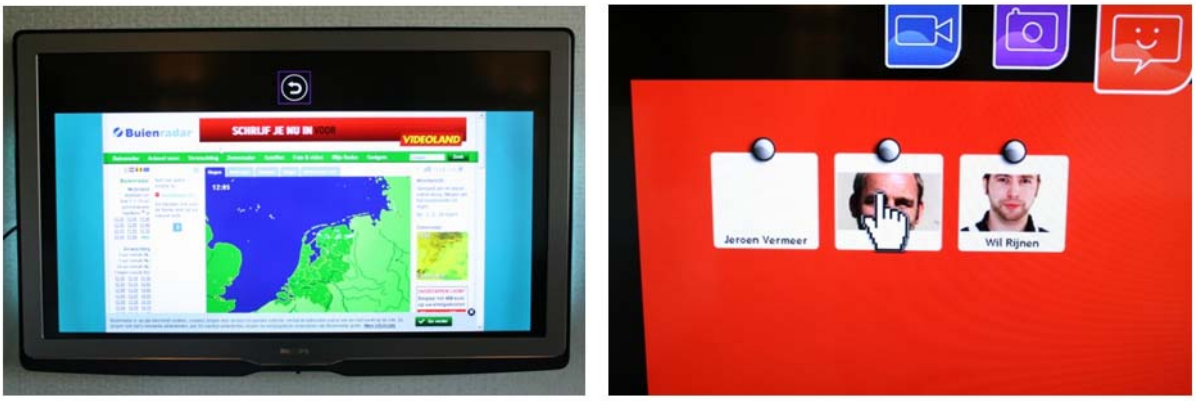


Figure 12 ABC TV – 2D buttons vs. 3D images

The function keys (**PLAY** ▶ , **PAUSE** ⏸ and **STOP** ■) both on the remote control and on the TV screen are not clear for half of the test population, although used for decades on cassette decks, CD players and video recorders. Some people do give a meaning to the buttons based on a well-known color schema: green is correct, red is wrong/stop and orange is something in between.

Figure 13 ABC TV – Function keys on remote control

Also the arrow keys (⬅, ⬆, ➡, ⬇) did confuse various users. Although most of them understood rather quickly that the arrow keys are used to control the cursor hand on the screen, in numerous occasions the **left arrow key** ⬅ and **right arrow key** ➡ were also pressed frequently to browse through pictures, or to go back in the menu. An explanation can be found in the fact that they look for a solution on the remote control first. In addition some users are used to other systems (e.g. a digital TV guide) where the arrow keys are used in a different way.

In the ABC TV agenda, for each appointment two clocks are projected, meaning start time and end time. Dependent on the appointment, people looked for a reasonable explanation:

- *"You can chose whether you go to the doctor at 12:00 or at 13:00."*
- *"I guess at 12:00 I will receive a reminder to go to the doctor at 13:00."*
- *"Probably I have to leave at 12:00 to be on time at the doctor's practice at 13:00"*
- *"I have to go to the doctor somewhere between 12:00 and 13:00."*

- *"No idea. Probably the doctor will have lunch at 12:00, so I will go at 13:00."*
- *"I have to take my medication twice: 14:30 and 14:35."*
- *"Maybe it is for 2 kinds of medication. Medication X before medication Y."*
- *"Probably, there are two groups of billiard players, one at 19:00 and another at 20:00."*
- *"I know a digital agenda. It will be start time and end time."*
- *"It has to do with daylight saving time, isn't it?"*

Although some answers are very creative, this list clearly shows how ambiguous this format with two clocks is. In some situations such a misinterpretation can have awkward consequences, e.g. a client taking each day a double doses of his medication. For some appointments a start time and end time make sense, but for others not.

Figure 14 ABC TV – Agenda use of 2 clocks

Listening to music is a familiar activity for most older adults. Some people just listen to the radio, others use cassette decks or CD-players and are familiar with the function keys (**PLAY** ►, **PAUSE** ▮▮ and **STOP** ■). It surprises them when they figure out that these buttons do not work for controlling the radio. In addition, often one power button is used to switch a device ON and OFF. So when, people find out that they have to press a radio channel (2D image) to start the radio, they try to switch the radio off by pressing the radio channel image again. By pressing, the radio starts re-loading, so it stops playing, and after a few seconds the stream is loaded and the radio starts playing again. People do not understand what happens. Besides, people are confused when they switch on the radio, a movie (advertisement) is played. "Strange, I have no idea what happened."

An online communication status is for many of the participants a new concept. People that have already used Skype before, or that have tested one of the other systems, understands the green indicator. Nevertheless, after a short explanation the concept is clear. In the contact list, not everybody has a profile picture. Some people thought that you could only ring a person when you can see the picture, and that the green indicator might mean that the person is feeling well.

User control and freedom

Users often choose system functions by mistake and will need a clearly marked “emergency exit” to leave the unwanted state without having to go through an extended dialogue. ABC TV does not have one single button to go to the home screen. Nevertheless, in each screen a **BACK** ➲ button is displayed to go back step-by-step. Unfortunately, this button is presented on different locations on the screen, which makes it harder to find. During video and photo browsing the button disappears. When visiting external websites, the screen is so overwhelming and attracts so much attention, that people do not see the **BACK** ➲ button. Various participants prefer a **BACK** ➲ button on the remote control.

Figure 15 ABC TV – Back ➲ button on various location on the screen

On the weather forecast website, drop down menus appear when hovering over certain titles. You can go back by pressing on the white website background, but many people do not manage to leave such a menu.

In particular in the agenda mistakes can be made that are extremely difficult to solve. In the agenda, you have the option to choose ☺ or ☹ in order to indicate whether you are interested or not in a certain activity, or to indicate whether you have taken your medication or not, and so on. From the moment a certain activity is planned in the agenda, the user can react upon it. When you press ☺ the appointment will remain in the agenda. When you, however, press ☹, the appointment is removed. Once you have pressed one of the buttons you can no longer change your decision. Besides, the fact that you can indicate days in advance that you have taken your medication, medication reminders can be deleted by accidently pressing ☹**.**

Figure 16 ABCT TV – Smiles to react upon activities in the agenda

Consistency and standards

In order to make a system user-friendly, it is important that identical concepts are used and that the same action results in the same effect irrespective of the service used. Consequently, the user has to learn how to deal with specific concepts, tools and patterns only once. Within ABC TV both good and bad examples are encountered. In general, consistent methods are used, but each method appears to have exceptions, especially when external websites come into play.

With regards to navigation, each service uses a specific background color in line with the color of the service icon on top of the screen. This clearly indicates that you are inside a specific service. However, when you go one level deeper (video or slideshow) the background color disappears.

Figure 17 ABC TV – Colored background to show which service is currently in use

When the cursor hoovers over a clickable item, the user is informed by giving feedback. A good way to show interactivity. Unfortunately, different ways of feedback are generated, making the feedback inconsistent. In some cases a button is enlarged, sometimes the border is thickened, the colour is changed, or a combination. In some cases, e.g. hovering over a video call contact, no feedback is provided. When visiting external websites, the variation of feedback is increased even more. The (small) hand cursor changes into an arrow or into a text cursor.

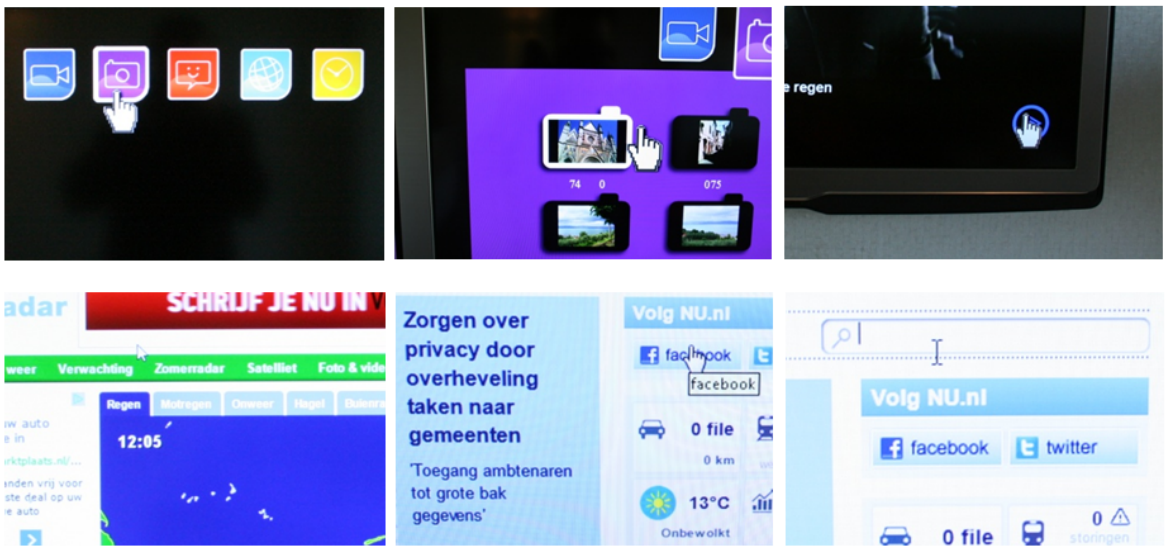


Figure 18 ABC TV – Different feedback mechanism hovering, different cursors

Most of the time there is a clear **BACK** ➲ button displayed on the screen. Most of the time on top of the screen, sometimes in the middle and sometimes in the upper right corner. When inside a folder, the **BACK** ➲ button is displayed a bit lower to the left. Since the placement of the **BACK** ➲ button is not consistent, the users do not know where to look for it. When visiting an external website with an overwhelming layout, the attention is drawn to the website and not the **BACK** ➲ button above.

Video calling service is the only ABC TV service that uses a loader. The external websites – out of ABC control – make use of different types of loaders making the system inconsistent. A similar issue is encountered with the design of control panels for watching videos and listening to the radio. Each radio channel for example uses its own design, making it very confusing. In the services developed by ABC TV itself – the function keys (**PLAY** ►, **PAUSE** ▮▮ and **STOP** ■) can be used. When watching or listening content via external websites, these buttons cannot be used. Users do not understand this discrepancy.

In the agenda it is chosen to use a consistent structure for each appointment: title, location, start time and end time. Additionally, green ☺ and red ☹ buttons can be linked to each appointment. Agenda items, however, can be quite different. For an art craft session of 2 hours it makes sense to identify a start and end time. For an appointment at the hospital it makes less sense: you know when you have to be there, but you have no idea what time you go back home. Also for taking medication, it is strange to have a start and end time. The use of the smiles is also quite consistent. The context, however, is not. Dependent on the appointment the green ☺ can mean “I am interested to join a trip”, but can also mean “I have taken my medication”. In all situations the system gives the same feedback by presenting the text “I will join”. Further, for social events it can be interesting to react on an item one week beforehand, but for other items this function needs to be disabled until the moment action needs to be taken, e.g. medication.

Figure 19 ABC TV – Layout Agenda

Error prevention

In general, you can undo most of the mistakes quite easily. When choosing the wrong service, you can just pick another, and you always have the option to go back. Even better than solving errors is a careful design which prevents a problem from occurring in the first place. Only in the agenda some crucial faults can be made. When pressing the wrong smiley, you cannot change your choice anymore. When you press ☹, the appointment is removed without any ask for confirmation. In this way, the user could accidently delete medication reminders.

As written above the use of 2 clocks is difficult to understand for many users. This could cause some ambiguity and awkward situations. One of the participants in the tests suggested to add some words to the clocks dependent on the type of appointment, like “from… to …” or “Between … and …”.

Also when using the radio, some mistakes were made. When moving the hand cursor over the screen it changes (arrow, hand, text cursor) when hovering over certain objects. This causes unintentional clicks and errors. Although most of the objects are non-clickable (not all), the hovering feedback gives the wrong impression. Also advertisement like “click here”, titles like “No sound” or images that look like buttons, draw attention and causes errors. The image is seen as the **STOP** ■ button, and the is seen as the Windows button to close a program.

Recognition rather than recall

To get used to a new system, there is always a learning curve. The steepness of such a curve, is largely influenced by the level intuitiveness on the screen. Instructions for use (objects, actions and options) should be visible. In this way the user only needs to recognize what is presented, rather than recalling how the system needs to be operated. Virtual buttons disappear from the screen when in video watching or photo slideshow mode. People do not get any instruction, lose track and start to press randomly the buttons on the remote control. On the external websites the **BACK** button is deployed, however due to the overwhelming layouts, users have difficulties to see it. Also the radio control panel is invisible in the crowded interface. Too much useless information is presented, making the important things – like buttons – vanish.

Figure 20 ABC TV – Overwhelming radio interface hides the important elements

If the interactive elements are difficult to find, people have to learn where to retrieve the services and buttons they would like to use. This asks a much larger effort from the users, and will lead to a steeper learning curve.

Flexibility and efficiency of use

It is important that the system is easy to use for novice users. They take their time to find their way and to do what they want. Experienced users may be interested in speeding up the process in selecting services and browse through content, by making use of so-called accelerators. Controlling the hand cursor on the screen is a slow process. Some users (unintentionally) found out that they can use the **M** button to return to the overviews of the photos and videos. Various users, therefore, interpreted the **M** button to go back, but that works only in certain situations.

For the rest, there are not many accelerator functions implemented in ABC TV to speed up the interaction for the expert user. One of the test participants tried to use colour coding: “I suppose the photos are saved in the purple service, but I do not see a purple button on the remote control.” Colored buttons for each of the services, might be a good way to please the needs of more experienced users.

Aesthetic and minimalist design

As already mentioned before, there is an inconsistency between ABC TV services on the one hand, and external websites on the other hand – both in design and interaction. The layout of the ABC TV services is simple and minimalistic. The external websites present much irrelevant information units , which pulls the attention away from what the user needs to see to be able to operate the system. The users are overwhelmed by the abundance of information, visuals and colours.

Besides the fact that the font types and font sizes are not adjusted for an older target population, some of the text is written in capitals, which is perceived as unfriendly.

When a user hoovers over photo or video in the library, the title starts moving over the screen. Probably done to be able to display lengthy titles. This largely reduces the readability, and people are confused. They do not understand it. Some perceive it as a kind of loader, so they wait.

Whereas the remote control is more minimalistic than a standard TV control, most of the people did manage to accomplish all tasks with using only the arrow keys (⬅, ⬆, ➡, ⬇) and the **OK** button. In the ABC TV modules, the function keys (**PLAY** ► , **PAUSE** ▮▮ and **STOP** ■) on the remote control, but also their virtual variants on the screen have the same functionality. The M button is only used to go back to the library. This can be done by using the **BACK** ➲ button as well. Half of the buttons are not required.

Help users recognize, diagnose, and recover from errors

Except for choosing a wrong service, or pressing a wrong button, no errors occurred. People see themselves that they chose a wrong option, and are able to recover from the mistake. Only in the agenda people cannot recover from pressing the wrong smiley - ☺ or ☹.

Help and documentation

In this test scenario, no extra documentation or paper-based user manuals were provided. The idea was to evaluate the system itself and its intuitiveness. Most of people needed some minutes to figure out how to interact, but afterwards they were quite able to perform the tasks. They reported that the system was clear, simple and easy to use. One person reported that he really needed additional instructions.

Overall the interface is clear. In the agenda there was an information unit that was not understood by the majority of the users. The text stated: “Respond in … hours”. This statement was unclear, and some help might be useful here. Besides the text, also the context causes some confusion, because the answer (☺ or ☹) can have different meanings. In addition, when ☺ means that you have taken your medication, it is strange that you can already respond to a medication reminder several days in advance.

Conclusion

The main difference – and benefit – with other service platforms is the unique concept of providing three different graphical user interfaces. This high level of end user centrism to be able of dealing with interpersonal differences and age-related changes exceeds the personalization levels offered by others. Due to the character and goals of the user tests in this stage, only the C variant is evaluated.

Whereas the hand cursor navigation is slow and cumbersome, it is effective and clear. Also the interface is simple and quite intuitive. The ABC TV modules are enjoyable and consistent in terms of design and interaction. However the implementation of external websites – over which ABC TV does not have control – break up the clear and enjoyable interface and the consistency. Feedback mechanisms, control panels and buttons look differently, and the overwhelming interfaces diminish the relative visibility of important elements.

Overall, the majority of test users was able to handle the ABC TV interface pretty well. In some cases experienced technology users had a little advantage over inexperienced users, but in other cases people with no computer skills at all managed better, for example when the system goes beyond typical computer conventions. The majority was positive and enthusiastic.

5.2.2.2 VieDome (Remedus)

VieDome is described as:

The need for new solutions in the field of care, safety and comfort grows. Solutions that provide efficient care and more personal attention to the client. Solutions that allow people to manage their live and live and stay longer at home. And solutions that provide a better quality of life. More money and staff is obvious. But there is much more possible!

VieDome is a reliable and secured digital platform. It is easy to operate, even for people who are not used to work with internet. The platform is so secured that users are never approached by people or entities that are not screened by the facilitating institution in advance. The user privacy is guaranteed. The VieDome platform is proved to be a tool where care- and welfare organizations, building cooperation and other care providers can offer their services to clients, patients and residents. VieDome facilitates different services from within your own organization or from joint initiatives. The VieDome platform uses open standards so different connections can easily be realized. This creates an open but secured platform for care, services and technology providers. Freedom of choice, efficient care and other services for the users, are extremely important within VieDome.

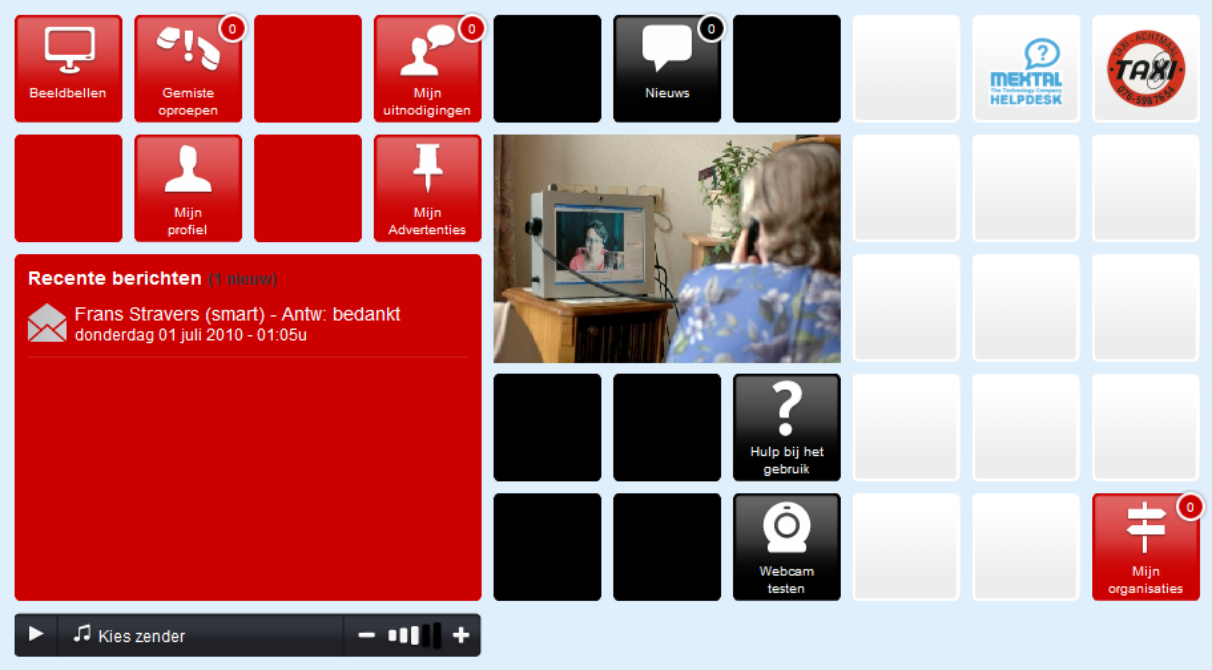


Figure 21 Overview Viedome service platform

By using VieDome, elderly will be effectively able to live longer, more comfortable, save and responsibly 'at home'. VieDome makes it possible to make video conferences, improve social contacts with friends, ... Technology has to follow the demand for care by the user. Technology is not the leading actor, the user is.

Delivery of hot meals and shopping services, but also tele-monitoring and transmitting data to care professionals lies within the possibilities of this platform. VieDome is an accessible computer based online platform that can be used by ordinary computer, touch-screen computer or tablet.

The VieDome platform was presented on a PC with touch technology. Traditional keyboard and mousse were also available. The respondents had the opportunity to use touch screen functionalities and/or mousse and keyboard.

A variety of services were available; radio, news items, video conference, mailing and advertisements. The users were shown the possibilities to add links to other organisations, shops.

Items of personal care were not available: medication intake, reminders, and agenda.

Evaluation based on heuristics and user feedback

The majority of the responders in the study disliked VieDome. The system was described as to overwhelming, too much information, no overview, unrealistic use of colours… p/e:

- red is associated with danger/stop, green is safe/go. People who can be contacted are shown in yellow.

- difference between two types of grey.

During the test days the respondents needed to work with several platforms. We noticed if they used VieDome as first platform, they were more or less enthusiastic, but if they were able to compare it with other platforms, they mostly disliked this platform.

VieDome was tested on a computer with touch screen. Most of the people were amazed that the touch technology was so friendly to use, but otherwise we had several respondents who get a little frustrated if the screen did other things as they expected (p.a. enlarging of the screen of no reaction because of touch by finger nail). Once they got used to it, they forgot the opportunity to use a keyboard or mouse. Even more, the respondents without PC experience were searching for a touch keyboard on the screen while the ordinary keyboard was right in front of them. Otherwise the respondents who had PC experience changed easily to the touch technology.

A lot of the respondents mentioned some useful information to make VieDome a better platform:

- well known/universal icons
- other colors
- search possibility

These subjects will be discussed further on.

Otherwise, some of the respondents dared to ask if the VieDome platform was tested by their developers. ‘If so’, they mentioned, ‘they did a bad job’!

There was a big discussion about the colors that have been used. As background it was black, red and white, and these were named as ‘hard to look at’. In other applications there were used different shades of grey, what made it confusing.

Age related changes

Several respondents were not able to use the touch screen because of motoric decline. Because of a tremor they touched the screen twice, what resulted in an enlargement of the screen. Some of them didn't know what to do about it, and gave up using the VieDome platform. Sensitivity of the system is something we need to guard.

Other people had a difficult eye-hand coordination, what resulted in opening another screen as demanded. Frequently, it was hard to get back to the screen they mentioned to open. It was noticed that some items were so close together, that it was difficult to choose the desired item. Certainly the 'help' function is an excellent example.

Despite of the use of a lot of pictograms, some respondents mentioned they need glasses to be able to read everything on the screen. Finally, it was asked why some application used different but similar shades of grey. The refraction of the light on the computer screen made it impossible to see the differences.

Navigation

Both operating systems, touch screen or mousse, were used by the respondents. People who had PC experience were more using a mouse and key board, but almost every one of them started to use the touch technology. The respondents with no experience didn't get started easily, but once they used the touch screen they had no problems by using the system. It seems to be a instinctive behaviour to point to what you want to use. Once the respondents were used to work with the touch screen, it was hard to make the change for using the keyboard to type a message. Most of them were looking for a touch screen keyboard. When developing a system with touch technology, it seems clear we have to preview a touch keyboard as well.

Several respondents searched for a 'back-button' of 'back-arrow'. It was mentioned several times to be missing.

Visibility of system status

A lot of the respondents lost orientation when using VieDome. It's very hard to remember the progress you've made by using VieDome. The structure of the platform is missing, but could easily be visualized.

'Opening a new screen was shown by making the colours of the screen more dimmed. The difference in colour was not clear enough to understand the system was in progress. The use of loaders could improve VieDome.

VieDome was presented on a large screen. For most of the respondents in the study, it was hard to keep an overview of the screen. Certainly when they opened an application and background colors were changing, the overview was lost. The screen needs a better structure to be useful. VieDome is built with cubes that can be touched. Almost the entire system is made out of cubes. For one or other reason, the radio and help function have another layout, what makes it very confusing for the user. Uniformity over all applications is needed.

A cube is indicated as 'active' by a little drawing inside the cube. The few links that were visualized to move forward to another site, were using logos. Unfortunately a logo doesn't always show what possibilities are behind it. There is no provision for grouping different types of services. The system allows to make video conferences, but instead of using pictures or cubes with the name of the contacts, it's visualized as flat lines with information. We noticed that a lot of respondents in this study were not able to indicate who they were able to call.

Match between system and real world

A lot of the respondents had computer experience. They were used to work with Office applications and tried to find similarities between these systems. Unfortunately, VieDome did use other icons.

Video conference: Icon of a grey phone: is this person available or not? Why not using red and green?

Figure 22 VieDome – Video conference icon

Symbol for news item 'Sport' was not recognized as 'sport' (4 respondents).

Figure 23 VieDome – Sport news icon

Symbol for news item 'Nature' was recognized as nuclear explosion (2 respondents).

Figure 24 VieDome – Nature news icon

Why they use '+' in the right top corner to mention that this item can be added and a bin to mention it can be deleted? It was perceived more cleare to use '+' and '-'.

Figure 25

Why is a pencil used by VieDome to indicate you can write a text message (and not the usually symbol of an envelope). The difference between 'offered' or 'found' advertisements is not clear to users.

Figure 26

Symbols should be used as they are known in community, not as desired by the developer.

The respondent mentioned it was not clear why they used different back ground colors in different screens (see Figure 21). In the eyes of the users, there is no difference. Using these colors is confusing. In some screens there is no balance. Focus is more on a specific part of the screen what distracts the user by finding what he's looking for. The attention of the people looking for advertisements is withdrawn to the right part of the screen where they're able to make a new advertisement. Because of this, some respondents had problems with finding what they were looking for.

Sending a text message, the user needs to click the text field before the text can be entered. Same for the subject of the message. The respondents wondered why the cursor couldn't be in the right text field immediately. This would make the system more user friendly, certainly for an elderly population we are looking for. If one of the fields (text field of subject) remains empty, an error occurs. Unfortunately this error does use terminology that can't be found on the screen! Different users were disappointed of the quality of the webcam as well. It were more 'pictures' than a fluent movie. A final remark: Some of the respondents tried to click on a bold text because they thought it was a link. Unfortunately it didn't work.

User control and freedom

'*I've got more than 250 contacts in my mobile phone. Can I structure my contacts in VieDome as well?*'

Not all users got the same experience with computers, but within the population we'd like to help, there are a lot of people who are experienced. Therefore it would be necessary to build a system that can be adapted on the grade of experience of the user. Most of the users would be able to use VieDome as it was presented for the study, but others need more possibilities to create their own structure of their contacts or news items.

VieDome as presented for the study offered about 8 radio stations to be listened. There were no possibilities to add some more stations as desired by the users. A platform only becomes user friendly if it can be adapted by the user or their carer.

One of the most confusing items in VieDome was the possibility to read 'old' news items. These news items are shown by 4. If you want to read the next 4 items, you have to click 'next'. More than 90% of the responders clicked 'previous' to search news items in the past. 'Previous' is understood as 'in history', not as the previous screen with news items.

Figure 27 VieDome – Old news items

The respondents were asked to use the 'help' function in VieDome. Most of them managed to find the item they need, but almost none of them were able to do what they were explained to do. This 'help' screen contains much too many information, not structured, without 'pictures'. The respondents didn't think it was easy to use. Even more, when reading the instructions it is impossible to do what they suggest, because opening the 'help' screen blocks all other functionalities. People asked for a Windows based 'help' screen.

Figure 28 VieDome – Help function

Consistency and standards

Most of these topics are already mentioned above, as:

Use of different colors in background is disturbing.

Radio and/or 'help' screen are constructed totally different from all the other screens. Why aren't these built with cubes as well?

Other items that were mentioned:

In the right bottom of the screen is always the sign 'back to start screen'. Only in the start screen, there is mentioned 'my organizations'. This is confusing. There are different approaches in navigating through a screen. Uniformity is necessary.

Error Prevention

In the VieDome platform, there are no tools for error prevention. In some cases it would be useful if there appears some more information by hovering over the screen, but of course this is hard to realize using a touch screen. Adding some question marks on the screen could be another possibility. More information/signs on the screen makes it otherwise more complex to understand everything. If the user is going to change items/topics, it's never asked to confirm this change, what can lead to unintended changes.

Also error handling isn't always clear.

Sending a text message, an error can occur if there wasn't a subject or beneficiary mentioned. Unfortunately, the terms that are used in the error screen can’t be found in the VieDome screen.

Figure 29 VieDome – Error handling

The lay-out of the screen is similar in different applications. The screen for sending a message is almost the same lay-out as making a new advertisement to the VieDome Community. Using different colours or screens could create this difference.

Recognition rather than recall

In different screens in the VieDome platform, the user don’t see an opportunity to navigate to the previous screen. Therefore they don’t find another solution than navigating by the ‘start’ screen and go back to where they were working. They need to make a hug circumbendibus to make it to where they like. A ‘back’ button could by the answer.

In some situations, p.a. the screen to read some advertisements, focus is brought to the screen were you can add a new advertisement. Developing a new platform, it should be taken in account

to show the user the information he wants (and nothing else than relevant information.

Flexibility and efficiency of use

VieDome previews no possibility to add 'favorites'. VieDome has not the possibility to structure news items, contacts, … as wanted.

News items can't be filtered on 'date' or 'item' by using a search screen. Demonstrating VieDome, there were several problems in using the radio. Performance is crucial.

Aesthetic and minimalist design

Developers should be well aware that developing a system for elderly people, it needs to be adapted to their needs and habits. Flashing colors and moving images are often not liked by this population. The colors used in VieDome were mentioned as disturbing. A minimalistic design must be able to make clear which part of the screen is active and which part not.

Attention for not desirable optical effects. Using black or grey cubes creates an optical movement were the corners of the cubes hit each others. The respondents of the study mentioned this as disturbing.

Figure 30

Help users recognize, diagnose and recover from errors

The 'help' screen in the VieDome platform isn't user friendly. The respondents had to be able to find the solution for a problem. They had to read text (to small), had to understand it (to complex), had to remember it (different steps) and had to be able to do it as described. This text does not use print screens what made it even harder to understand. A help screen should be more logic and better visualized.

Conclusion

VieDome was not considered to be the most user friendly device. The reasons for this are the use of colors, the use of icons that are not always understood as mentioned, and a lack of overview of the screens. The structure itself is rather easy. Different topics can be added (by programmers) in the

different screens. The system of cubes make it manageable for programmers, but there has to be attention it stays clear for the user as well. The VieDome system as it was showed, was found not to be well visualized and had some troubles with performance. Respondent who had some computer experience were able to work with VieDome without any troubles, but asked more tools than VieDome offers for this moment. There should be a way to catalogue contacts as desired by the user. Same for pictures, news items, advertisements, …

VieDome as shown for the study, could be seen as a tool to communicate with care givers and other elderly people, but had no more influence on living on your own.

VieDome should be more user friendly and preview what's wanted by the user. The system should give the information/screen that is needed and no other information than this. The use of the touch screen, remembering some topics as sensitivity, was liked by the respondents in this study. It was mentioned that, because VieDome is computer based, there is still another screen needed in the house and this computer cannot replace a television. Other combinations to use VieDome can be explored to find a more practical way to use: possibility of satellite device (tablet, smart phone, game console, ...) to be used in combination with regular TV.

5.2.2.3 MiBida (SmH)

MiBida can be seen as an easy to operate computer or tablet. Even people with no previous computer experience can use the platform. With a simple touch the user can have a video call with family and friends or a service provider in the neighbourhood. The latest news is immediately available as well as requests from others who can use assistance. Available services are directly visible, there are no menus or hidden layers, everything that can used is in plain sight.

The platform has been developed based upon several years of user research into usability and user needs. Together with current clients additional services that can aid to make life easier, more fun or offer more safety and comfort are being developed. The basic principle that everybody must be able to operate MiBida remains as core requirement. People that already own a computer or tablet can install MiBida as an app. Making it possible for them to keep using their familiar device.

Figure 31 Overview MiBida service platform

MiBida offers the following services:

D. **Video communication**; Contact with family and friends, basically the same as a telephone call but with the possibility to see the person you are calling.

Figure 32 MiBida – Video communication service

E. **Games**; The possibility to play one of more than 20 games, ranging from puzzles and card games till memory trainers.

Figure 33 MiBida – Games service

F. **Radio**; Enjoy your favourite music in digital quality.

Figure 34 Mibida – Radio service

G. **Newspaper**; News from the local neighbourhood and the rest of the world.

Figure 35 MiBida – Newspaper service

H. **Notice board**; Possibility to share messages with contacts or to make a personal note.

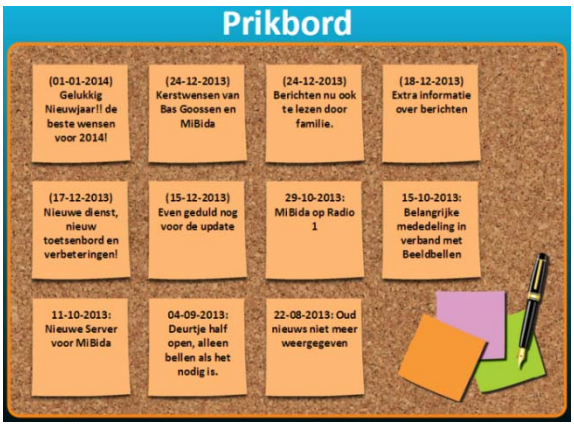


Figure 36 MiBida – Notice board service

I. **Social support**; When somebody needs your help or the other way around this is clearly visible

Figure 37 MiBida – Social support service

J. **Weather service**; Information on the weather situation.

Figure 38 MiBida – Weather service

MiBida can be operated via a touch-screen interface. All available services are represented as miniatures. When a service is selected it will zoom out and the overall service menu will disappear.

Figure 39 MiBida test system

Evaluation based on heuristics and user feedback

The majority of the respondents in the study was enthusiastic about the user-friendliness of the MiBida system. The GUI (graphical user interface) was perceived as simple, clear, intuitive and easy to use. Selecting a service by pressing on the 'miniature' of the service was easily understood by the participants.

A few participants hesitated in first instance when they had to touch the screen to operate the system. However after this initial hesitation all of them freely explored the possibilities by pressing the screen.

Although learning to use a new system always costs an extra effort, most of the people were used to the system rather quickly. In general they understood the concept of using the touch screen in a few seconds. The navigation needed to be explained and repeated more often but still after trying a few minutes it was clear to all participants.

Many quotes from the tests show that they understand the system:

- "This one to return, right?"
- "Ok, this is easy, clear."
- "I have to type, then I need something to be able to do so, ah here I found one."
- "To go back I must press here."
- "Oh it must be here."
- "OK yes here is the forecast."
- "Isn't in the list, OK then I must search via the arrow buttons."
- "Ok then I must press next to the service every time, that is always the same procedure."
- "OK then I can add contact persons here and every contact person has its own home" (comment in relation to the video communication service).
- "The game isn't in the list, ah this is the way to search, ok there are many more games on this."
- "If you press something then it will enlarge."

Navigation

By selecting a miniature of a service the service will be enlarged and can be used (Step 1). When a functionality within a service is selected it will be presented within the enlarged section (Step 2). To return to the main menu every opened functionality and service needs to be closed. To close a functionality within a service the user needs to press outside the functionality but inside the service (see grey area in step 3). To return to the overall menu the user needs to press outside the service but not on the controls at the bottom (see grey area in step 4).

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Overall menu</td><td>Step 1 (select a service)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Step2 (select a functionality)</td><td>Step 3 (grey area: return to start screen service)</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Start screen service</td><td>Step 4 (grey area: return to overall menu)</td></tr>
</table>

Figure 40 Navigation in MiBida platform

The navigation isn't that intuitive that participants understand it without any explanation. However after some guidance participants find it easy and only in some instances the navigation needs to be explained again after trying 2 or 3 services.

One participant had problems to navigate since his hand was shaking. In order to have some support for his hand he used the edge of the screen. In doing so he sometimes unintentionally pressed the screen which led the system to return to the overall menu. As this was done unintentionally it confused the participant.

Visibility of system status

In order to understand and use a system correctly, it is important to give appropriate feedback about the system status. For example where users are in the menu, what is happening on the screen, and when they have to wait.

All the services are represented by miniatures and the name of the service is presented above the miniature. All participants found it easy to find a service. Participants however did have problems to get back from a specific service to the main menu. In services where arrows were part of the GUI the arrow pointing left (see screenshot below) was often used to try to get back to the main menu. This was mainly done by participants who had some computer experience.

Figure 41 MiBida – Arrow button used (in red circle) to try to return to the main menu

Others assumed that the green circle in the right bottom of the screen was a button to return to the main menu.

Figure 42 MiBida - Green circle (in red circle) used to try to return to the main menu

Match between system and the real world

The video communication service is set-up in a way that it is intended to resemble a street in which the contact persons of the user live. Each house represents a contact person. When a user has more than 5 contact persons it is possible to walk through the street (scroll) using the arrow keys or swipe and move to the contact person the user wants to call. For participants it wasn't always clear that the houses represented the contact persons.

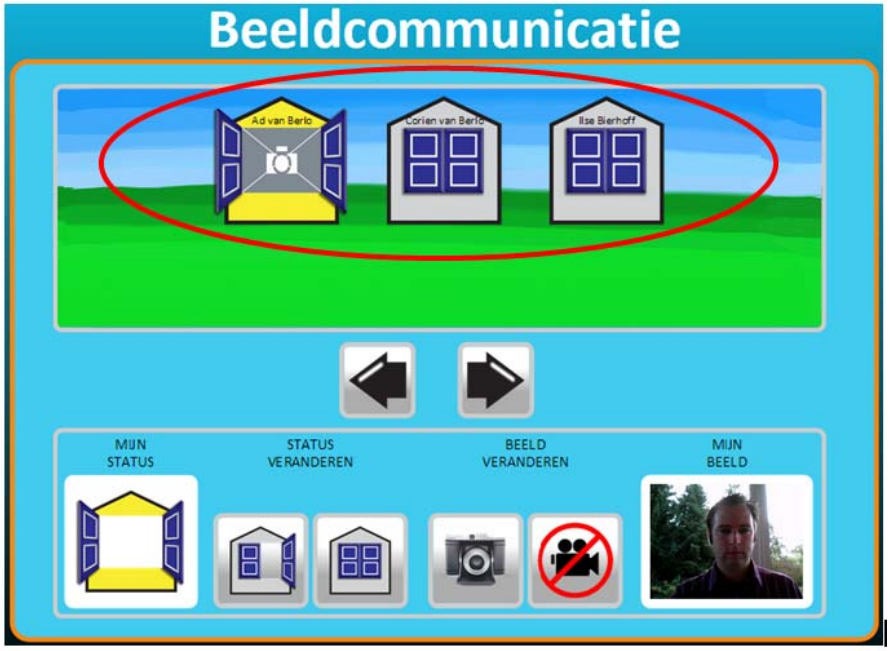
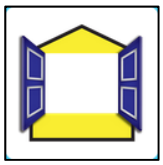


Figure 43 MiBida – Street with contact persons (in red ellipse)

Second aspect of the video communication service is the possibility to indicate your availability. For that three options are available, again resembling the real world. The meaning and some of the responses by the participants are displayed below.

Icon	Meaning	Reference to real world
	Available	The windows are open and the light is on. *'The doors are open'* *'The one with the picture inside'* *'Yellow means that the person can be reached."* *'It is open, ok then I can call.'*
	Available but please do not disturb	The windows is only open halfway and the light is switched off. *'Ah so in this one the door is halfway open'*
	Not available	The windows are closed and the light is switched off. *'OK so then this person isn't available'* *'Oh the doors are closed, that person isn't at home'* *'Shutter is closed so service is not available'*

After some initial guidance on where to look the differences between the three statuses is clear to most of the participants. Third aspect is that the user can make a picture of him/herself that will be displayed in “their home” and is visible for contact persons. The current picture is presented at the right bottom of the service.

Figure 44 MiBida – Current image of the user (in red circle)

To change the current picture the user needs to select the photo icon, see below.

Figure 45 MiBida – Photo icon

Which button to select to change the image is not always clear to the user. Sometimes they select the video icon (to the right of the photo icon). When calling a contact person there is a clear reference to a mobile phone, using the green button to make a call and the red button to close a call. This was easy to understand for all the participants.

Figure 46 MiBida – Use of green and red button in video communication

In the notice board service almost all participants immediately recognized that the pile of notes can

be used to make a new message. One participant tried to press on the part of the notice board where no notes were put on the board, expecting that in that way he could add a new note. It is unclear to some that the pen displayed to the right of the pile cannot be used to add text to the message.

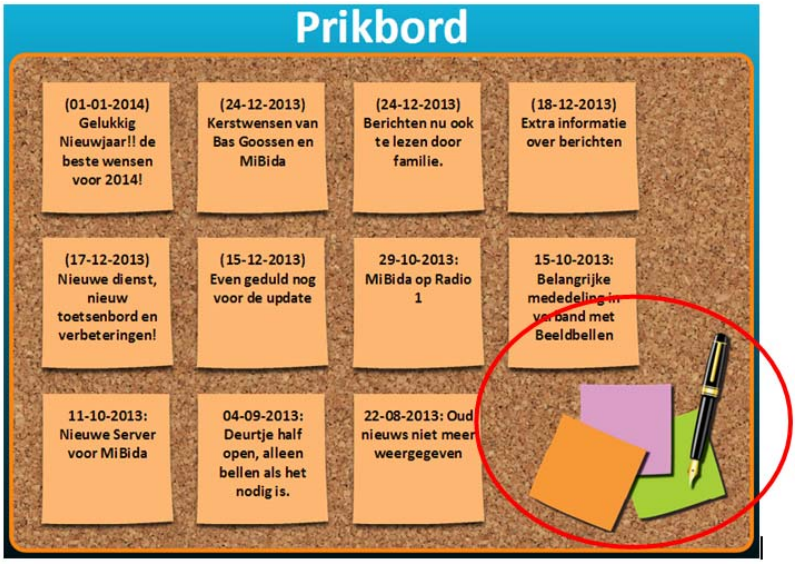


Figure 47 MiBida – Pile of notes and pen in the notice board service (in the red circle)

User control and freedom

Participants experienced problems when they were asked to write a note on the notice board. Since no physical keyboard was available participants had to search for a way to enter text. Some found the on-screen keyboard by trying others needed assistance in locating the on-screen keyboard.

Figure 48 MiBida – Location to active onscreen keyboard (in the red circle)

In the newspaper service all participants found it easy to open the service. However when they found a news item that was of interest to them they expected to be able to select the message and that additional information would appear. This is however not the case: "*So you cannot read more!*".

Figure 49 MiBida – Only short news items are available to the user

Same occurs in the weather service. Especially participants with some computer experience expect to be able to select a specific location to see if it will rain in that city. However the service is set-up in a way that automatically the rain forecast for the next three hours for the entire country is displayed without the possibility to interact.

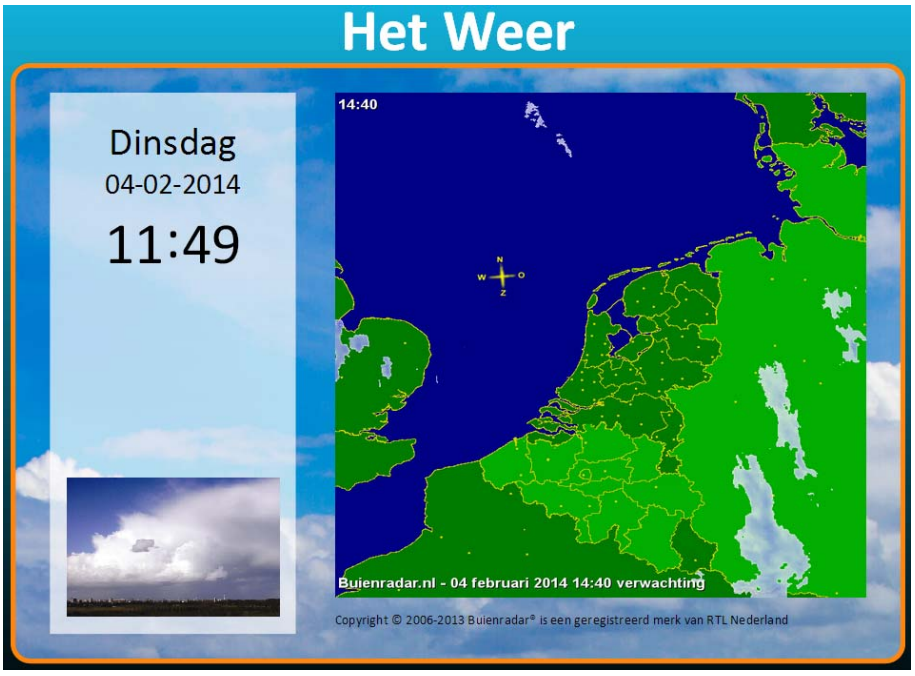


Figure 50 MiBida – Rain forecast

In the video communication service some participants were wondering how additional contact persons could be added.

Consistency and standards

In order to make a system user friendly, it is important that identical concepts are used and that the same action results in the same effect irrespective of the service used. Consequently, the user has to learn how to deal with specific concepts, tools and patterns only once.

In terms of consistency the way to add a new image of yourself to the video communication service isn't clear to all users. When selecting a new service or functionality the user is used to pressing on the service/functionality. So when they were asked to change their picture they pressed the current image and expected to be able to change the picture in that way. Same was the case for actually making a picture. Again the photo icon needed to be pushed and not the image itself.

Figure 51 MiBida – Photo icon needs to be selected to open the functionality and to actually make a picture

When a user has a limited amount of contact persons the only way to return to the video communication service after a call has ended is to close the functionality by pushing the red button twice. This is inconsistent since the correct way to close the functionality is to press outside the functionality but inside the service. This is however not possible since the 'street' with contact persons is too narrow.

Figure 52 MiBida - Pop-up for call functionality is wider than the 'street' with contact persons

After a while the participants got used to clicking outside a service or functionality to close it.

Therefore it was confusing that the on-screen keyboard couldn't be closed in the same way. When the on-screen keyboard was visible a red cross appeared in the keyboard icon and that needed to be pressed again to close the keyboard. Some participants noticed the cross after trying to press outside: "*Ah of course I can close the keyboard here!*"

Figure 53 MiBida – Icon that needed to be presses to close the on-screen keyboard

In the Social support service after answering some questions about your own feelings the group that the user belongs to is displayed. Besides a picture of the person also two icons indicating whether or not a person would like to receive a call and how the other person is feeling that day appear. However these icons don't have any action connected to them. As all other icons can be pressed participants tried to press for example the green call icon and expected to be able to call to person: "*Oh Wil is not feeling well, I better give him a call.*" Participants were surprised when nothing happened after pressing the icon.

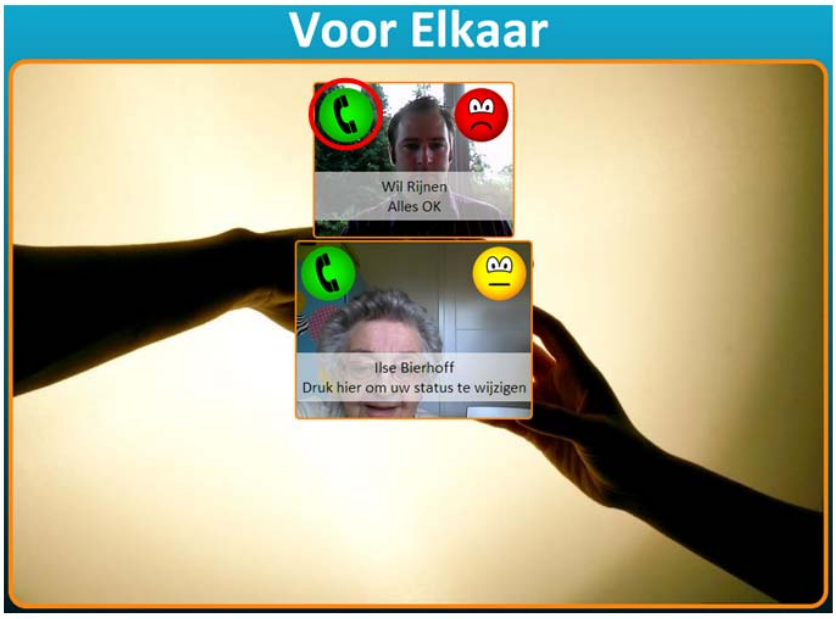


Figure 54 MiBida – Icon that was pressed expecting to make a call (in the red circle)

Error prevention

When the task was given to shut down the radio a lot of participants got confused. Most of them pressed outside the radio service but that resulted in returning to the main menu but the radio kept on playing. Some participants tried by controlling the volume but since no mute option is available the radio could still be heard. Since the on-screen keyboard is located next to the volume buttons some participants tried that but got very confused: "*Oh what have I done now!*" The systems offers no help functionality to guide the user so the moderator had to explain the navigation before the participants could complete the task.

In the notice board service the navigation within the service can be confusing due to the fact that the functionality to make a new note is in the area where normally can be pushed to return to the

start of a service.

Figure 55 MiBida – When clocking on the red marked areas a new notice will open instead of the notice board

Furthermore participants were asked to delete the message that they have put on the notice board. A lot of participants got confused on how to complete that task because of two reasons: 1) the on-screen keyboard was partly covering the button 'Delete' and 2) there were two buttons 'Delete' (weggooien) and 'Undo' (ongedaan maken) that meant more or less the same to the participants. Since the Delete button was in plain sight they often chose that option instead of the Delete button. Some participants blamed themselves by saying: "*Oh I didn't read correctly*".

When asked to play a game all participants easily found the game service and selected a game to play. However the games are not designed in the same way as the rest of the interface since it are embedded online games. This was confusing for the participants due to the fact that the games where in English and the way to operate them was totally different from the rest of the service platform and also not explained.

Figure 56 MiBida – Embedded online game

In the Social support service a confusing message is presented after a person in the group of the user has answered the question. The message “Everything is OK” refers to the fact that a person has answered the questions and not to the actual status of a person. A lot of participants read the message and assumed that the person was doing fine even when the smile at the right top of the box indicated something else.

Figure 57 MiBida – Wil is not feeling well (☹) but has answered the questions and therefore the status says ‘everything is OK’

Some participants didn’t really press the buttons but made a hovering movement over the button. The interface is designed in such a way that this is still recognized as one touch so no errors occur when operating the interface. One participant was totally unfamiliar with computers and didn’t understand the rain forecast functionality. “*The sky is blue, blue is good*”, after explaining that the blue on the screen was the rain that was coming “*ah it works differently*”.

Recognition rather than recall

To get used to a new system, there is always a learning curve. The steepness of such a curve, is largely influenced by the level intuitiveness on the screen. Instructions for use (objects, actions and options) should be visible. In this way the user only needs to recognize what is presented, rather than recalling how the system needs to be operated. In the video communication service the statuses are represented by icons. One of the participants was missing the confirmation of the meaning of the icons. Now he needed to recall the meaning of the different icons. He preferred to have textual confirmation that he selected the correct one.

Flexibility and efficiency of use

It is important that the system is easy to use for novice users. They take their time to find their way and to do what they want. Experienced users may be interested in speeding up the process in selecting services and browse through content, by making use of so-called accelerators.

The swipe functionality within some of the interfaces wasn’t explained and isn’t intuitive so only one person tried it. Therefore when somebody had to search for a specific radio station or specific game this could take some time and can lead to confusion: “*Do I need to keep on pressing?*”

In the notice board service a lot of participants found it intuitive to press inside the text fields to be able to enter text. Some indicated that they wanted to know how they could move the cursor to be able to delete a specific part of text. This is a result of the fact that a keyboard for inexperienced users was chosen that had the ABCDE instead of the QWERTY format and only had the option to delete input starting from the end of the input. Participants without computer experience indicated

that they find it very easy to find the letters on the keyboard. Some of the more experienced users noticed the difference but only a few found it disturbing.

Figure 58 MiBida – On-screen keyboard in ABCDE format

The use of the previous and next button to 'read' the newspaper is clear to almost all participants. Only one participant tried to press/swipe inside the newspaper to read it.

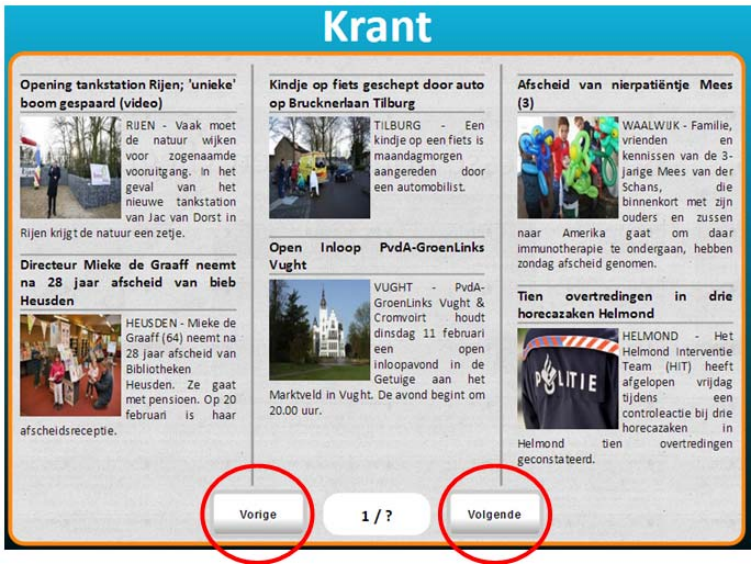


Figure 59 MiBida - Previous and next button to read the newspaper (in red circle)

Furthermore participants find the question sign confusing "*It doesn't indicate how many pages there are.*" The only way to know how many pages there are is to go till the final page and then the system will know how many pages there are and will keep on displaying that number until it automatically refreshes.

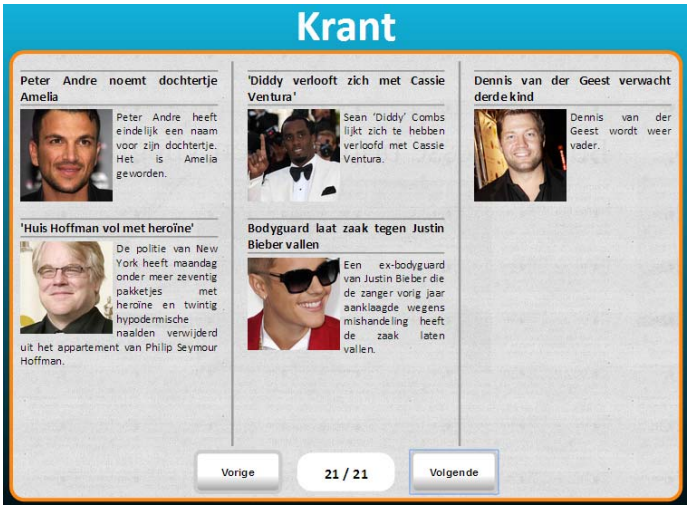


Figure 60 MiBida - Total number of pages in newspaper displayed

In the weather service not all participants recognized that the service automatically showed a two hour forecast. After some explanation a participant expressed: "*Oh that is convenient.*" In the radio service a participant indicated: "*It is very easy to listen to the radio in this manner, you don't need to turn to get to the correct channel*."

Aesthetic and minimalist design

In the Social support service every day the user needs to answer some questions (Step 1). After the questions are answered a box appears summarizing the answers and asking the user to indicate if the responses are correct. The user can confirm with the 'check mark' (Step 2). The fact that a confirmation is asked is understood by most of the participants. After this confirmation a second box appears wishing the user a nice day (Step 3). Again a check mark is present. Participants don't understand that they need to press the check mark again to proceed. They are reading the message but don't expect that they must perform an action to proceed.

Questions (Step 1)

Confirmation answers (Step 2)

Second confirmation (Step 3)

Figure 61 MiBida – Procedure to answer the questions in relation to the social support service

Help users recognize, diagnose, and recover from errors

In the notice board service participants experienced problems when they were asked to write something on the notice board. Some started to try different things, for example they tried the option 'put on the notice board' or pressed outside the note area. Since no error messages appeared some responded like '*Oh now I'm here again*'. Only with assistance from the moderator they were able to complete the task.

In the system a few error messages are available in the system. For example:

Error message when a subject of a note is forgotten

Error message when the content of a note is forgotten

Error message when the questions is the social support service aren't answered

Figure 62 MiBida - Error messages

Some participants expressed that they would like a bit more error messages to be able to solve issues themselves. One participant added: "*Maybe only add the error messages two weeks, after that you are familiar with the system and know how to operate it*."

Help and documentation

In this test scenario, no extra documentation or paper-based user manuals were provided. The idea was to evaluate the system itself and its intuitiveness. Most of people needed some minutes to figure out how to interact, but afterwards they were quite able to perform the tasks. They reported that the system was clear, simple and easy to use: "*If you use it for a while you know how it works.*" Some participants were wondering what they would need to have in their own home if they want to use the MiBida system.

Conclusion

All participants were able to use the MiBida platform after a bit of guidance. Some participants expressed that they felt that they weren't performing the tasks very well but from the moderator point of view no major problems occurred. The use of the touch screen was no problem for the participants.

Participants were enthusiastic about how easy it was to operate the system. This was mainly due to the fact that the number of actions that needed to be performed to operate the system are very limited and everything is in plain sight. For participants that had some computer experience the system was sometimes a bit too minimalistic. Especially when trying the services that had limited functionality they were asking for and expected additional features.

The system is missing a help functionality that would guide the users to solve issues themselves. Some simple guidance would probably be enough to assist the users.

5.2.2.4 Vicasa (SmH)

Vicasa is an ICT concept (service platform) aimed at supporting people with care needs and their carers. It is the aim to increase independent living by providing telecare and additional services via the Vicasa service platform. Central to the concept is a screen-to-screen service for two or more persons (e.g., caregivers, patients, etc.). A precondition is the presence of the Internet. Different types of hardware are available for use, depending on the user's computer skills and role in the process of care (care recipient, caregiver). For the target group of frail elderly, the Vicasa Home Post has been designed with a touch screen and user interface intended to enhance accessibility. A videophone can serve as a means for the caregiver to connect to the Home Post.

The management environment of Vicasa provides the "owner" opportunities in respect to privacy and user control options. The Vicasa platform also offers a variety of messaging features and a calendar. Additional personified applications can be added to the platform and telemonitoring systems (digital scale, blood pressure monitor, blood glucose meter, etc.). The data can be transferred to a central system. In addition to these services, infotainment, exercise programs, eLearning, Internet radio, (church) TV is also offered. The service platform is targeted to be used in nursing homes and senior assisted living environments. In addition to the abovementioned services, automation features Such as opening doors, security cameras, etc., can also be controlled from the screen. In addition to these, the concept can also be expanded with more traditional forms of alarms (e.g., PERS).

Home screen

The home screen consists of a desktop similar to a common Microsoft or Apple Operating System. The main functionalities with supporting services are located in a vertical bar on the right of the screen (see Figure 1.). From the right of the screen, from top to bottom, the red alarm button provides the user a direct call to the nurse or carer. The light blue button represents a personal address book, which can be used to call additional/other persons. The green button represents a message or mailbox, the dark blue button a calendar, the purple button an entrée to games, the weather, and news services. The bottom right button in black/grey represents a functionality to enter a ‘sleep mode’ of the screen / service platform. On the top left of the screen, the day, date, year, and time is displayed. On the bottom left of the screen there is a clickable image to enter the help menu with videos of how to use the main services and functionalities (the image with the

screen and an questioning mark) and the one below with the napkin and the screen a functionality to clean the screen physically – the screen turns black then for 10 seconds and no services can be activated.

Figure 63 Screen capture of the Vicasa home screen with the major functionalities on the right of the screen.

Address book

The address book can be accessed via the light blue button on the right of the screen (see Figure 63). Whenever the button is pressed, the user is presented with the 'Personal Address book' (persoonlijk adresboek). In the address book (see Figure 64), contacts are presented in text in alphabetical order in a pink bar. Whenever the bar is pressed, the specific contact is called by means of the screen-to-screen functionality. To go back, the user has to press the arrow that is pointed to the left, on the top-left of the screen.

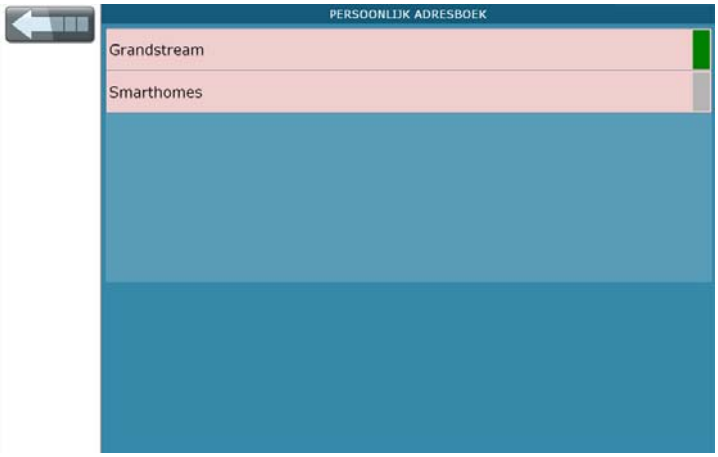


Figure 64 Screen capture of the Vicasa Personal Address book

Messages

When the green button below the address book (see Figure 63) is pressed, a user is presented with the messages that are placed on a pin board (see Figure 65). Images can be added to a message and the user can go back by pressing the left arrow button on the top-left of the screen.

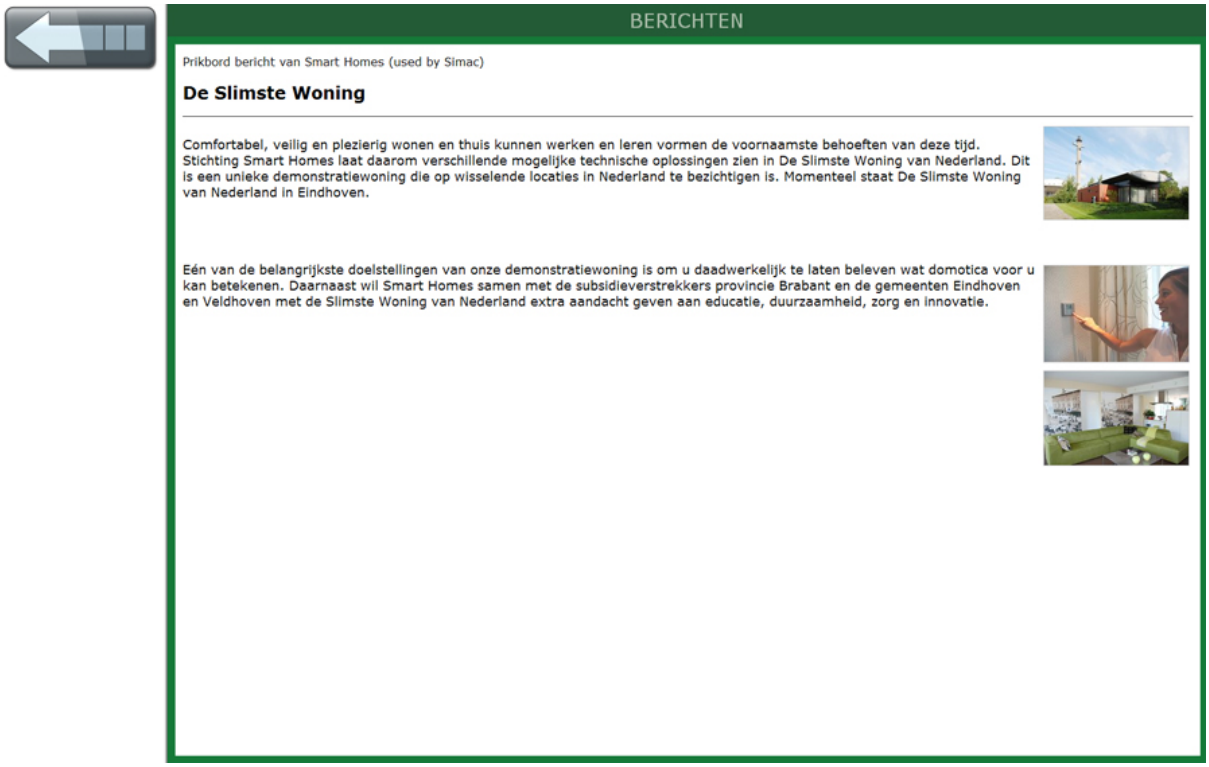


Figure 65 Screen capture of the Vicasa messages/inbox functionality

Calendar

The calendar can be accessed via the dark blue button on the right of the screen (see also Figure 63). Whenever pressed, the user is presented with the screen displayed below (see Figure 66). On the top left of the screen, there is a button in red with which the user can directly call – when pressed - the nurse or other caregiver. To go back, the user has to press the arrow that is pointed to the left, on the bottom-left of the screen. In the grey square on the top-left, the month and year is displayed. Under the date, there is a calendar with squares representing days in a particular month, and the current day is displayed in blue. Some of the days have a small icon displayed under the day, which represents a certain activity or reminder. To go to the previous month, the user has to press the purple address book arrow pointed to the left below the calendar. To go to the next month, the user has to press the arrow pointed to the right. Whenever a certain date is pressed, the user is presented with Figure 67.

The calendar function to add an appointment of reminder (see Figure 67) presents a box over the calendar with on the top a title that presents ‘Agenda for’ the day with date and year. Below the title the appointment or reminder is displayed and on the right it is presented who added the appointment or reminder (in this case ‘Slimste Woning’ = ‘Smartest Homes’). In the bottom left of the square there is a button with a ‘+’. By means of this button, a user can add an appointment for

this day (screen capture is lacking). The blue button with the trashcan on the right provides the user a function to delete an appointment. On the bottom right there is a button 'Sluiten' = 'Close', to close the appointment function and to go back to the agenda overview (Figure 66).

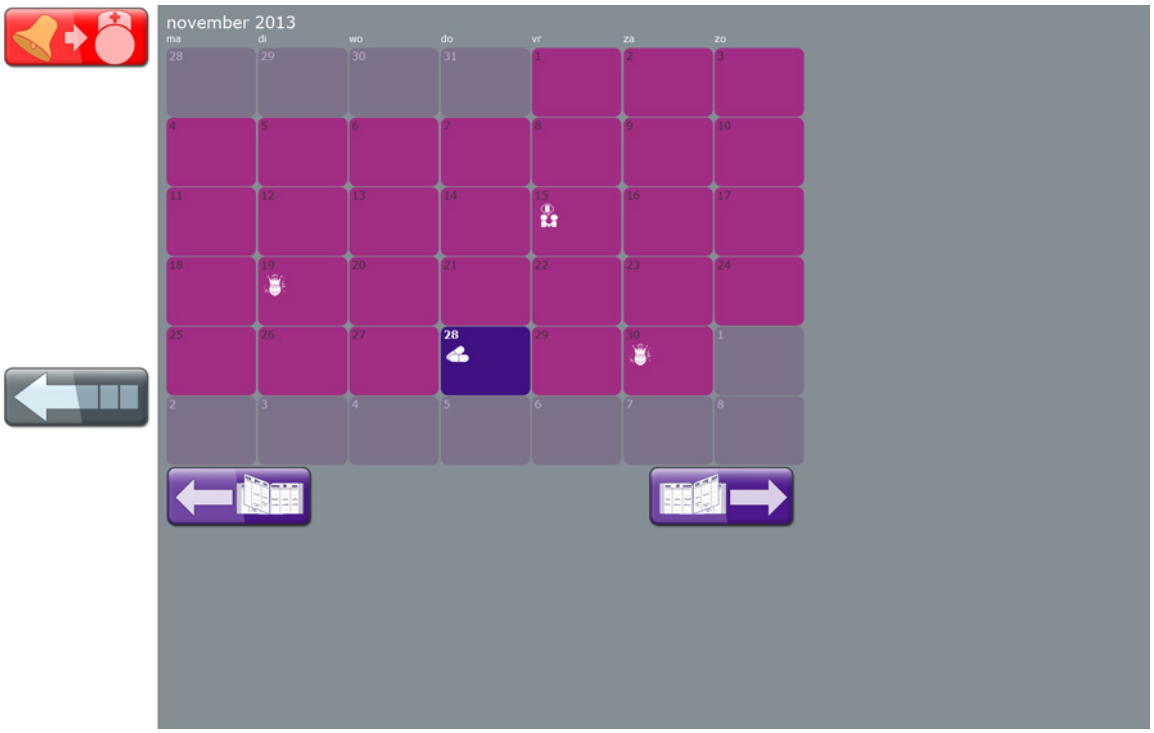


Figure 66 Screen capture of the Vicasa Calendar and agenda functionality.

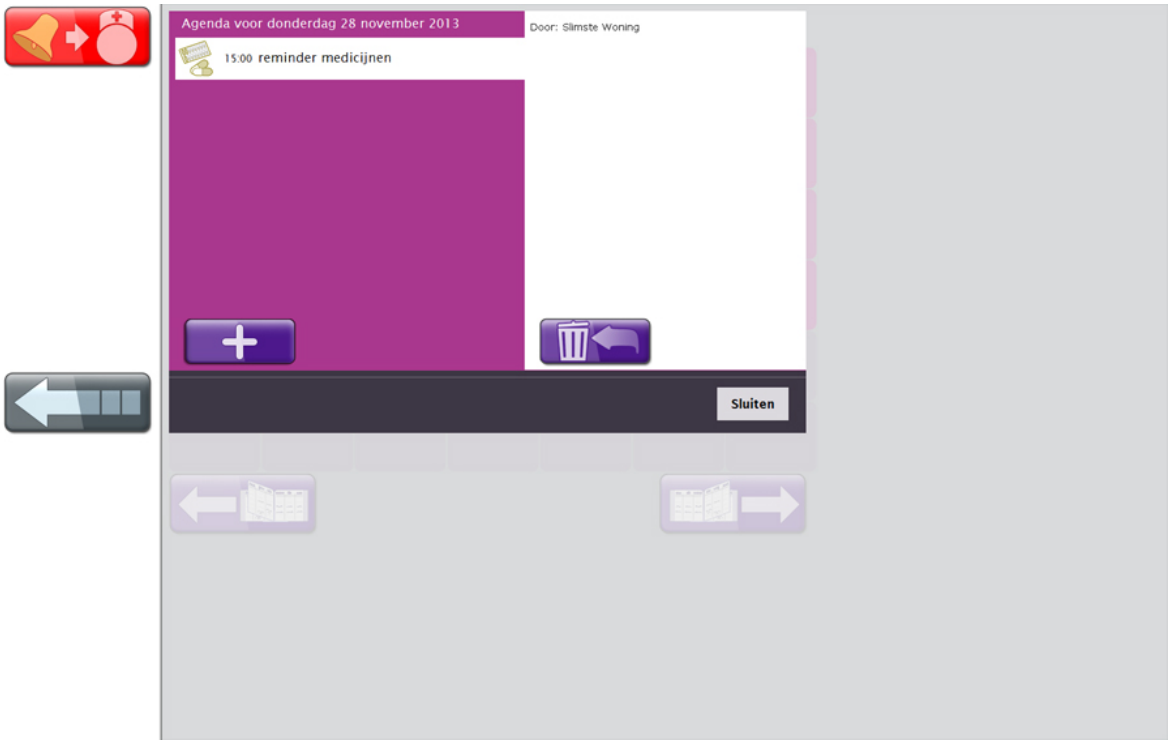


Figure 67 Screen capture of the Vicasa Calendar date function to add an appointment or reminder for the selected date

Enter- & Infotainment

An enter- & infotainment page can be accessed via the purple button (under the calendar button, second lowest on the right of the screen, see Figure 63). Whenever this button is pressed, a user is presented with a number of widgets (in this case 3 with space for more widgets, see Figure 68). Again, at this screen, a user can press the alarm button to call the nurse or caregiver (top left corner); a button is presented on the left with an arrow to go back to the home screen. In the right square with the widgets, the top left widget represents a radio function/service, the widget in the middle a news service, and on the right a weather service. There is space for 9 additional widgets or services.

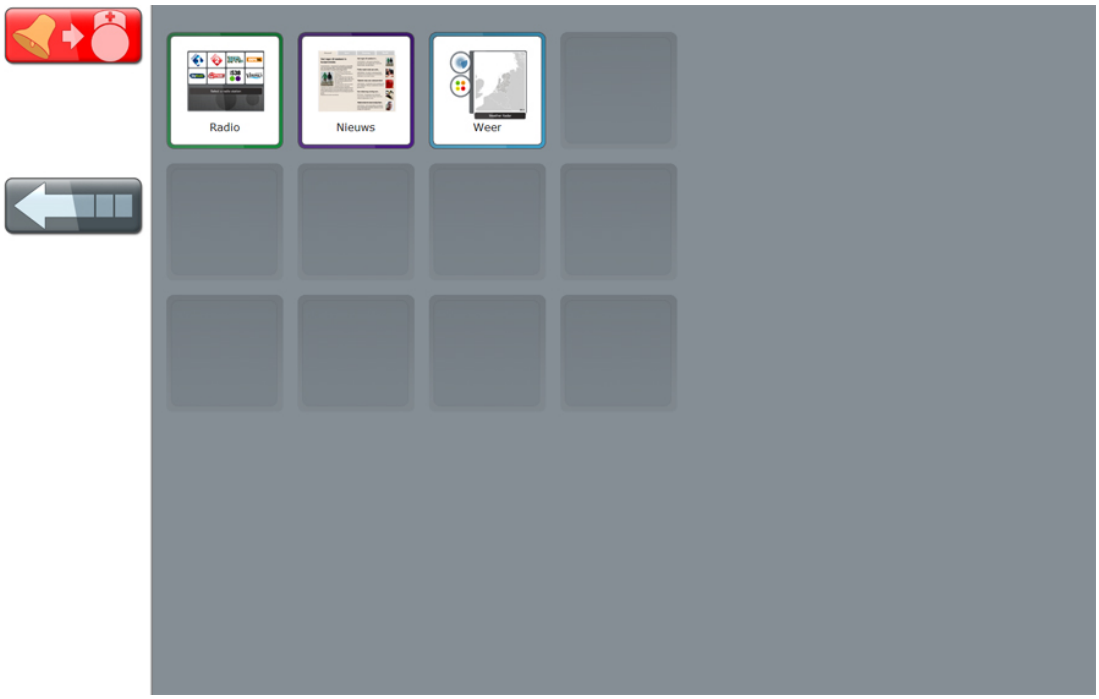


Figure 68 Screen capture of the Vicasa enter- & infotainment page with widgets of the radio, news, and the weather

The radio service (see Figure 69) presents 8 radio stations with their logos. The logos can be pressed to tune in to the specific station.

Figure 69 Screen capture of the Vicasa radio service

The sound volume can be changed by pressing the speaker logo on the left to turn the volume down, and on the right to turn the volume up. It is also possible to press the volume bar to decrease or increase the sound volume.

The weather service (see Figure 70) first presents an empty white square with a sentence 'please select a category'. First a user has to press one of the round buttons on the left of the screen to show the weather radar for rain (top round button), the temperature in The Netherlands (middle button) or the pollen allergy information map (bottom round button). The green smiley face represents no pollen, the yellow mild, the orange high, and the red represents very high change of allergies to pollen.

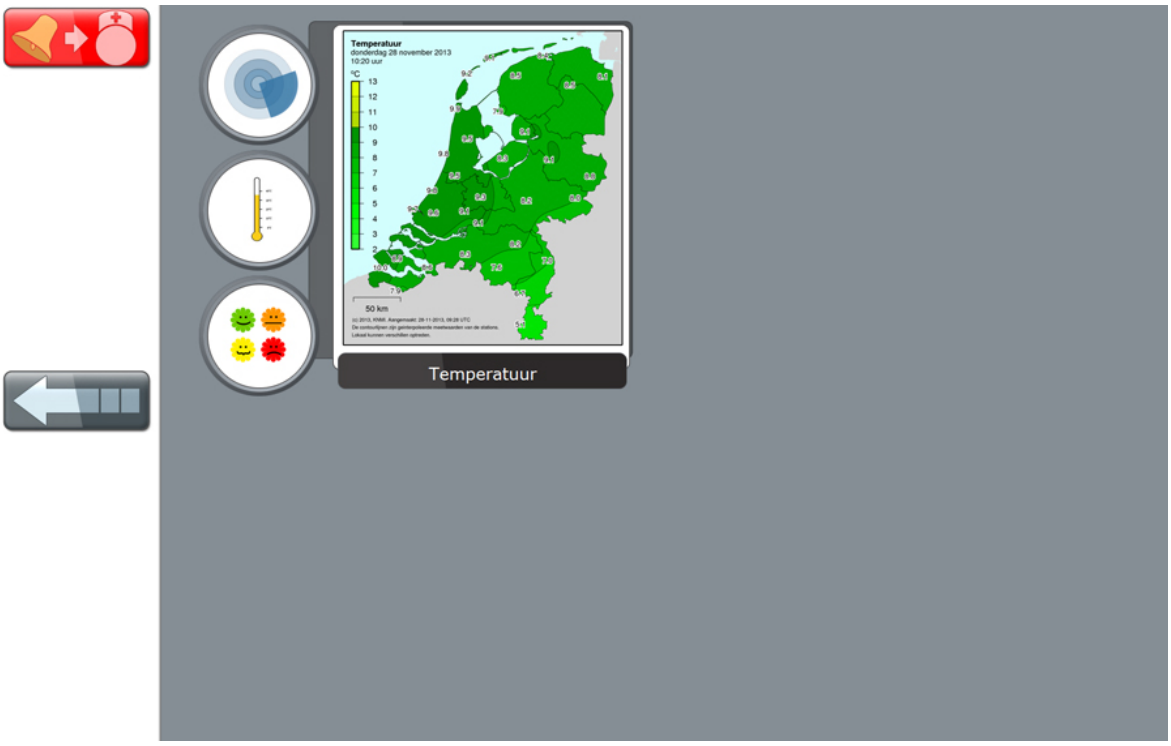


Figure 70 Screen capture of the Vicasa weather service.

Below, a number of images are shown of the evaluation sessions with the Vicasa service platform (Figure 71).

Figure 71 A participant performing tasks during the evaluation session with the Vicasa services platform.

Evaluation based on heuristics and user feedback

Participants had to perform a total of nine tasks with subtasks (e.g., 1a “Call the nurse”; 4a “What is the current time and date”; 5c “Turn the radio on Skyradio”; 9a “Put the screen in sleep mode”, etc.), see method section. Overall, most seniors that participated in the Vicasa evaluation study were able to operate the basic functionalities of the platform and were able to perform tasks. Many of the participants were pleased with the design of the screen, which represents simplicity and consistency. However, although the interface and functionalities seem to have been designed with the end-user in mind, most participants were not able to perform a number of the tasks and all participants seemed to face difficulties with the responsiveness of the touch screen. The findings – including some quotes – are presented and discussed from the evaluation sessions.

Age-related changes

Aging affects general changes (declines) in perception, cognition, and movement control (Bouwhuis, 1992) (Charness & Holley, 2004) (Czaja & Lee, 2003) (Hawthorn, 2000) (Mead, Lamson, & Rogers, 2002), see Table 2 for an overview.

The effects of aging have an influence on how well seniors use existing technologies as well as how they learn to use new technologies (Charness & Holley, 2004), (Morrell, 2002), (Neerincx, Lindenberg, Rypkema, & Van Besouw, 2000), (Xie, 2002). Seniors have been found to be slower than young adults on information retrieval tasks (Freudenthal, 2011) (Nap, De Greef, & Bouwhuis, 2005) on 3D navigation using desktop systems (Sayers, 2004), and on Web navigation (Neerincx, Lindenberg, Rypkema, & Van Besouw, 2000). Freudenthal (Freudenthal, 2011) found that deep menu structures are less suited for seniors than for young adults. In addition, seniors who have been raised in a different technological generation (e.g., the mechanical generation), than young adults, have been found to face difficulties interacting with layered interfaces (Docampo Rama, 2001).

Ability	***Age-related Change***
Vision	
Colour vision	Difficulty discriminating certain wavelengths, particularly blue-greens.
Contrast sensitivity	Increase in minimum luminance contrast needed to resolve high spatial frequency patterns.
Glare sensitivity	Increased susceptibility to glare.
Temporal resolution	Increase in minimum detectable temporal frequency (flash rate).
Visual acuity	Decreased ability to resolve small details.
Visual selection	Difficulty selecting relevant information in a display that contains relevant and irrelevant information.
Audition	
Auditory frequency range	Decline in sensitivity to high frequencies.
Auditory sensitivity	Decreased ability to distinguish among tones.
Auditory selection	Decreased ability to separate speech from background noise.

Cognition	
Working memory	Reduced capacity to maintain information in active memory.
Spatial visualization	Reduced ability to hold and operate on spatial representations in working memory.
Language comprehension	Decreased ability to process complex text.
Episodic memory	Poorer explicit memory for specific events and their contexts. Slower acquisition of new knowledge.
Semantic and procedural memory	Previously acquired general knowledge and skills are well maintained. Slower acquisition of new skills.
Movement control	
Fine motor control	Decreased ability to manipulate very small controls.
Noise to force ratio	Decline in accuracy of rapid movements.

Table 2 Age-related changes in perception, cognition, and movement control (Mead, Lamson, & Rogers, 2002).

Specific guidelines for seniors have also been developed that account for the changes in perception, cognition, movement control and system knowledge, see

Table 3 for an overview.

Typography

Guideline	*Improves*
Strive* for 14 pt. font size for body text and 18-24 for headers	Reading Acuity, Reading Speed, Resolution
Use sans serif font types like Geneva or Helvetica	Reading Acuity, Reading Speed
Use bold; Avoid italics	Search
Use mixed case; avoid using uppercase text	Lateral Masking, Reading Speed
Use left justified text; avoid centered or full justification	Reading Speed, Eye Movements
Strive* for leading greater than single spacing	Reading Speed, Lateral Masking
Line Lengths between 45-60 characters	Eye Movements, Search, Reading Speed

Layout

Guideline	*Improves*
Use black text on white ground	Acuity, Contrast Sensitivity, Glare
Use white space actively	Search, Reading Speed
Avoid multi-column format or frames	Eye Movements, Distraction
Use consistent placement of page elements	Search

Organization

Guideline	*Improves*
Reduce text from print by 50%	Search, Legibility, Distraction
Minimize number of hypertext links in a line of text	Search, Distraction

Separate steps of a procedure using #s or bullets	Search
Use headings or subheadings	Search, Organization
Present an alphabetical index	Search
Cue important information	Search, Eye movements

Navigation

Guideline	*Improves*
Use large buttons with symbols and text	Search, Mouse Coordination
Provide visual feedback upon selection	Mouse Coordination
Minimize need for scrolling	Search
Increase the size of peripheral elements	Peripheral Detection
Use yellows/blues for important information in the periphery	Peripheral Detection

Graphics

Guideline	*Improves*
Strive for consistency, simplicity, and meaning	Search, Distraction
Strive for clear graphics	Contrast Sensitivity
Place text on unpatterned backgrounds	Acuity, Contrast Sensitivity, Search
Use colour judiciously, consistently & with purpose	Search, Selective Attention
Avoid using similar hues, pastels, or blues/greens together	Colour Discrimination
Avoid flashing/blinking text	Distraction

Continued

Other

Guideline	*Improves*
Be aware of how information looks printed	Legibility
Allow distance and height of monitors to be adjustable	Presbyopia, Glare
Encourage the use of high resolution screens	Reading Acuity, Contrast Sensitivity, Reading Speed, Search, etc.

* = font size and line lengths should be adjustable by the user.

Table 3 Interface design guidelines for seniors (Echt, 2002)

Vicasa Results

Age-related changes

The guidelines described above to compensate age-related changes in the design of GUIs should rather be accounted for in the design of service platforms as Vicasa.

From the study with the seniors it appeared that the date and time on the home screen are difficult to perceive for seniors (small font size and light grey on grey contrast). Overall, most of the fonts were too small, in particular the temperature readings (e.g., 14^0) and the QWERTY keyboard. Furthermore, the icons in the agenda that represent certain reminders like medication, birthdays or appointments, were not perceived as an image, but as a white dot or undefined signal. In addition, the tabs in the news menu were not perceived as a button to browse through the news items. The purple on purple/black contrast in the agenda is difficult to perceive and a high contrast colour palette is advised to use in Vicasa.

Touch screens vary in responsiveness and it could be stated that the Vicasa touch screen was difficult to use by all seniors and the screen responsiveness to a press was low. Some participants used their nails, a hard press, swipes or multiple presses to make the screen respond to an action, yet, this did not result in an expected output. The lack of responsiveness also made it difficult to operate small buttons. Overall, the Vicasa screen could be enlarged or buttons and text could be enlarged since there is unused space on the screen.

Visibility of system status

Overall, the Vicasa system's GUI provides users graphical feedback about the current location and where a user could go to. However, the system does not provide feedback on an action. The system could simply provide textual and graphical feedback that a certain action was performed and could or could not be performed.

Match between system and the real world

In respect to the problems that seniors were facing performing the tasks on the Vicasa service platform, relatively most were related to a mismatch between the system and the real world. A number of the participants seemed to perceive the address book icon/button as a means to go to messages and even more to go to the agenda. Some participants reported that the address book icon represented a newspaper. In addition, the agenda was perceived as messages and the purple button to go to additional services (weather, newspaper, games) as a function to go 'only' to the games services, i.e., it was perceived as games.

Other buttons were also perceived as having a different functionality then intended by the designer(s). The back button (an arrow to the left) was not always found as a function to go back. News and the radio could not be found since the purple button was perceived as a button to go to games. The button to add (toevoegen in Dutch) was interchanged with confirm (bevestigen in Dutch). Some participants pressed the sleep button on the right of the home screen to go to the radio function. It was said that the sleep button could lead them to a radio alarm clock. Other pressed the clean screen button to find the radio. Furthermore, news was expected to be found either under 'messages', which resembles a real newspaper or under the personal address book (which also resembles a newspaper). As mentioned, the small icons in the agenda were difficult to perceive. The pills icon was not perceived as such, while the 'bell' icon was perceived as a reminder to take your pills. The small graphics – smiley faces – to present the chance of having allergies due to the amount of pollen in the air were perceived as suns, i.e. temperature.

The agenda function is interesting. Whenever a person is used to fill in an agenda for 50-60 years of

his life by writing the date/time and the appointment in a paper agenda, why do they have to fill in a 'Subject' in a digital agenda? Many participants did not understand what 'subject' means, probably because they do not use e-mail. The agenda – as other agendas - are designed as if it is an email. In the agenda, there is the '+' button to add a new appointment, yet, the button was not perceived as a function to add an appointment. While add (toevoegen in Dutch) was perceived as making an additional appointment.

Whenever the participants were searching for the weather service, it was expected to be found under 'news', likely because the weather is always presented at the TV news bulletin or in the newspaper. Vicasa could easily add a link to weather in the news section. In addition, the radio service was perceived by one of the participants as a place to find 'news' (news radio).

On the home screen, the metaphor of the person sleeping in the bed to put the system in a sleep mode was somewhat confusing. Some participants perceived as 'me' who is going to sleep, in fact, it is a person sleeping (not a system). Finally, calling the nurse has also been confused with the 'sleep state' of the system. Since it is a person lying in a bed (possible sick, so represents a call to the nurse).

User control and freedom

Overall it could be stated that participants perceived control and freedom on the Vicasa service platform. Nevertheless, some participants perceived problems in respect to 'situation awareness', in particular how to go back. As described above, the arrow to go back, but also the arrow to go forward is not perceived as such. For some participants – probably with little typing experience – the QWERTY keyboard was unclear and some did not perceive the QWERTY keyboard onscreen as a tool to fill in information. Similar to findings from Nap (Nap, Stress in Senior Computer Interaction, 2008), participants were not able to delete text and were therefore not in control to change a mistake on the keyboard, because they did not understand the term/symbol 'backspace'. Similar problems were experienced with changing lowercase fonts to capital. Furthermore, participants expected that titles were clickable in the agenda, while they were not. As mentioned above, the touch screen was difficult to press by all seniors, some used their nails and others tried to press really hard (no response).It was unclear why, but the touch screen did not always respond to users who pressed the 'i'.

Furthermore - in respect to control and freedom - the agenda function was troublesome since most participants were not able to add an appointment in the agenda. It was almost impossible to control the time/date in the agenda. Furthermore, in the agenda, users need to fill in the date of an appointment, while the date has already been selected while they pressed the date 'square' to make a new appointment. To select a category at the weather service, it is written 'Select a category'. At least one participant clicked on this sentence to select a category and it could be argued why users first have to select a category while they (e.g., the temperature) could also be immediately presented on screen. Users have control in respect to turning on the radio, yet, it is not possible to listen to the radio and read the newspaper. Whenever you leave the radio screen, then the radio is turned off. In the radio section, it happens on occasion that the radio is not playing songs, i.e. lack of control. There is not feedback (everywhere actually) that some button has been pressed or that an option is not working.

Consistency and standards

One of the major design recommendations is: 'do the same as everybody else'. In addition, be consistent in design and functionality. The date and time that can be filled in the agenda has a title for 'end time', but not for 'starting time', which is not consistent. The agenda has a top-down navigation/fill-in style and has a focus on the functionalities on the left of the screen, yet, users have to press an arrow that is pointed to the right on the right of the screen to go one step further.

Error prevention

Overall, there are no to little errors possible on the Vicasa service platform. Nevertheless, one error – which is easy to prevent – occurred on multiple occasions. Whenever a participant made an error by accidentally pressing 'back' in the agenda function, while almost everything was filled in, then all the information is gone and everything has to be filled in from scratch.

Flexibility and efficiency of use

As mentioned, in the temperature menu, users first have to select a category before anything is shown. Could present the temperature immediately with options for allergies etc.

Help and documentation

In Vicasa, there are instruction movies on how to operate the platform. Yet, the movies are not consistent (some with a person operating the screen, and others with a screen capture program). It is interesting to note that one of the participants - with possibly a beginning stage of dementia - thought that he performed the tasks while watching the instruction videos.

Additional services

At the end of the Vicasa sessions, participants were asked if they could come up with additional services. Hereby in non-particular order a number of quotes from the participants:

> *"Add a connection possibility to the GP."*
>
> *"Would like to call the kids whenever there is an emergency, then the neighbors, then my good friends. This should be a direct link/possibility on the home screen"*
>
> *"Would call the doctor, GP. Help! I am alone. Is there anybody who wants to drink a cup of coffee with me?"*
>
> *"Internet services, e-mail, Skype and Video"*
>
> *"Neighbourhood care 'wijkverpleging', possibility to report a health complaint"*
>
> *"A 'real' newspaper, watching TV and a TV guide, a cooking advise for making diner, where to go to today?"*
>
> *"Adding a regular Internet function. Nevertheless, the system is handy because you do not have to buy an 'additional' computer. When you have limited space, and you do not have room for all sorts of equipment"*

"Sending e-mails, paying bills, news"

General:

It is possible to select the text and boxes on the screen (become blue)

'It is not possible for me to send an email on the PC, yet, with this system it is working and it I learn from it"

Conclusion

This report described the functionalities of the Vicasa service platform and the results from the evaluation sessions with the seniors from The Netherlands and Belgium. In general, the Vicasa system was relatively easy to use. Nevertheless, as with any other system and GUI, usability problems are present and these were described in detail and categorized per usability heuristic. In particular the agenda functionalities on the Vicasa service platform are difficult to use and only a few of the participants were able to add an appointment – most could not add an appointment in the agenda. In addition to the problems with the agenda, multiple graphics, titles, buttons and icons were misinterpreted by the senior participants. It is advised to ensure compatibility between the knowledge and experience of seniors and the GUI design. Icons can be supported by text and overall the font size could be enlarged, including the buttons, since there is plenty of open space on the home screen and service screens. It is also advised to ensure that the hardware – in particular the touch screen – is made more responsive, i.e., a press with a nail should initiate a 'key press'.

It should be noted that there are probably more positive Vicasa UI aspects than negative, and most participants were able to call the nurse and perform other simple tasks on the system. Most participants were positive about the colour usage, relatively large buttons and low information clutter. However, the system could be enhanced with some minor design changes to increase the ease-of-use to its full potential.

5.2.2.5 Quantitative analysis: usability(SmH)

Please note that the usability scale was recoded with respect to ATTACHMENT 5, with 7 a high/positive score (i.e. strongly agree) and 1 a low/negative score.

		Overall Usability	System Usefulness	Information Quality	Interface Quality
MiBida	Mean	5,38	5,45	5,16	5,58
	N	22	22	22	22
	Std. Deviation	1,27	1,48	1,28	1,39
Viedome	Mean	4,57	4,41	4,52	5,06
	N	22	22	22	22
	Std. Deviation	1,21	1,36	1,18	1,33
ABC	Mean	5,17	5,21	4,79	5,82
	N	20	20	20	20
	Std. Deviation	1,36	1,61	1,44	1,10
Vicasa	Mean	5,03	4,98	4,80	5,65
	N	25	25	25	25
	Std. Deviation	1,07	1,18	1,29	1,17

Table 4 Mean usability scores (Overall Usability, System Usefulness, Information Quality, and Interface Quality) (Lewis, 1995), per service platform, with number of participants per group and Standard Deviations.

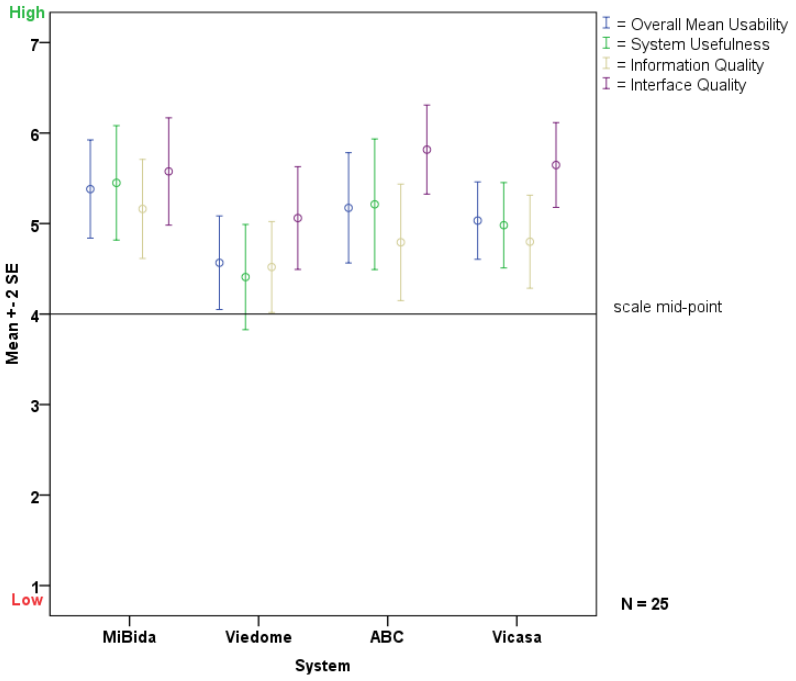


Figure 72 Mean usability scores (for the categories Overall Usability, System Usefulness, Information Quality and Interface Quality) per service platform with Error Bars (+/- 2 SE)

Device – main effects

Linear Mixed Models analysis (LMM) was performed for on each usability component with Device (MiBida vs. Viedome vs. ABC vs. Vicasa) as within groups factor, and Participant as random factor. A significant main effect was found of Device on Overall Usability (F(3,62.09) = 3.46; p=.022), System Usefulness (F(3,62.51), = 3.96; p=.012), and Interface Quality (F(3,61.72) = 2.94; p=.040). No significant main effect was found of Device on Information Quality (F(3,61.99) = 2.09; p=.111).

Device – contrast analysis

Contrast analyses revealed that the Overall Usability was significantly lower for Viedome, than on MiBida (p=.002), ABC (p=.045), and Vicasa (p=.045).

System Usefulness was also significantly lower for Viedome than for MiBida (p=.001), ABC (p=.022), and Vicasa (p=.04).

In respect to Interface Quality, Viedome scored significantly lower than MiBida (p=.039), ABC (p=.014), and Vicasa (p=.014).

5.2.2.6 Focus groups (SmH)

From the observations in the user sessions and from the discussions during the focus groups afterwards, we can clearly conclude that the majority of the participants was enthusiastic about the possibilities that such service platforms can offer, and that they liked the different systems. Whereas a minority of the participants reported the technology as too difficult for older adults with no computer experience at all, most of them where surprised about their abilities to cope with it after just a few hours. Several older adults mentioned in the focus groups that they are not capable of using a normal computer, but they believe that they will manage to get used to these service platforms. Moreover, only 30minutes of experience with one of the platforms gives them a start in trying out the others, meaning that their overall level of computer/technology skills improves.

Nevertheless variation is reported about the user-friendliness of the different platforms. Not all participants were unanimous, but in general the Vicasa and MiBida platforms were evaluated as the most easy one, and Viedome as most difficult. ABC TV was also seen as easy to use, but some modules (external websites) caused difficulties, and the remote control interaction was evaluated as slow and cumbersome. Although the participants managed quite well, they mentioned that the platform developers did not think very well about certain aspects and the platforms and they reported design flaws. A few examples:

- Unclear where a certain pictogram or button stands for
- Colors do not match people's expectations
- Too much clutter on the screen
- Problems with sensitivity of input devices

The four platforms that were evaluated in the user sessions offered a combination of comfort and care services. Due to the available care services, some of the participants reported that such a stigmatizing platform was not targeted at them, because they did not need care yet. They believe that such a platform is built for people that are alone, lonely and care-dependent. Only a few

participants (including the man for who we assume dementia) mentioned that dealing with such a platform is too complex for older adults. The majority agrees that it is important to start learning such a platform in an early stage. When technology is applied for enjoyable and attractive services they are more willing to do efforts to learn. When people – at a later stage – need more support, care services could be added to the platform, and they will know how to deal with it. Additionally, it is mentioned that it would be advisable to integrate such technology in a device that people already have or buy anyway. Consequently, the older adult does not need to be convinced to buy extra equipment.

Flexibility in the offer of services – like the example above where you can add care services when needed – is seen as beneficial. Some of the users will prefer a wide variety of services, whilst others will choose for a basic system with limited functionality. Many of them are interested to know what happens in the local area but also in the larger world around them. They are willing to be social active, search for information and participate in society. Today's older adults have a busy life, and do not accept having to wait for the moment that the TV broadcasts the information they are looking for. They want to be able to access the information they want at the moment they want. Some of the participants do use a computer for that, but they admit that it is not always easy for themselves or others. One of the participants has used TV teletext quite a lot, but this medium is less used and therefore less information is shared via this channel.

Video-communication appears to be the most preferable service. Also looking for old or new friends, people with the same interests and group calling is liked. Of course people prefer to have face-to-face contact, but when impossible they would enjoy video-communication a lot. They also see video-communication as an opportunity to see family and friends more often. Whereas people believe in maintaining the social network via video-communication, several participants have doubts about making new friends online. Besides social networking, also shopping services, an agenda, an overview of local activities, email, TV guide, exchanging recipes and photos, social media and searching for news, weather forecasts and information are proposed as services to brighten up older adults' lives. A minority would like to add online banking to the platform as well, but wonders about data security.

Besides comfort, wellbeing and entertainment, a service platform can offer added value in terms of safety and care as well. Video-communication can also be used for teleconsult with care professionals, door-video-intercom and online training sessions. Also professionals like lawyers, insurers, cooks, bank employees, and police agents could give advice electronically. A shopping service – above mentioned as comfort – can also be used to order and deliver medication and/or meals-on-wheels, in this way improving people's independence. Also alarm services like MiBida's "zorg voor elkaar" where people check the status of family and friends on a daily basis, social alarms and fall detection services can offer an added value with respect to the perception of safety, for both the client and their family carers. Depending on the health status services for telemonitoring would be of interest as well.

Although people do not want a service platform just for care services, they do see the added value it can offer to manage your life in times of health deterioration. From all today's contact moments with health care or social care professionals, many could also be replaced by a virtual, remote variant. When clients – in this case often patients – can do certain tasks themselves (or supported

by volunteers and or informal carers), care efficiency can be increased and care costs can be decreased. Nevertheless, questions are raised during the focus groups about the workload on care professionals if they have to check the telemonitoring data, set appointments in people's agendas and so on. Since clients are supported by the platform to do more things by themselves, also the burden on informal carers can be decreased.

Presenting the services via a TV-platform – as proposed in HEREiAM – is seen as a strong point. In particular the large size of the screen is seen as beneficial. Further it is nice that you do not have to buy extra equipment like a computer or a specific device that stresses the fact that you need support. The TV is often located in the living room which is a space for being together and enjoying yourself. Therefore, the platform can be seen as a gadget for comfort, joy and social connectedness. Some participants mention the idea of sitting together with their partner in the couch and having video contact with family or friends. Since the TV has a prominent place in the living environment, it is also an ideal medium for medication reminders. For some care-related services, however, privacy is reported as an issue. In these situations solutions need to be found. Ideas for using a TV in the bedroom or an extra interface on a tablet are raised by the participants as possible solutions.

With respect to financing, it is important to take into account that authorities all over Europe decrease their budgets for care, and that people have to pay for much more services by themselves. According to the participants in the focus groups, it is important that you only pay for what you need or for what you want. When you really want something or you really need something, you are willing to pay for it. Moreover, when the user has to pay for it himself, people will be selective, which will lead to cost savings. For the device itself, it would be nice if you can use a device that you already have, or a device that can be used for multiple activities and services. With respect to the services, a modular approach is preferable so that you chose and pay only for the functionality that you want or need. When certain care is required for a specific person, it could be possible that care budgets could be used to pay for certain services like a teleconsult with a care professional or telemonitoring. Some participants expressed that they are willing to spend a few hundreds of euros for a system that can prevent institutionalizing. Of course the willingness-to-pay is strongly related to people's income and people's needs, two factors that can vary a lot.

5.3 User sessions in Italy

5.3.1 Demographics participants

November 2013, first day of testing: twelve seniors (M_{age} = 69.72; SD_{age} = 6.6; 3 female) members of the local elderly association "Società di Sant'Anna ONLUS" in Cagliari, Italy were invited for the testing of two existing service platforms. With the exception of two participants, everyone wanted to try, at least, one of the systems proposed. With regard to educational qualifications, the majority of participants had a high-school diploma, one of them a degree and the rest a primary or a secondary school certificate. Seven of the participants lived together with their partner, two with sons and three people lived alone. In respect to computer and Internet usage, the majority of the participants uses them every day or, at least, every week. A few of them said that they never use them. The answers for PC and Internet are identical, this suggests that when people use the PC, the main reason is to go online. Regarding the tablet, the situation is diametrically opposite: almost everybody said that they never use it, only a few use it regularly. Eleven of the participants used a

mobile phone and everybody watched TV on a regular basis (11 daily, 1 weekly). Regarding the health-oriented technology, only a few participants asserted that they use it regularly. Half of them admitted that they never use it.

January 2014, second day of testing: eighteen seniors (M_{age} = 70.83; SD_{age} = 5.2; 12 female) members of the local elderly association "ANTEAS Associazione Nazionale Terza Età Attiva per la Solidarietà" in Cagliari, were invited for the testing of the two service platforms. The majority of participants had a high-school diploma (55.6%), two of them a degree (11.1%) and the rest a secondary school certificate (33.3%). Sixteen of the participants lived together with their partner, only two of them lived alone. In respect to computer usage, the frequency of usage was lower than the participants from Sant'Anna (6 never, 1 less than once a month, 2 more than once a month, 1 weekly, and 8 daily). Seven participants never used the Internet and one participant reported to have used a tablet. All participants used a mobile phone and seventeen reported that they watched TV on a daily basis (1 weekly).

The answers given in the user profile questionnaire are summarized in the following figures. Figure 73 shows which ICT technologies are daily used by respondents while results related to their leisure activities and lifestyle are shown in Figure 74.

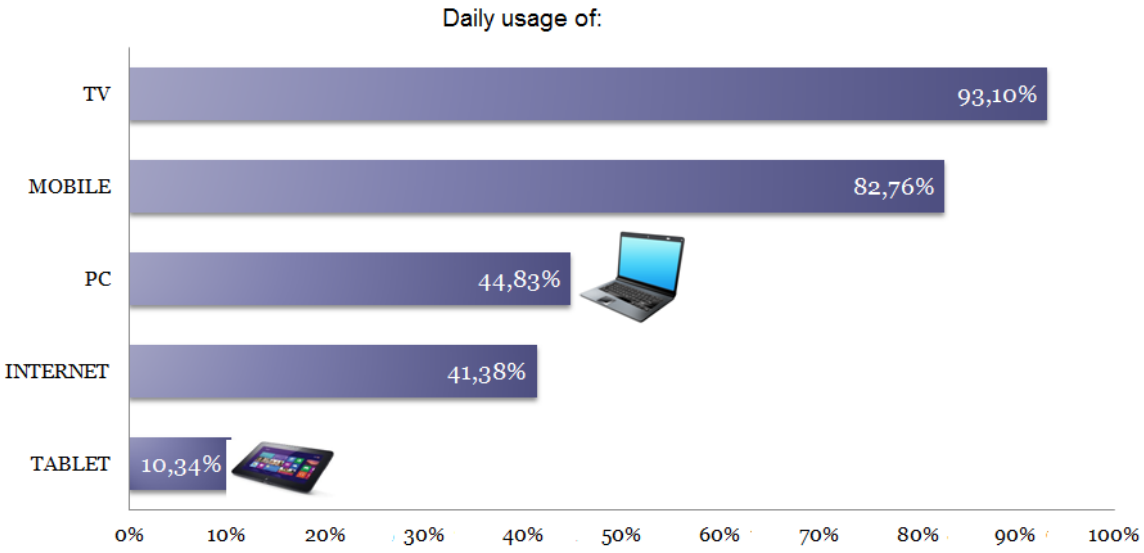


Figure 73 User profile questionnaire: analysis of the answers related to the daily use of ICT technologies

Question: How often do you perform the following activities?	Never	Every year	Monthly	Every week	Daily
- Gone out (e.g., shopping, bus trip, restaurant) with relative(s)/friend(s)	6,90%	10,34%	20,69%	17,24%	44,83%
- Organizing social gathering/meals	10,34%	37,93%	24,14%	20,69%	6,9%
- Physical activity (e.g., walking, sports, gym)	17,24%	3,45%	6,90%	27,59%	44,83%
- Play card games	67,86%	14,29%	7,14%	3,57%	7,14%
- Go to cultural events (e.g., museums, concerts…)	14,81%	33,33%	11,11%	22,22%	0%
- Travel	13,79%	65,52%	17,24%	0%	3,45%
- Play board games	86,21%	10,34%	0%	3,45%	0%
- Craftwork	17,24%	17,24%	13,79%	13,79%	37,93%
- Play brain-teasers/puzzles	68,97%	6,9%	0%	13,79%	10,34%
- Play computer games	72,41%	0%	3,45%	6,9%	17,24%

Figure 74 User profile questionnaire: results related to the leisure activities

5.3.2 Findings

Including members of two different elderly associations we had a mixed participant group with a variation gender, age, education, family situation and affinity with technology. Therefore, we are confident that the findings can be extrapolated to the target population. The majority of participant was easily able to complete their tasks quickly and efficiently without any trouble. In general the participants were enthusiastic about the functionality of the systems and about the added value a service platform could offer them. Various participants were surprised about their skills in dealing with unfamiliar technology. In the following sections we will first go through the two different individual service platforms. Based on heuristic evaluation techniques, the observations of the experimenters and comments from the participants during the user sessions, each platform is evaluated qualitatively. Second, the user friendliness (measured via the IBM usability questionnaire (Lewis, 1995)) of the different platforms is compared.

5.3.2.1 KeepInTouch

The purpose of the session was to understand users' feeling about the use of KeepInTouch (KIT), a low-cost tele-home-care system based on the Digital Video Broadcasting Terrestrial Technology (DVB-T) (Angius, Pani, Raffo, & Randaccio, 2011), (Angius, Pani, Raffo, Randaccio, & Serius, A tele-home care system exploiting the DVB-T technology and MHP, 2008).

The goal of KIT is to give older or disable people the chance to monitor their blood pressure, cardiac frequency, weight and glucose levels from the comfort of their own home and to share results in real time with doctors. Since it employs common TV sets, we conceived that KIT was a good opportunity to explore how successful a TV-based service platform is in its mission to be user-friendly for senior citizens and how it must be improved for better ease of use.

The participants were equipped with a TV set transmitting the KIT application, a remote control, a sphygmomanometer and a personal body scale. They were invited to do well-defined tasks with the KIT system, while their behaviors were observed.

Visibility of system status

The xlet-KIT application runs directly on the decoder from the selected TV channel; no action from the patient is required. It manages data acquisition and transmission to the remote health center for patients pressure, weight and glycemia measuring. The graphical user interface available

for the KIT care service consists of three main environments (see Figure 75). On the top-right corner of the screen, a small area provides the TV program being broadcasted simultaneously by a local channel. On the top-left corner, a larger panel with word balloons helps patients in the process of acquisition and transmission of their physiological parameters. The patient's name, the patient's physiological measurements and eventually physician's feedback messages are displayed on the bottom of the screen. The patient interacts with the service by pressing proper buttons on the set-top-box remote control. The user uses different colored remote control buttons of the decoder in order to transmit the results to the remote health center.

Figure 75 Screenshot of the KeepInTouch Xlet for physiological parameters measurements

Description of the tasks

The trial was carried out using the KIT system, a sphygmomanometer and a personal body scale. Before starting with the test, users were encouraged to become familiar with the system for a few minutes. We have evaluated the user ability to interact physically with the application, focusing on the efficiency of the system. The user was able to complete the tasks?

Figure 76 A participant performing tasks during the evaluation session with the KeepInTouch services platform

The goal was to identify any usability problem and determine the users' satisfaction and perceived usefulness in the use of the system. During the test, users were invited to complete the following tasks:

Task 1 - Measure personal weight. Test users were invited to measure their personal weight and to press the blue button on the remote control to share results with the health care provider.

Figure 77 TV-Screen capture of the KeepInTouch send data page

The steps we expected the user to go through in completing the task are shown below:

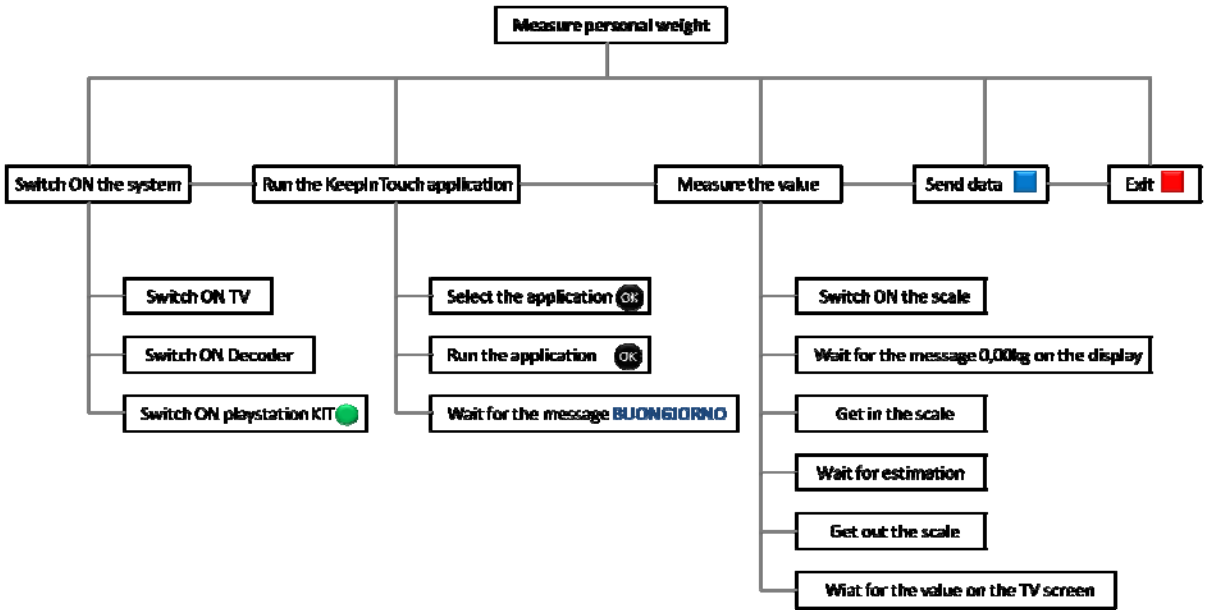


Figure 78 The steps required to be completed in Task1 during the evaluation session with KeepInTouch

Task 2 - Measure pressure. Participants were asked to measure their blood pressure value using the sphygmomanometer and to press the blue button on the remote control to share results with the doctor. The steps we expected the user to go through in completing the task are shown below:

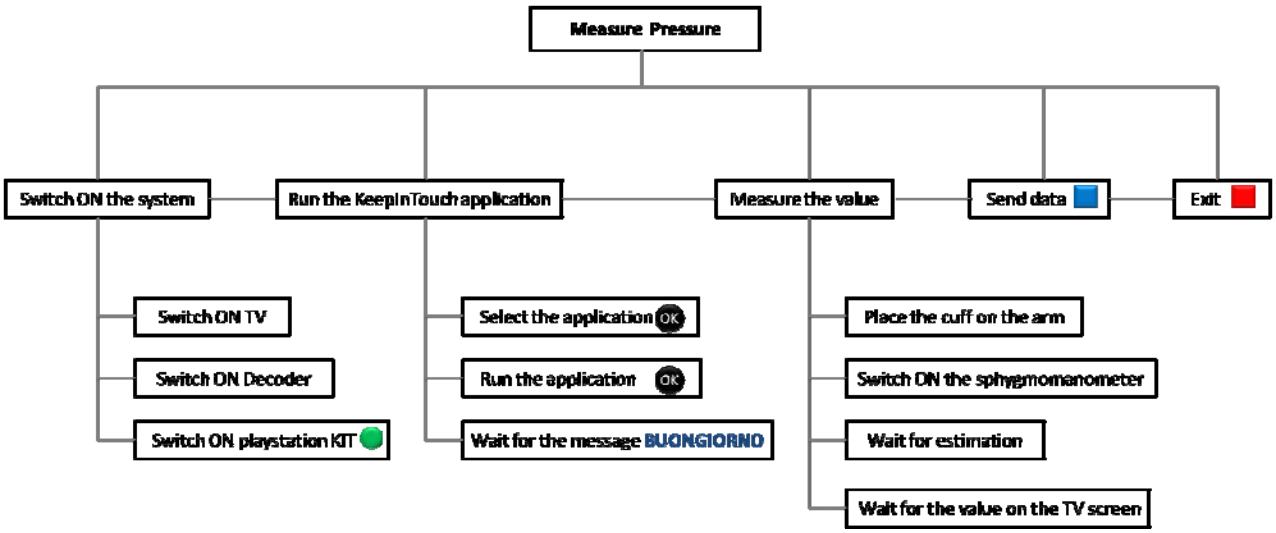


Figure 79 The steps required to be completed in Task2 during the evaluation session with KeepInTouch

Evaluation based on users feedback

The study involved 14 participants (5 male and 9 female). Ages varied from 63 to 82 years old. All the participants were interested in joining the experiment and in applying what they had seen during the KIT system presentation.

Before the test, participants reported that they had familiarity with the use of a remote control but limited experience using colored-buttons. The majority of them had difficulty understanding the relation between color and function reported in the X-let application. Despite that, the 85.7% of the participants was easily able to complete their tasks quickly and efficiently without any trouble. The majority was very satisfied with the user-friendliness of the KIT system.

Regarding Task 1, most of the participants were able to measure their weight and to send results pressing the blue button on the remote control without any training time. The scale required participants to tap it, to wait for three zeros to appear and then to step on it to get their weight recorded. Only one participant (76 years old) had difficulty with this task and needed assistance. More in detail, in the beginning he had difficulty in turning the scale on. He was supposed to "tap" it with his foot to activate it, but nothing happened when he tapped. After several attempts he was able to turn the scale on, but then he had troubles in understanding when to step on it. He didn't wait for the zeros to appear and he got an initialization error on the display. Moreover, some respondents were of the opinion that a wide scale platform should be adopted, providing more surface area on which to stand.

Although participants were familiar with taking the blood pressure measurement, some of them had difficulties in placing the cuff and in switching on the sphygmomanometer during the Task 2. Whenever they attempted to start the measure, the Start button was pressed twice turning off the device. Two participants were concerned because their values were particularly high, they re-checked 2 times and values barely went down.

Figure 80 Participants performing tasks during the evaluation session with the KeepInTouch services platform

Regarding the KIT interface, some participants didn't like how results were displayed on the TV screen. They were of the idea that an easier interface with less options and graphics (sponsors, Partners' logos) and bigger fonts could be preferable. Some participants were of the idea that the TV screen should be organized in different way, showing only the results (weight and pressure values) and the options EXIT and OK. The broadcasting of the television program during the use of the system was considered useless by the majority of the participants.

Positive comments

Positive comments from participants about the KIT system:

"I like the idea of reading my weight on the TV screen rather than on the scale display at ground level. I don't have to strain my neck to look down. That's nice" (Participant 2, 76 years old, male)

"I think that the possibility to manage my health status at home and to transmit data to clinicians is actually a great alternative to moving into the medical office" (Participant 8, 70 years old, male)

"I really like this system, it's simple to use." (Participant 2, 67 years old, female)

"I think that this platform could give me more motivation to lose weight and stay healthy. If data could be shared every week with a trained specialist, I would be interested." (Participant 8, 71 years old, male)

Negative comments

Negative comments from participants about the KIT system:

"I'm not sure that I would use this platform by myself since I'm not entirely comfortable with using it without your supervision" (Participant 4, 74 years old, male)

"I get confused if the screen displays the application and a television program at the same time. I prefer to stay concentrate on my task." (Participant 7, 63 years old, female)

"It would be really great if there was a way to send data automatically to the Doctor any time a value is measured, without using the remote control. I get confused with all these colored-buttons and there are too many information to read on the TV screen" (Participant 9, 82 years old, female)

"For the moment I feel good and everything is going well. Why should I measure my blood pressure daily? I don't have a need for it at the present time. I'm not sure that I would use this system." (Participant 13, 72 years old, male)

Conclusion

Thanks to the information gathered during the user sessions, we can draw a few general conclusions about the KIT system. Regarding the instrumentation used, it could be better to change the body scale with an automatic one. The one we used required participants to tap it, wait for three zeros to appear and then to step on it to get their weight recorded; these actions were not very intuitive to perform. The new body scale should be automatic, with no tapping or waiting time. Also, it should be bigger than the one used, in order to make them feel well in balance and not afraid to fall.

Analyzing the participants' comments about the KeepInTouch interface, we can state that a few changes are in order:

- The hints given by the virtual nurse appear too big and, according to some participants, they are unnecessary. It could be useful to change the text or provide suggestions in a different way.
- The streaming of the TV channel during the measurement of the physical parameters, the way it is, is a little bit distracting. It could be better to present it differently (only audio, in background…).
- Many participants suggested that it would be better to see the data measured in a bigger font size, in order to see them more clearly. Another suggestion is to automatically send the data to the doctor, once the measures are done, to avoid confusion due to the colored buttons. The clearest window could be with only the patient data (name and measures) and the "Exit" button.

5.3.2.2 Eldy

The purpose of the session was to understand users' feeling about Eldy, a free software package conceived by an Italian nonprofit organization and designed specifically for seniors who have little or no computer experience (Eldy, 2014). The goal of the software is to help senior citizens use computers and access the internet. Thanks to Eldy, users were able to experience an interface that makes easier to read the latest news, see weather forecast, send an email, video-call friends and share photo, just with a touch of the screen. Since it is completely free (available to download at www.eldy.eu) and covers 25 different languages, we conceived that Eldy software was a good place to start in order to establish how users from Cagliari experience the usage of a touch screen interface and to understand in which services they fit better.

Users were equipped with the tablet Samsung Galaxy Note 10.1 pre-loaded with the Eldy software and they were invited to do well-defined tasks with it or simply asked to explore it freely, while their behaviors were observed. No extra documentation or user manuals were provided because we wanted to evaluate the interface itself and its intuitiveness.

Visibility of system status

The Eldy system exists out of 9 explicit services, presented by 9 large buttons on the screen, each with a different icon. The simple nine-buttons main menu "The Square" has large text and color

contrasts that makes it easy to see, understand and operate (Manoim, 2011).

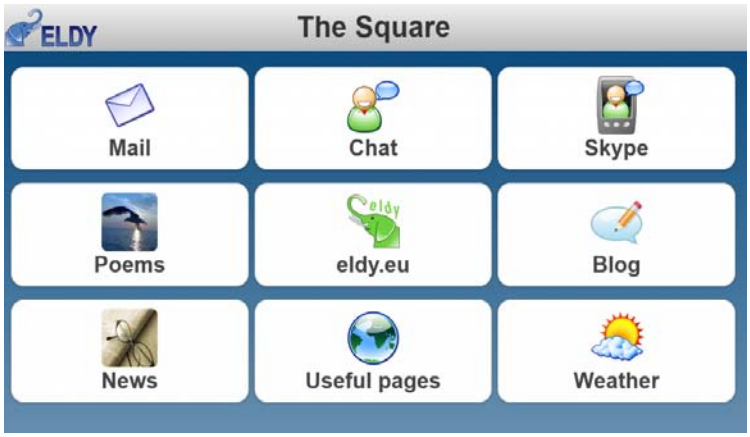


Figure 81 Screen capture of the Eldy home screen

Description of the tasks

The trial was carried out using the tablet Samsung Galaxy Note 10.1, pre-loaded with the Eldy software. We have evaluated the user ability to interact physically with what was shown on the screen, focusing on the efficiency of the system.

- The user was able to complete the tasks?

During the test, users were invited to complete the following tasks:

Task 1 - Looking for the weather forecast. Test users were invited to read the current conditions for the city of Cagliari, the forecast for later in the day and for the day after. Since the application allows to check the weather forecast for any city in Italy, participants were asked to get information regarding another city, clicking on the bar next to “how is the weather in:” and selecting the city they’re interested in.

Figure 82 Screen capture of the Eldy Weather forecast functionality

The steps we expected the user to go through in completing the task are shown below:

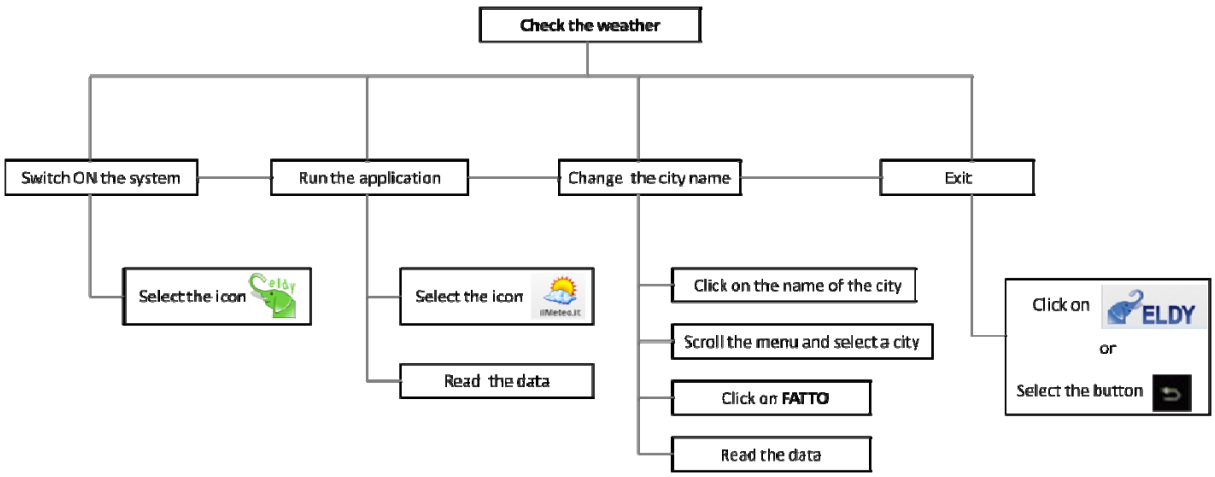


Figure 83 The steps required to be completed in Task1 during the evaluation session of Eldy

Task 2 - Looking for an on-line newspaper. Participants were asked to look for an on-line newspaper, clicking the icon News from the main menu and selecting the newspaper they're interested in.

Figure 84 Screen capture of the Eldy Newspaper page

The steps we expected the user to go through in completing the task are shown below:

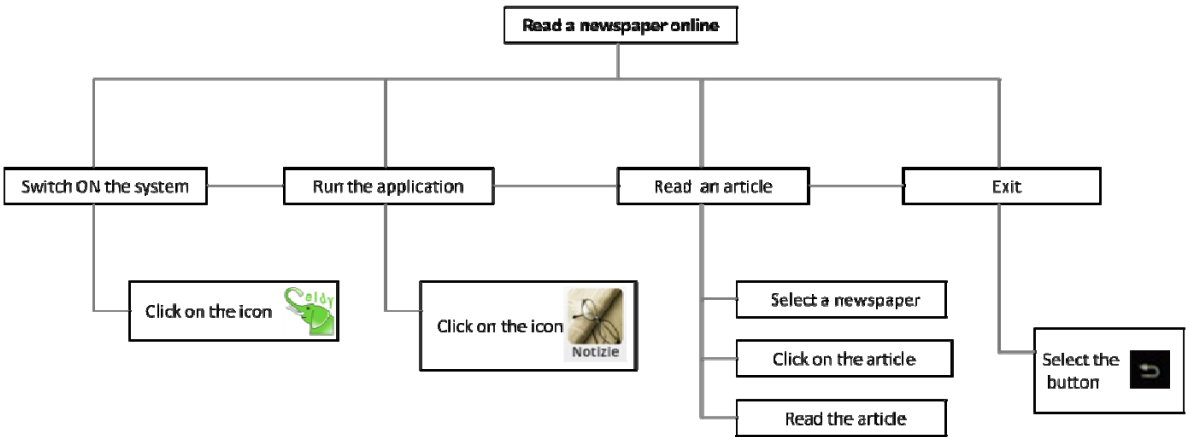


Figure 85 The steps required to be completed in Task2 during the evaluation session of Eldy

Task 3 - Writing a text. Participants were invited to type their name using a touch-screen keyboard. Before the test, we explained that when a new sentence is started on a touch-screen keyboard, automatically the first letter is uppercase and everything else is lowercase.

Evaluation based on users' feedback

The study involved 14 participants (6 male and 8 female), all members of local elderly associations with reasonable health and vision. None of them were experienced with tablet devices before. Ages varied from 63 to 82 years old.

Participants found the software engaging and helpful. Overall, the majority of the users was easily able to handle the touch-screen interface intuitively and pick up the gestures quickly. The majority was positive about the user-friendliness of the Eldy application. In particular, some users were enthusiastic about the speed with which they can check weather conditions/forecast or keep up on the latest news from around the world.

Figure 86 Participants performing tasks during the first day session with the Eldy services platform

Although the interface was perceived as clear, well structured and understandable by participants, some of them had difficulties in selecting one specific city on the touch-screen during the Task 1. Whenever they attempted to scroll down the list of the cities available, the Home button of the tablet was selected and the central home screen was displayed, making it extremely hard to select one city.

Figure 87 Participants performing tasks during the second day of evaluation session with the Eldy services platform

Regarding Task 2, when looking for newspaper articles some participants clicked on button "Useful pages" instead of "News". The majority of the participants were able to browse through the newspaper external webpage but the layout was quite disorganized for them (pages with too many advertisement, links and sponsored stories) and the article content wasn't visible at a first glance. During Task 1 and Task 2, some participants were complaining that although you can expand the font size, the applications do not really adjust the page so you end up scrolling a lot. Lastly, the difficulty with the Task 3 for most participants was to type capital letters on touch screen. Some participants

pressed and held (or pressed twice) the shift key before to start typing the first letter of their name and got confused when all capital letters appeared.

Only one participant was familiar with the Eldy software and what it proposed. He reported that his daughter installed a version of the software in his PC at home and that it is a simpler way to use email. After that some users were more interested in exploring the Poems application, rather than performing the proposed tasks. They were enthusiastic about the possibility of reading poetry and of sharing their poetic works with others.

Positive comments

Positive comments from participants about the Eldy software:

“This device offers some fun and entertaining apps that might keep me busy at home. I’m very interested in submitting my poetic works in this system and receiving comments from other users. I think it would be fun.” (Participant 13, 72 years old, male)

“I’m a limited computer user but this tablet seems to be very easy to work with. I would use it daily to read the newspaper.” (Participant 1, 70 years old, female)

“No more cables? Great.” (Participant 5, 72 years old, female)

“I like these larger icons that make easier to see the different choices you can make.” (Participant 2, 80 years old, male)

“I like this interface to check the weather because it doesn't have too many dialog boxes popping up” (Participant 5, 70 years old, male)

“I will be recommending this device to my wife who wants to use the computer/Internet, but is easily frustrated with the whole thing and she is afraid to try.” (Participant 6, 75 years old, male)

“This is something that I can actually function and use.” (Participant 7, 63 years old, female)

Negative comments

Negative comments from participants about the Eldy software:

“I had to scroll the menu a lot to change city in the weather application. It would be too annoying for me.” (Participant 3, 71 years old, male)

“I’m okay with the touch-screen, but I’m not sure if I want to use it all the time. It seems to require good control for gestures. It would be tiresome” (Participant 5, 72 years old, female)

“I like pushing buttons, I don't like the touch screen” (Participant 2, 80 years old, male)

“Honestly, I have no need for these services right now” (Participant 5, 70 years old, male)

Conclusion

Analyzing the results of the test regarding the Eldy system, we were able to evaluate the participants’ appreciation to the services offered by the system. They appreciated very much the “Poetry”, “Weather” and the “News” services. The thought of having a reading activity to perform as a diversion during the day was considered a very nice idea by the majority of the participants. Speaking

about additional services, some of them reported that they would also like the possibility to have games to play, even though in the questionnaire very few of them affirmed to play card, board or pc games. Regarding the possibility of having grocery delivered at home, everyone affirmed that they would much rather going shopping by themselves than order it, because they see the shopping activity as a pleasant way of going out, meet and talk to other people. The same concept applies to the e-prescriptions: they prefer to go to the physician in person, because it is an excuse to spend a few hours with other patients. With these information in mind, we can think about implementing those services only in case the users have had some injury that suddenly forces them to stay at home.

5.3.2.3 Quantitative analysis: usability

		Overall Usability	System Usefulness	Information Quality	Interface Quality
KIT	Mean	2,21	2,11	2,53	2,68
	N	14	14	14	14
	Std. Deviation	1,09	1,28	1,29	1,40
Eldy	Mean	2,34	2,26	2,65	2,02
	N	14	14	14	14
	Std. Deviation	1,00	1,46	0,62	1,64

Table 5 Mean usability scores (Overall Usability, System Usefulness, Information Quality, and Interface Quality) (Lewis, 1995) per service platform, with number of participants per group and Standard Deviations.

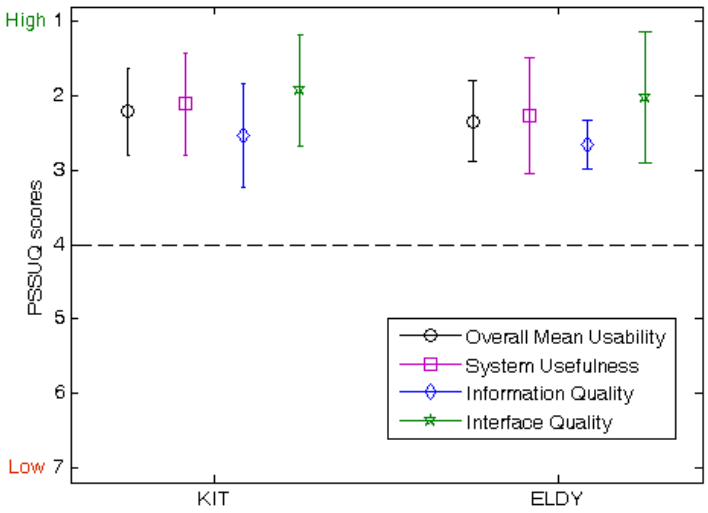


Figure 88 Mean usability scores (for the categories Overall Usability, System Usefulness, Information Quality and Interface Quality) per service platform with Error Bars (+/- 2 SE).

Despite the claimed user-friendliness and the overall positive feedback by the group of expected users about Eldy, compared to KIT, the two platforms mark very similar usability scores on the PSSUQ. As we can see in Figure 88, both the platforms scored highly on the scale, their scores fall above the average score of 4 and there were no significant difference between them.

6. Requirements

The HEREiAM consortium aims at developing a service platform that goes beyond the success of today's service platforms. To become successful, it is important that the platform fits the needs of both clients and third party service providers. Therefore it is important to develop specific and correct platform and services requirements for the different stakeholders.

During the project, working systems will be piloted and evaluated in real homes. Therefore feasibility, reliability and implementation are of great importance. When developing a platform for a large-scale roll-out (after the project duration), requirements for efficient management and control are also crucial.

6.1 Client perspective

HEREiAM aims at improving well-being, independence, safety and health, by developing a TV-platform to offer a wide variety of services in the homes of older adults. Such assistive systems can assure basic support for daily activities, detect health critical situations, and stimulate social and psychological engagement. As a result, elderly can live longer independently and comfortably in their own domestic environment. The HEREiAM user interface – the graphical user interface (GUI) on the one hand, and the interaction modalities including the remote control on the other hand – will be the link between domestic technology and the older target users. Since older persons are often shivery in accepting and using new technologies, an attractive and user-friendly interface is indispensable. The user interface should lower the threshold for older adults to start using new technologies, by making it easy, familiar, and enjoyable. Besides usability, also issues like configuration, personalization, support, privacy and security play an important role.

6.1.1 Designing domestic technologies for older adults

From literature and from the user sessions we have organized we can draw conclusions about the relationship between the aging process and technology. It revealed relevant insights about factors hindering older adults' accessibility and acceptance of new technologies and suggest how "traditional" Human-Computer Interaction (HCI) principles should be reconsidered to meet older adults' needs; it is crucial, in these respects, that the peculiar social, psychological, cognitive, perceptual and motor factors related to ageing be considered when designing acceptable and usable artefacts. In the next sections, we summarize the state of the art of studies considering age-related changes and acceptance issues.

6.1.1.1 Aging and perceptual, motor and cognitive changes

Several studies report the implications for the design of digital technology of age-related changes in functional capabilities (Czaja & Lee, 2003). Perceptual, motor and cognitive capabilities change when aging. Designing technologies for older adults means, first of all, to carefully take modifications in these abilities into account. Indeed, usability problems often lead older people to experience dissatisfaction when operating with technologies, with the eventual consequence of rejecting them. Several studies demonstrated for instance how texts can become difficult to read, metaphors and icons difficult to be interpreted, how memory and motor problems can make it hard to operate a system (Rogers, Mayhorn, & Fish, 2004).

Sensory changes

Sensory changes occur when aging, even if they do not necessarily occur at the same time and with

the same speed for all individuals. The major age-related sensory changes impacting on design occur in eyesight, hearing and touch. Most widespread vision problems are: degenerative changes to pupil, iris and sclera that entail the need for more light, the increase of sensitivity to glare and the decrease of light/dark adaptation. The decrease in the elasticity and strength of eye muscles causes poor eye coordination and diminished peripheral vision. Other changes in vision entail a decreased near vision (presbyopia), decreased accommodation to near/far objects, distortion of colours (blue/green spectrum), difficulties in perceiving moving objects and complex figures. These changes have important consequences above all for the graphical representation of digital content. Changes occur also in touch sensitivity: with aging, you may experience reduced or changed sensation of vibration, cold, pressure, and touch. Even if it is difficult to understand the causes of these changes, findings on the implications for the design have begun to emerge, with respect to both handheld remote controls and touch screen interfaces.

Hearing problems are also related to the aging process. Czaja and Lee (Czaja & Lee, 2003) report that the main problems are: loss of sensitivity of pure tones (high frequency), difficulties in understanding if speech is distorted, problems in localizing sound source, and increased sensitivity to loudness. Implications for design include: difficulties in understanding synthetic speech and in understanding high frequency alerting sounds.

Motor difficulties

Changes in motor abilities include: slower response times, decline in the ability to maintain continuous movements, disruptions in coordination, loss of flexibility and greater variability in movements (Czaja & Lee, 2003). These changes have implications, above all, for the performance of older adults in using mouse and keyboard (e.g., point and click, double click, and dragging are difficult). Lots of studies suggest considering alternative input devices.

Cognitive changes

Aging is associated with the decline of diverse cognitive abilities: attention, working memory, inference formation and interpretation, encoding and retrieval in memory, and information processing speed (Czaja & Lee, 2003). However, beside the decline in abilities, recent developments in cognitive psychology demonstrated that it is important to consider also the adaptive and compensatory processes of the cognitive functioning. For instance, studies demonstrated that, in the absence of pathological phenomena, when sensory abilities decrease, perception remains nearly unaltered (Pravettoni, Cesa-Banchi, & Cesa-Bianchi, 1995).

This is due to the compensating effect that cognitive cross-modal re-allocation has on lower performance of sensorial organs (Grafman & Litvan, 1999).

Attention changes as well. Researches have shown that with elderly people, attention is more strongly related to motivation and emotions rather than to stimuli coming from the outside world. This effect is related to the progressive loss of performance (typical of mild cognitive impairments due to aging process) of the prefrontal cortex that couples the stimuli from the outside with those from the soma. This progressive degeneration diverts older people attention from new or challenging stimuli, to concentrate on what they are prepared to interpret (Mather & Carstensen, 2005). Another effect of this degeneration is the progressively increasing difficulty in learning abstract concepts and notions, as well as new procedures. Once again, motivation and emotions

can play a major role: for instance, elders learn better by doing than through processing abstract information and procedures storage and retrieval (Cunningham, 1988).
Another main cognitive change regards memory loss. The information encoding process and the working memory show a progressive decline during the aging process. Episodic memory is especially impaired, due to impoverishment in the ability to refresh recently processed information. In addition, older adults tend to fail at remembering the source of their information. Instead, long term and procedural memory are saved from the degenerative process (Nilsson, 2003). HCI studies investigating the impact of cognitive age-related changes on the design of technology tend to focus on the decrease of elders' functions and on the resulting weakening of abilities; the result is a technology-mediated assistive/prosthetic slant both in the identification of functionalities, and in system design. The field still lacks an appreciation of the importance of the compensatory processes described above, and an understanding of the ways to make the best of them (Czaja & Lee, 2003).

6.1.1.2 Aging and acceptance issues

User acceptance can be defined as the demonstrable willingness within a user group to employ information technology for the tasks it is designed for. Studies conducted on elderly people usage of IT technologies (PC, mobile phones, Internet) demonstrate how the reluctance of adopting communication technologies is not only due to a lack of skills but, above all, to the absence of perceived advantages and benefits (Melenhorst, Rogers, & Caylor, 2001). Selwyn (Selwyn, 2004) observed that older adults' ambivalence with respect to ICT originates from the limited perceived relevance to day-to-day life. As the relevance of a new artefact depends also on contextual (social, cultural, environmental, psychological) aspects specific to a target group, HEREiAM's first goal was to understand the meanings and the values underlying the relationship between older people and technology, and the motivations supporting the use or non-use of digital artefacts. In the next subsection we discuss initial findings from user studies.

Digital technologies are often perceived as superfluous and useless: older adults do not perceive the benefits and opportunities that technologies can provide to them; on the contrary, technology is scary, unknown and unfamiliar. In several cases it was difficult even to speak about the "technology issue" because of an a-priori rejection of something perceived as stranger and belonging to "another world". It is actually the "otherness" of digital technology and the lack of an anchorage to elders' practical activities the main barrier. On the other hand, digital technology is perceived as meaningful when associated to the activities and needs of other categories: older people consider technology as a requirement for young people who want to keep up with social changes, or associate it to professional work or leisure activities.

Digital technology as a challenge. However, for a growing part of the elders, technology provides a range of potentially useful artefacts. Even if they have never operated a computer or the Internet, some elders are able to anchor and see technological aspects in their practical activities, interests and desires. Besides being considered as an opportunity, digital technology is also seen as a challenge: from participants' accounts the tension is clear between the awareness about benefits (above all, the access to information, maintain distant relationships) and the costs and resources (both cognitive and economic) needed to access them.

The model of "Selective Optimization with Compensation" (COS) developed by Baltes and Baltes (Baltes & Baltes, 1990), explains why it is more difficult for older people to cope with the challenges of adopting new technologies and new practices. The model posits that "people increasingly tend to focus their limited energy on activities and domains that they perceive as being most essential and valuable in their lives". The perception of high benefits associated with the adoption of new technologies is therefore an important incentive to motivate older people to cope with perceived costs and effort associated with the usage of a new technology (Melenhorst, Rogers, & Caylor, 2001).

6.1.1.3 Moving from the workspace to the domestic environment

Recent studies point out that designing technology for the home – and more particular for the living room – presents specific challenges. Albeit the design of workplace technologies – focused on productivity and efficiency – is facilitated by the existence of well understood approaches, the design of domestic technologies requires the re-thinking of principles and methodologies. Besides usability, other issues become central: emotion, affection, pleasure, and aesthetics. Home is a private and intimate place where artefacts and technologies are "embedded within an ecology that is rich of meaning and nuance" (Bell, Blythe, Gaver, Sengers, & Wright, 2003). With the aging process the home acquires other meanings and values. As stated by Oswald et al. (Oswald, Wahl, Naumann, Mollenkopf, & Hieber, 2006), "the home becomes more relevant to people as they age, due to the increased time they spend at home, as well as the many activities that take place there". All these considerations emphasise the importance of the notion of user experience for the design of home technologies, a notion where the user, the objects and the context of use are integrated in a network of actions and interactions. User experience must find a place and an importance in the design of home technologies that is at least identical to that occupied by the traditional concerns for cognitive and functional aspects.

Another relevant (and not completely distinct) aspect relates to the notion of the 'self', and the importance of the home to maintain identity and personality (Oswald, Wahl, Naumann, Mollenkopf, & Hieber, 2006). Older people often perceive the danger of losing their homes as connected to the risk of losing an important part of their selves (Oswald, Wahl, Naumann, Mollenkopf, & Hieber, 2006); the same authors also stress the active behaviour of older adults in adapting their home to their changing needs: the "environmental proactivity" hypothesis posits that older adults are active in changing housing conditions in order to maintain independence. For instance, the "environmental centralization" is a way for older adults to maintain control and enhance competence in the house: the preferred places at home are those where the important things are positioned (remote controls, TV, telephone, etc.) and/or control is exercised over (e.g., windows, the entrance).

6.1.1.4 Summary of major implications for design

Drawing from the analysis presented above, we have identified the following general requirements and principles for a sound and effective design.

- The consideration of age-related changes in perceptual, motor and cognitive abilities is required to guarantee accessibility. However, awareness of the importance of these aspects must be coupled with the acknowledgment of the importance of the compensatory processes that older people develop to adapt to the changes, and by the crucial role played

by motivation, affection, and experience ("learning by doing") in supporting them.

- Acceptance of IT technologies is a complex and multifaceted issue. Drawing from theories of aging and from the user sessions findings, we argue that one of the primary goals of the design is to turn technology into something "familiar", i.e. artefacts that are perceived as belonging to our own world, that fit into our daily practices, and that can be interpreted and used exploiting common and practical knowledge acquired through experience. "Familiarity" knocks down two main barriers to the accessibility to, and acceptance of, digital technologies: the lack of perceived advantages of the technology, and the perception of a negative trade-off between the investment of personal resources required and the expected benefits.
- Finally, the design should be grounded on the affective and aesthetic value of artefacts besides that on efficiency-oriented principles, and should consider the specific meanings and values associated to the home, e.g. the role of the home in maintaining identity and independence.

6.1.1.5 Requirements

Requirement 1	**Address everyday problems and enhance perceived usefulness**
Description	Make sure that new technologies fit in the daily lives of the older adults or relates to their daily activities, so that the users see the usefulness. Training programs should strengthen users' perception of advantages and benefits. • Platform that can host a wide variety of services where the older adult can choose from, ranging from comfort services, welfare, safety and care. • Platform can vary in complexity according to the needs of the older adult.
Rationale	User studies show that reluctance to explore new technology in elderly people is due not only to a lack of skills but, above all, to a lack of perceived advantages and benefits. When older adults see the added value of new technologies, they are willing to do an effort to get used to it.

Requirement 2	**Make use of familiarity-based design**
Description	Technologies should look familiar to the user or appeal to familiar features. • The platform should be offered on a TV, a device where almost all older adults are familiar with. • The system – but also user manuals – should make use of words, phrases and concepts that are familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
Rationale	Familiarity-based design can lower the threshold in trying and accepting new technologies. What is new, unexpected or unknown is perceived with suspicion, concern or awe. Providing a device that looks familiar could prevent rejection.

Requirement 3	**Design for the living room**
Description	The living room is a common space in the house used by different people for a wide variety of purposes, ranging from social activities, entertainment and relaxation. The system should fit well this atmosphere. • Avoid movable objects with wires, to maintain tidiness, and to avoid as much as possible additional risks for falls or occupation of (already reduced) available domestic space. • Both the devices itself and the graphical user interface (GUI) have to be aesthetically pleasurable and adapted to the living room environment. • The appearance should not be stigmatizing.
Rationale	What is of added value for one person is not necessarily for others. Each individual has different skills and needs. Each individual should experience both perceived usefulness and perceived usability.

Requirement 4	**Design for reduced physical and cognitive abilities**
Description	Design of interaction interfaces should take into account sensory changes, motor difficulties and cognitive decline. • Readability of information. Make use of large font sizes, strong contrasts and fonts that are suitable for either an interface or a manual (eyesight). • Sounds have to be loud and not abrupt. Age-related sensory changes such as hearing problems can cause loss of sensitivity of pure tones (high frequency), difficulties in understanding if speech is distorted, problems in localizing sound source, and increased sensibility to loudness. Implications for design include: difficulties in understanding synthetic speech and in understanding high frequency alerting sounds (hearing). • Avoid complex hierarchical structures. The information structure has to be as linear as possible, restricted to maximum three levels, in order to minimize the number of steps to reach a given screen (cognitive load). • The interface must look tidy and organized. A simple, minimalist style should be preferred to a complex and elaborated style. Avoid clutter and decorative elements that serve no functional goals, since it distracts users from necessary information (cognitive load). • All elements of the interface should be clear and unambiguous. Graphical rendering of digital objects should use a stylized rather than a realistic way. Digital objects should not display too many details and information (demands too much sensorial and attentive resources). • Use animations sparingly and purposefully. Quick animations are

	difficult to perceive. Animations should be smooth and slow. Animations imply a shift of attention and elderly people need quite more time to perceive, follow and interpret them than young users. • Give users the time to respond to read and respond. Avoid messages that appear automatically.
Rationale	Insufficient adaptations to age-related changes leads to difficulties in dealing with technology, frustration and possibly to rejection.

6.1.2 Graphical User Interface for TV

Unlike other media that were born interactive (e.g. computers), television becomes interactive after a long time of existence and coexistence with the public. By connecting interactivity to television, the development of design must always observe the viewer's baggage and customs based on simplicity of approaching information by means of this communication vehicle. People are used to watch TV only as passive viewers. Gomes (Gomes, 2008) argues that the great design challenge for interactive television is to make viewers notice artefacts in an interface that will encourage them to respond and take action against a background that previously did not demand much from their participation.

Gomes emphasizes that the environment in which television is watched is one of the factors that influence design solutions for an interactive interface. It is also necessary to assess how viewers are accustomed to using the remote control and their behaviour that often varies with the social context in which they are inserted, their age and even the time of day that the interactive program is running. From the perspective of the viewer, Junot (Junot, 2010) suggests that "the interaction with the television content can be performed by graphical interfaces, whose functions can be activated by buttons on the remote control."

The relationship of these interfaces can be of at least three types:

- overlay (in which the interface covers part of the video);
- resizing (in which the video is resized to a smaller size and becomes an element within the GUI);
- total coverage (in which the GUI entirely covers the video, making it invisible).

Whereas resizing leads to smaller size of video content, overlay or total coverage causes the loss of relevant video content. Junot adds that in this context, the television production must adopt a video language that considers the interactions of the viewer the instant interactivity is available, avoiding more closed framing planes and using a composition of scene that leaves room for the display of interfaces.

According to Oliveira et al. (Oliveira, Queiroz-Neto, & Maeta, 2007), the remote control is the means by which the user interacts with the GUI, and should get to know their characteristics and limitations to apply maximum usability in its possible use.

6.1.2.1 Heuristics GUI

Heuristics are principles that are often used to identify usability problems in a graphical user interface (GUI). Heuristic evaluations – where usability experts examine the interface and judge its

compliance with recognized usability principles – are mainly used to evaluate the user-friendliness of existing interfaces. There are many sets of usability design heuristics; they are not mutually exclusive and cover many of the same aspects of user interface design. Jakob Nielsen's heuristics are probably the most-common usability heuristics for user interface design. Since GUI's are often designed in a short space of time, taking into account the well-known usability heuristics in the design process can give developers a head start. A good user interface facilitates finishing the task at hand without drawing unnecessary attention to itself. Graphic design may be utilized to support its usability, however the design process must balance technical functionality and visual elements to create a system that is not only operational but also usable and adaptable to changing user needs.

The most often used set of heuristics were released by Nielsen in 1994 (Nielsen, Heuristic evaluation, 1994). The heuristics as published in Nielsen's book *Usability Engineering* are as follows (Nielsen, Usability Engineerin, 1994):

- **Visibility of system status**: Navigation through the interface has to be transparent: users should always have clues available that remind them where they are and which activity they are undertaking. The system should always keep users informed about what is going on, through appropriate feedback within reasonable time.
- **Match between system and the real world**: The system should speak the user's language, with words, phrases and concepts familiar to the user, rather than system-oriented terms. Follow real-world conventions, making information appear in a natural and logical order.
- **User control and freedom**: Users often choose system functions by mistake and will need a clearly marked "emergency exit" to leave the unwanted state without having to go through an extended dialogue. Support undo and redo.
- **Consistency and standards**: Users should not have to wonder whether different words, situations, or actions mean the same thing. Follow platform conventions.
- **Error prevention**: Even better than good error messages is a careful design which prevents a problem from occurring in the first place. Either eliminate error-prone conditions or check for them and present users with a confirmation option before they commit to the action.
- **Recognition rather than recall**: Minimize the user's memory load by making objects, actions, and options visible. The user should not have to remember information from one part of the dialogue to another. Instructions for use of the system should be visible or easily retrievable whenever appropriate.
- **Flexibility and efficiency of use**: Accelerators—unseen by the novice user—may often speed up the interaction for the expert user such that the system can cater to both inexperienced and experienced users. Allow users to tailor frequent actions.
- **Aesthetic and**: Dialogues should not contain information which is irrelevant or rarely needed. Every extra unit of information in a dialogue competes with the relevant units of information and diminishes their relative visibility.
- **Help users recognize, diagnose, and recover from errors**: Error messages should be expressed in plain language (no codes), precisely indicate the problem, and constructively suggest a solution.
- **Help and documentation**: Even though it is better if the system can be used without documentation, it may be necessary to provide help and documentation. Any such

information should be easy to search, focused on the user's task, list concrete steps to be carried out, and not be too large.

6.1.2.2 10-foot user interface design

In computing, a 10-foot UI refers to a software GUI designed for display on a large television with interaction using a regular television-style remote control. “10 foot” is used to differentiate the GUI style from those used on desktop computer screens, and refers to the fact that the GUI’s elements – i.e. menus, buttons, text fonts, and so on – are theoretically ergonomically large enough to read easily at a distance of 10 feet (3 meters) from the display. This distance makes a traditional web page harder to read, cluttered, and more difficult to perform basic tasks like navigating menus and selecting buttons. Therefore you should make at least a few modifications in order to make a site usable on a 10-foot UI. To avoid distractions and to be more clear, 10 foot UI’s also tend to be very simple and usually only have the minimum core buttons.

When designing a web page for TV, the viewable area should display less information overall, and what's there should focus on a confined set of tasks (even consider performing their desired task automatically or select by default). Try to keep all content "above the fold" and fully viewable on the screen without scrolling down. The goal of 10 foot user interface design is to make the user’s interaction as simple and efficient as possible, with as few buttons as possible while still having an intuitive layout, in terms of accomplishing user goals. It is of great importance to take into account TV characteristics and larger viewing distance.

TV displays

TV displays come in multiple resolutions categories: 720p and 1080i/p (the 'i' and 'p' designations don't impact the number of pixels available). The exact pixel dimensions of the display varies by TV manufacturer. Besides, TV screens have higher contrast and saturation levels than computer monitors. It is important to learn how to deal with it.

TV displays also have varying degrees of "overscan", depending on the manufacturer. Overscan is the portion of the screen that is pixel-addressable by the hardware, but outside of the viewing area of the display. This area is not accessible by software (including the web browser). Every TV you test will likely have a different amount of overscan. Studies overwhelming show that users prefer fast sites. As a TV may not be able to render a page as quickly as a computer, it is best to balance any flashy visual appeal with performance considerations. Before requiring many complex animations for your page to render, test/consider the impact on user satisfaction.

Layout

When lay-outing an interface, you have to take into consideration different TV displays with a wide variety of characteristics. Therefore it is best to measure the size of the window when the interface is loading, using that information to size the elements on the screen. Alternatively, floating elements can be sized sized automatically by the browser to fit the layout you intend.

It is important to understand that the browser window is always offset and sized to fit the visible area of the display (as long as the content is within the window boundaries, it will be visible). Also, realize that this window has the same behavior as a browser window in other contexts: if content is placed outside the visible area of the screen (in the overscan space) it will trigger scroll bars on the

window. With respect to onscreen text it is crucial to take into consideration some guidelines with respect to font selection, font size, line spacing, line length, and so on, in order to increase readability.

Navigation

TV displays are different than computer monitors, and remote control navigation differs strongly from mouse navigation. In order to benefit from the familiarity of TV's and a standard handheld remote control, it is important to make use of it appropriately. TV screen space is plentiful on the sides, but vertical space is precious. Therefore it is best to only use side category navigation, rather than top navigation. Even more fancy is to include navigation as an overlay.

Vertical scrolling, while fundamental on a desktop browser, may not be as appealing on the TV UI. Currently, Google TV and the Chrome browser don't scroll up/down as seamlessly as the desktop experience. At this time, we advise keeping all content above the fold. One option is to scroll one segment (content) of the screen while the rest of the screen remains static (left nav bar). "Down arrows" can indicate that more content exists and where to find it. Another option is to make use of horizontal layouts and visual transitions between pages of content.

Navigation through a 10-foot experience will be new to most users. Providing them with an explanation of how to get around will ease user frustration. Explain for example the following:

- The D-pad arrow keys: do they move between pages? open context or navigation menus? and so on.
- The back button: does it move to a previous page? undo an action? close a pop-up?
- Media keys: what does play/pause do? what about skip forward/skip back?
- Other keys: do you have a key mapped to cancel actions or close pop-ups (such as ESC)?
- Consider opening a pop-up on your site home page to offer this navigation help so users are given assistance up-front.

6.1.2.3 Requirements

Requirement 5	**Design a GUI specifically for presentation on a TV display**
Description	A TV display is different than computer monitors and the GUI needs, therefore, to be designed differently. Additionally, the graphical user interface (GUI) needs to be able to run on a wide variety of TV's with different characteristics • TV displays have a higher contrast and saturation levels than computer monitors. Therefore it is important to take into account some guidelines when working with solid colors: o Use pure white (#FFFFFF) sparingly. It causes vibrancy or image ghosting. Instead use #F1F1F1 or 240/240/240 (RGB). o Avoid bright whites, reds, and oranges. It cause bad distortion. o Make sure that the GUI looks nice in various display modes that TVs have (standard, vivid, cinema/theater, game, etc.). o Be conscious of using large spanning gradients, it may result in banding if not properly tested.

	• Balance any visual appeal with performance considerations, because rendering complex visualizations could have a negative impact on user satisfaction, since TV's and set-top-boxes might have less computing power.
Rationale	Older adults are familiar with TV's as a qualitative and reliable mean. When the GUI of a TV platform is perceived as substandard, people might lose their confidence in TV technology.

Requirement 6	**Minimize the complexity of 10 foot UI's**
Description	On a TV, the viewable area should display less information overall, and what's there should focus on a confined set of tasks (even consider performing their desired task automatically or select by default). The goal of 10 foot user interface design is to make the user's interaction as simple and efficient as possible, with as few buttons as possible while still having an intuitive layout, in terms of accomplishing user goals. • Keep it simple and restrict to a minimum of core buttons. • Keep all content "above the fold" and fully viewable on the screen without scrolling down. • Add blank space (padding) between elements on the page to avoid a cluttered appearance.
Rationale	Keep the interface as simple, tidy and user-friendly as possible, in order to make the learning curve less steep.

Requirement 7	**Take into a viewing distance of 10 feet (3 meters)**
Description	All GUI elements – i.e. menus, buttons, text fonts, etc. – are theoretically ergonomically large enough to read easily at a distance of 10 feet (3 meter) from the display. • Digital objects should be distant enough one from the other to be perceived as different objects. Blank spaces and clear boundaries between objects help to distinguish them. • Break text into small chunks that can be read at a glance, and limit paragraphs to no more than 90 words. Keep line length at about 5-7 words per line. Never go shorter than 3 or longer than 12. • Avoid lightweight fonts or fonts with both very narrow and broad strokes. Use simply constructed sans serif fonts and apply anti-aliasing to increase readability. • Target body text needs to be around 21pt on 720p and 28pt on 1080p. Text smaller than 18pt on 720p and 24pt on 1080p should be avoided. • Add more leading (larger line spacing) for onscreen text than print text. • Remember that light text on a dark background is slightly easier to read on TV (compared to dark text on a light background).
Rationale	The living room – the TV in particular – is associated with entertainment and relaxing. The user is in "couch mode". An easy interface that does not demand much effort to use is required to fit this atmosphere.

Requirement 8	Navigation should be TV-originated
Description	By connecting interactivity to TV, the development of design must bear the TV characteristics and viewer's baggage and customs in mind. The idea of offering HEREiAM via TV is just to keep the affordances low. • TV screen space is plentiful on the sides, but vertical space is precious (even more on wide screen TV's). Therefore, it is best to only use side category navigation rather than top navigation. Even more fancy is to include navigation as an overlay. • Avoid visual pollution. Relevant information can be lost when covered by interactive elements like menus or buttons. • Vertical scrolling, while fundamental on a desktop browser, may not be as appealing on the TV UI. Scrolling can appear less seamless, and important information may be hidden below the fold if users do not recognize that more content exists off-screen. A better approach is to make use of horizontal layouts and visual transitions between pages of content. • Segments of your page can scroll vertically to reveal new content (i.e. the left nav bar remains static while central area scrolls through content). This will likely have better performance than scrolling the entire page down. • Present onscreen "arrows" to indicate that more content exists, as well as how to reach it. • Keep in mind the characteristics and limitations of standard hand-held remote controls with respect to usability.
Rationale	Older adults are used to watching TV as a passive viewer. Making the TV an interactive medium is a challenge to fit computer functionalities into an existing TV, and into the way older adults deal with TVs.

6.1.3 Remote control

6.1.3.1 Input and interaction devices for older adults: literature review

Due to technology experience and changes in motor control, perception, and cognition, older adults vary in their performance in interactions with digital devices which has implications for the design of input devices. The following paragraphs discuss the design and human factors literature on input devices for older adults, and recommendations are provided for the input devices that are compatible with the needs and capabilities of older users.

From a review study of Taveira and Choi (Taveira & Choi, 2009) on computer input devices and older users it appears that a QWERTY keyboard is preferred for text entry or as found by Nap (Nap, Stress in Senior Computer Interaction, 2008) an alphabetical keyboard for older adults with no typing experience. The mouse, although demanding to control, is the standard choice for pointing and selection tasks and the trackball is a good alternative. A touch screen is an intuitive input device for older adults, yet, typing accuracy is relatively low. In addition, head and mouth controls could support users with special needs. From the service platform providers questionnaires, we have learned that some service platforms in the Netherlands support speech input and eye-tracking interaction to offer solutions for paralyzed users. From a study of Nap (Nap, Stress in Senior

Computer Interaction, 2008), it appeared that a substantial number of seniors had difficulties operating a standard mouse and a QWERTY keyboard. Some of these seniors mentioned that the location of the characters on the QWERTY keyboard are odd, they preferred an alphabetical layout. Others used their index finger to click on the buttons on the screen. Such types of input uncertainty could easily be overcome. In the present experiment, system complexity is reduced for the inexperienced seniors by replacing the mouse with a touch screen and the QWERTY keyboard with an ABCDE keyboard.

From the study, it appeared that participants were pleased with the alphabetical layout of the keyboard. A number of participants had difficulties operating the mouse, and many found it hard to find the right keys on the QWERTY keyboard.

Device	*Type*	*Best Application*	*Limitations*	*Comments*
Keyboard	QWERTY	Data and text entry	Poor postures	Conventional
	Split	Improved arm-hand postures	Learning required	Preferred alternative
	Chord	Minimal finger travel, portability	Learning required	Limited evidence
	Scooped	Shorter finger travel, better posture	Learning required	Limited evidence
	Smooth/soft	Small footprint, portability	No kinesthetic feedback	Limited evidence
Nonkeyboard	Mouse	Pointing & selection tasks	Demanding control	Standard choice
	Trackball	Pointing & selection tasks	Slower than mouse	First alternative choice
	Joystick	Tracking & pointing tasks	Sensitive to tremor	Not recommended
	Trackpoint	Pointing, small footprint	Hard to control	Not recommended
	Touch pad	Display-control compatibility	Selection accuracy	Poor finger item selection
	Touch screen	Intuitive, menu selection	Typing accuracy	Direct user input on display
	Light-pen	Intuitive, pointing & selection	Availability	Direct positioning device
Hands-free	Foot controls	Reduced hand mobility	Restrain seated postures	Limited research evidence
	Head controls	Upper limbs impairment	Motion range & control	Only for special needs users
	Eye-tracking	Motor control impairment	Portability, accuracy	Still in development
	Mouth controls	Severe mobility impairment	Motion range & control	Only for special needs users
	Voice input	Motor impairment	Accuracy, voice fatigue	Complement other devices

Table 6 Summary of Computer Input Devices and Their Main Characteristics[57]

About all seniors who had no computer experience mentioned that they also had no typewriter experience. Participants who had experience with QWERTY keyboards found it difficult to operate the ABCDE keyboard, although they were still able to perform search tasks. In Table 6, an overview is presented about various input devices and to which extent they are suited for older users. Although many alternatives have been developed for standard input devices (e.g., mouse and keyboard), limited evidence support these alternatives as preferred input devices for older adults.

For HEREiAM it is recommended to offer a variety of input devices dependent on the technology and computer experience of older users, i.e., for older adults with computer experience, a QWERTY

keyboard with standard mouse could serve as effective and efficient input devices, while less experienced older adults will benefit from a alphabetical keyboard with a touch-screen. Both Taveira and Choi (Taveira & Choi, 2009) and Nap (Nap, Stress in Senior Computer Interaction, 2008) did not address a remote control as an input device for older adults, which is discussed in more detail in the following paragraphs.

In the European LEAGE (Learning Games for elder Europeans) project, which was finalized in 2013, a number of focus groups were performed where older adults reported about their perceptions on controlling a serious learning game, either via a touch screen, keyboard, and remote control or via a Kinect 3D sensor (Diaz-Orueta, Facal, Nap, & Ranga, 2012). From the study it appeared that most participants preferred the mouse-keyboard combination, because they knew how to work with them:

> *"The mouse, because you have been raised with it" (Participant 2 (P2) – Focus Group 1 (FG1), Male (M), 64 years of age)*
>
> *"I am most comfortable with the mouse and the keyboard…" (P3 – FG2, M, 70)*
>
> *"If you are comfortable with the mouse, then the mouse [is preferred]." (P6 – FG2, F, 72)*

A number of participants preferred the touch screen:

> *"I think [I prefer] the touch screen (P1 – FG1, F, 63)*
>
> *"The touch screen [is preferred]." (P3 – FG2, F, 68)*
>
> *"…the touch screen would also [aside from the mouse and the keyboard] be very easy" (P3 – FG2, M, 70)*

In the second Focus Group, where a number of participants saw a Wii-mote, participants showed their preference for the Wii-mote in combination with a (large screen) television:

> *"For me, if there is something like this [a learning game], then I would prefer [to play] with such a thing [Wii-mote] on the TV…The TV is much more visual [than a computer], much easier." (P6 – FG2, F, 72) "Yes. A larger image." (everybody – FG2)*
>
> *"Rather [play games] behind a television than behind a computer" (P4 – FG2, F, 80)*

Some of the participants did report about foreseeing problems with a standard remote control to control the learning games, because of the relatively large number of buttons:

> *"A [TV] remote has so many buttons… which button do I need to use?" (P2 – FG2, F, 63)*
>
> *"For such a game [learning game] you do not need so many buttons…" (P3 – FG2, F, 68)*

One of the participants reported about the possibility to connect a standard mouse to a TV, to stress that a Wii-mote or standard remote are not the only possibilities.

> *"You can also connect it [a computer] to a TV and work with the mouse" (P2 – FG2, F, 63)*

Furthermore, one of the participants reported about the screen resolution of a TV, which may be an obstacle to play games that use text:

> *"[on the TV] it depends if the font is big or small" (P4 – FG2, F, 80)*

From the Alpha & Beta studies, older adults reported on their directs experiences of the Ease-of-Use of a TV remote control (standard Microsoft Media Center Remote Control, see Figure 89):

> *"Reasonable handy. Only need the numbers, so [even] a remote is not needed - just a box with numbers [would be sufficient]." (P2, The Netherlands)*

> *"It was easy. Just using the keyboard. [buttons]" (P4, The Netherlands)*

> *"Numbers are small (on the remote)" (P6, The Netherlands)*

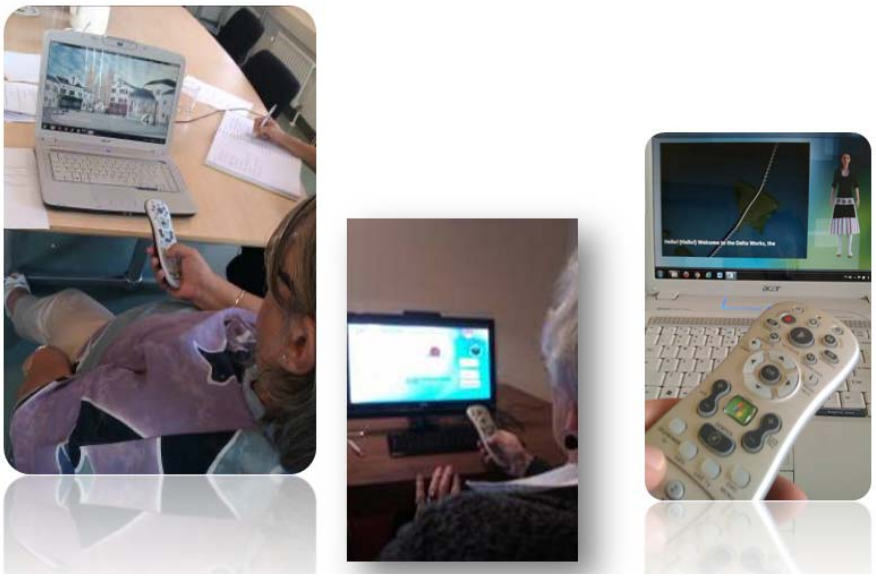


Figure 89 Standard Mediacenter Remote Control used by older adults to control the LEAGE game

In the CAALYX-MV/eCAALYX (CIP), a specific remote was designed as an interaction and input device for the CAALYX service platform, which has similarities with the HEREiAM service platform under development.

Figure 90 Soap remote prototype (left) and paper prototype interface (right)

From eight usability tests, with a TV paper prototype, soap remote (see Figure 90) with a total of 16 older adult participants (Socialitv, 2014) and a functional prototype usability test with ten older adults, the following requirements were gathered for the design of an input device and service platform for older users which should be considered in the design of the HEREiAM service platform:

- Minimize number of steps to reach a given screen
- Information hierarchy restricted to three levels
- Use consistency to facilitate recognition
- Consistency in visual components and behaviours
- Make error recovery as painless as possible
- Explain errors in simple language
- Without negative connotations
- Explain how to proceed to resolve the situation
- Reduce the information presented so users can focus on a single concept at a time
- Use animations sparingly and purposefully (e.g. fading arrows)
- Use scrolling with caution
- Scrolling needs to be very clear
- Clearly indicate the current location
- Titles indicate actions
- Show the current selection clearly
- Use meaningful icons and labels
- Concentrate information at the center of the screen
- Use a high contrast color scheme
- Use large, sans serif, left-aligned text
- Text should be as large as is reasonable
- Tests with 20 users showed at least 40pt is required
- Use simple language
- Give users time to read
- Popups that disappear after a certain number of seconds should be replaced with 'OK' selection.

6.1.3.2 Problems with standard remote controls

Older adults encounter difficulties in using new technologies. Although familiar with TV, operating a handheld remote control can cause some problems. The remote control buttons, for instance, are too small to press or the text and symbols used are hard to read and ambiguous, resulting in cognitive overload and confusion. Due to age-related changes, it is important to evaluate standard TV remote controls, and to define requirements with respect to human factors and usability. From the study of Poonsak and Teeravarunyou (Poonsak & Teeravarunyou, 2007), it is concluded that buttons are preferred over sliders or turning knobs to control a TV interface. The results from participatory design show that older adults desire a small size shape, that fits to their hand palm for a better grip, and a simple lay-out. The appropriate size, defined by width (small, large trapezoidal) and thickness (thick head-thin tail, concave, thin head-thick tail and flat), effects the level of comfort with respect to the grip. According to Poonsak and Teeravarunyou (Poonsak & Teeravarunyou, 2007), it can be concluded that the best shape of remote control that finger of elderly can reach is the concave, trapezoidal shape remote control.

Since older adults have difficuties perceiving the on-screen feedback, e.g. channel indication is too smal or some delay occurs, feedback mechanisms in the remote control can assist them in using a

remote control more effectively. In order to not divide visual focus over the TV and the remote control, it would be better to make use of multimodal feedback, for example visual feedback on the TV and auditive or haptic feedback in the remote.

6.1.3.3 Requirements

Requirement 9	**Design a remote control ergonomically**
Description	Older adults experience problems with respect to sensory changes and motor difficulties. Therefore it is important to take into account human factors for the design. • A concave, trapezoidal remote control is preferred • Take into account P5 of women to define the areas where buttons will be located. • Take into account P95 of men to define button size and distance between buttons.
Rationale	A remote control that is difficult to handle will cause frustration and can cause rejection of the system.

Requirement 10	**Minimize the complexity of the remote control**
Description	Older adults experience problems with respect to the complexity of existing remote controls. Therefore it is important to take into account some guidelines. • Minimize the number of buttons. • Avoid button combinations. • Provide a simple solution for text input.
Rationale	A complex remote control leads to uncertainty and reluctance.

Requirement 11	**Offer appropriate feedback**
Description	Proper feedback mechanisms simplifies the usage of technology. • Immediate feedback. • Multimodal feedback: visual feedback on the TV and auditive or haptic feedback on the remote control.
Rationale	A complex remote control leads to uncertainty and reluctance.

Requirement 12	**Make remote control interaction consistent**
Description	To lower the learning curve it is important to use the same interaction for the platform and all the services. In this way you can control all services, when you know how you control one • Every action must have the same effect in every context. • Consistent match between TV display and remote control.
Rationale	Consistent interaction lowers the effort needed to learn using the platform and the different services. This leads to shorter learning time, smaller threshold to start using new services, and more time to enjoy the platform added value.

6.1.4 Reliability and robustness

6.1.4.1 The concept relaibility

For assistive technology to be acceptable it needs to work properly; reliable and safe. Older adults, informal carers and other stakeholders rely on the HEREiAM system for their daily activities. Reliability is a concept that can be broken up into different sub-concepts:

- Availability
- Efficiency of use
- Integrity
- Configurability
- Consistency
- Interoperability
- Extendibility
- Reparability
- Predictability
- Error minimization
- Safety
- Feedback
- Verification

6.1.4.2 Requirements

Requirement 13	**Robustness and reliability**
Description	The system needs to be very robust and reliable. For some services 100% reliability and a back-up is crucial.
Rationale	To enable independent living, it is import that people can rely upon the technology for ambient assisted living. Therefore the technology needs to satisfy the general requirements of reliability and safety.

6.1.5 Configuration and personalization

Service platforms aim at enhancing quality and joy of life for clients and their social network by a wide variety of online services ranging from videocommunication for social connectedness and care purposes, a shared agenda, social alarm functionality, telemonitoring and exchange of information and content like photos and music. Most of today's service platforms offer a combination of comfort services, wellbeing, safety and care. Based on the needs and preferences, each older user can choose to install and use those services that are of benefit for him or her. In this way the perceived usefulness is increased. Besides a personalized set of services, there is also a need for an adaptable interface. Of course it would be nice to have a user interface that is okay for all elderly. Unfortunately, different older adults have different skills and different limitations. Therefore, attempts to develop an interface-for-all leads often to unsatisfactory and disappointing results.

The better a service platform fits into the daily life of older adults, the better the services answers the demands, and the better the platform takes into account interpersonal differences, the higher the chance for evaluating the platform positively and adopting this new technology. With the

appropriate settings, such a platform can offer an effective tool to organize independent living together with clients, informal carers, volunteers, care professionals, local authorities, communities and entrepreneurs.

Configuring and personalizing can be complex and time-consuming. Therefore, the configuration and personalization process should either be realized automatically (based on user profiles) or through a web-admin page, where various stakeholders can make adaptations, provide content, make contact, etc. The goal at least is to make configuration and personalization easy, flexible and efficient.

Requirement 14	**An open platform with a wide variety of services to choose from**
Description	The service platform should be a general platform offering some basic functionalities and a large set of services varying in goal and complexity. The user can choose him or herself which services to access.
Rationale	The better the platform and the services meet the requirements of an individual older adult, the higher the chance for accepting new technology.

Requirement 15	**Develop an overall user profile**
Description	For each older adult using the system a user profile needs to be developed and stored in the system containing information like contact details, age, location, social network, health condition and limitations, skills, Interests and preferences, allergies, etc.
Rationale	When the system has access to personal information, the system can better fulfill the user's needs and wishes.

Requirement 16	**A personalizable interface, for the platform and the services**
Description	An interface that can be personalized according to sensorial and motorical abilities (described in the user profile). For example larger font sizes and increased contrast ratios for people with decreased eyesight.
Rationale	The better the platform and the services meet the requirements of an individual older adult, the higher the chance for accepting new technology.

Requirement 17	**Link services to a database of personal information**
Description	Based on user profiles, it is possible to personalize services to the user, in order to suggest interesting services, tailor services to the user, and even avoiding risks.
Rationale	Tailoring the platform to customer needs and preferences automatically lowers the workload for the client and the carers. Besides, when the platform better fits the client's needs and preferences, they are probably more inclined to accept and use it.

Requirement 18	**Minimize the burden on clients and carers**
Description	Configuration and personalization can largely enhance the use experience. However, the processes to configure and personalize the system can be complex and time-consuming. Preferably, customization by the client himself is avoided, by doing it either automatically or by a carer. Further, it

	should be as efficient as possible. Personal information should be gathered only once and preferred settings, like increased font size, needs to be applied for all services automatically.
Rationale	The lower the effort to customize the platform, the more time to use and enjoy the platform functionalities.

Requirement 19	**Enable remote configuration and personalization**
Description	Informal carers, volunteers or organisations should be able to configure and personalize platforms remotely through a web-admin page.
Rationale	By enabling remote configuration and personalization, it is easier and quicker to make changes to the platform when needed.

6.1.6 Privacy and security

6.1.6.1 The threats of the world wide web

In the modern technological world, the privacy of millions of people is threatened. Companies are hired to watch what internet sites people visit, and then use the information, for instance by sending advertising based on one's browsing history. There are many ways in which people can divulge their personal information, for instance by use of "social media" and by sending bank and credit card information to various websites. Moreover, directly observed behavior, such as browsing logs, search queries, or contents of social media profiles can be automatically processed to infer potentially more intrusive details about an individual, such as sexual orientation, political and religious views, race, substance use, intelligence, and personality (Schafer, 2014).

Many people make use and enjoy online services like Facebook, YouTube, Skype, etc. Posting things on the Internet, however, can be harmful to individuals. The information posted on the Internet is permanent. This includes comments written on blogs, pictures, and Internet sites, such as Facebook and Twitter. It is absorbed into cyberspace and once it is posted, anyone can find it and read it. This action can come back and hurt people in the long run when applying for jobs or having someone find person information (Washington State Office, 2008). The use of assistive technologies is a clear indication for vulnerability. Often these people live alone and might be easy victims for people with evil intentions. The information processed via a service platform deals with personal and health-related information. This information can be of interest for health insurance companies, but also information about when the vulnerable elderly are out of the home or alone can better be protected.

Via Internet, people are often seduced to reveal personal and private information. Since many people do not see the risks, private data frequently falls in the hands of wrong people. Besides, criminals sometimes pretend that they are of a trustworthy organization – e.g. police or gaz company – to get access to the older adult's house. To avoid these kind of situations, it would be better if HEREiAM interventions are organized remotely as much as possible.

People with only a casual concern for Internet privacy need not achieve total anonymity. Internet users may protect their privacy through controlled disclosure of personal information. The revelation of IP addresses, non-personally-identifiable profiling, and similar information might become acceptable trade-offs for the convenience that users could otherwise lose using the workarounds needed to suppress such details rigorously. On the other hand, some people desire

much stronger privacy. In that case, they may try to achieve Internet anonymity to ensure privacy — use of the Internet without giving any third parties the ability to link the Internet activities to personally-identifiable information of the Internet user. In order to keep their information private, people need to be careful with what they submit to and look at online. When filling out forms and buying merchandise, that becomes tracked and because the information was not private, companies are now sending Internet users spam and advertising on similar products.

Most people have little idea about how to go about doing many of these things. How can the average user with no training be expected to know how to run their own network security (especially as things are getting more complicated all the time)? Many businesses hire professionals to take care of these issues, but most individuals can only do their best to learn about all this (Larose & Rifon, 2007).

6.1.6.2 Requirements

Requirement 20	**Environmental stability**
Description	The HEREiAM equipment itself, but also installing and maintaining it should not hamper the stability of the home environment.
Rationale	Stability of the home environment is of particular importance: introduction of inappropriate technology into elders 'home can dramatically alter their life – especially if the installation is time-consuming and disruptive (e.g. users' private space may be even too limited to permit PC's).

Requirement 21	**Privacy and informed consent**
Description	Data should only be exchanged for the benefits of the user. Besides, clients need to be aware and understand what data is being sent out of the house and to whom.
Rationale	Older people lack the expertise to estimate correctly the risks of their online behaviour. Therefore, they need to get protection and guidance.

6.1.7 Help and support

6.1.7.1 Older adults need training and support

When older adults perceive the added value of new technologies, they are open to learn how to use it. Given that ICT did not affect older people's "formative years", elders do not feel comfortable in "learning while doing". Therefore education, demonstrations and clear manuals are indispensable. Of course it is important that the effort does not overshadow the perceived benefits. Help and support is of key importance to lower the threshold. Only when the older adults perceive ease of use – besides perceived usefulness – they will accept and adopt a service platform like HEREiAM. Most of the older people lack the networks of technology support at home, that other population groups do have. Even what in well-supported contexts might turn out to be minor problems, may take considerable significance for the elderly user.

6.1.7.2 Requirements

Requirement 22	Human training
Description	Allow for human training on the use of new technology, with actual demonstrations, before the elderly people start using it. Not only explaining the use, but also demonstrating the use of technology.
Rationale	Due to short term memory impairment and lower fluid intelligence, older adults experience more difficulties in learning to use new systems. Often user manuals are incomprehensible and help files hard to navigate or irrelevant.

Requirement 23	Readable manuals
Description	Manuals of use should be easy to understand. Do not use foreign languages, terminology and ambiguous icons.
Rationale	People are heavily concerned about transparency of what they are going to use. Messages and feedback from technology should be clear and understandable.

Requirement 24	Efficient technical support
Description	The response time for solving problems with the home technology should be short. • Easy access to immediate technical support must be available. • The majority of technical support should be organized remotely
Rationale	If it takes a long time to solve a technical problem with the equipment at home, the acceptance of the technology will decline. Further, people rely on the technology to maintain their independence, so they cannot proceed without it.

6.2 Business model perspective

It is important to offer as soon as possible, preferably by July 2014, a "mock-up" working system with basic functionalities to attract users in order to have an immediate feedback and a further request of new services. On the other side we need to offer a modular structure letting stakeholders provide their services and build their business through HEREiAM. Herewith we can test the market attractiveness of the HEREiAM offering to potential interested customer segments.

6.3 Third party perspective

6.3.1 Stakeholders and Users of the system

From a third party perspective, in first place older seniors (couples and singles) also with limited mobility, digital virgin (opposed to digital natives or digital immigrants), limited learning capabilities/interest and difficult acceptance process, will benefit from the HEREiAM system. Having access to several services through the TV, they will delay the decision to leave home for a senior nursery home.

A direct support network with professional (e.g. general practitioners) and informal cares (e.g. close family, neighbors) will be provided to support seniors in the usage of the system, via the TV platform or via a separate application accessible via computer. The third party service providers do not necessarily have a direct connection with the elder, but provide services that will enable the senior to comfortably stay at home (from prospect to service provider).

Two categories of third party providers will be able to interact with the HEREiAM platform:

- Mobile-ready third parties (large retailers – global/national), that already use mobile apps for their workforce
- Non-digitalized parties (small retailers – local)

The HEREIAM governance body will judge which third party services will be provided via the platform.

6.3.2 Functional requirements

Sections below describe the possibilities that the platform should offer towards the senior on a day-to-day basis:

- Platform functionalities
- Additional services
- Seamless integration of additional services within the platform

6.3.2.1 Platform functionalities

The platform in itself will have to provide specific functionalities:

Requirement 25	**Central Calendar**
Description	The platform will present the personal calendar of the senior. This calendar can contain some personal appointment added by the senior or by someone close to him (family, …). Also the birthdays of his contacts can be shown. Next to these appointments, there will also be some input in the calendar by the applications of the third parties (see Requirement 35 below). The calendar can be either an individual one or a joint calendar for a senior couple.
Rationale	In order to encourage the senior to participate in social events and to bring/keep some structure in his/her life, the calendar should be very visual and central on the platform.

Requirement 26	**Notice-board and Reminders**
Description	The platform will have a central way of alerting the senior, with short messages (alerts). These alerts will be pushed to senior via a notice board. Reminders might be linked to appointments in the central calendar that might be coming up (e.g. appointment at the doctor) , or might have a deadline (e.g. taking medication). The senior (or his/her close support network) should also be able to add reminders for himself. Next to these alerts and reminders, there will also be some input by the applications of third parties (see Requirement 36 below). Alerts on this board can have different priorities and different presentation modes depending on their priority. This is mainly a one-way communication channel towards the senior. However it should be possible to monitor whether the messages have reached the senior, either by an automatic read-confirmation or by a manual confirmation.
Rationale	It is very important to reach the senior as efficiently as possible with alerts and reminders in order to keep him/her active and engaged with the system.

Requirement 27	**Central Contact list**
Description	This contact list will be a clear and visual representation (e.g. photo) of the close contacts of the senior, with some information to contact them. Contacting might be done via the functionalities of the platform itself (see Requirements 28 and 29 below) or in other ways (e.g. phone)
Rationale	Goal is not to have a complete and exhaustive view on the contacts of the senior, but to present clearly the close contacts, close family that the senior might want to contact.

Requirement 28	**Direct messages**
Description	The senior should be able to send and receive messages through the system. These messages should be going to the outside-world (the recipients are not necessarily connected to the HEREiAM platform) via the known digital communication channels. If a senior himself already uses an existing communication channel (e.g. email), it should be possible to integrate this existing account in the platform. It should also be possible to send messages (replies) to the senior from the outside world. In the same way, it should be possible to send messages between two users of the HEREiAM platform.
Rationale	In order to minimize the isolation of the senior, it should be very straightforward and accessible to contact Maybe it's not necessary to present a large number of messaging channels immediately, as this might confuse the senior, but the system should be extendable.

Requirement 29	**Video calls**
Description	Another communication possibility should be the conversation via video calls. This requires for the system to be equipped with a camera and microphone to capture the face and voice of the senior. The calls should be going to the outside-world, since the contacts of the senior will not necessarily make use of the HEREiAM platform.
Rationale	Being able to talk to a contact while seeing their face, is an important possibility to make the senior feel confident to stay at home for a longer period. This also allows for the correspondent to have a better impression of the wellbeing of the senior and his/her ability to stay at home.

Note: Feasibility to connect to existing technologies such as Skype, Google Hangouts, Apple Facetime needs to be investigated

Requirement 30	**Independent solution**
Description	The platform with its basic functionalities should be an independent solution with (maybe limited) added value to the senior.
Rationale	Even before adding the services of third parties, the senior should have a working system that provides value to the senior.

Requirement 31	**Basic functionalities via alternative solution**
Description	It should be possible to execute the functionalities mentioned above via an alternative solution such as a web application available via the desktop browser.

Rationale	Some of the functionalities described above (such as the creation of contacts with a picture) might not be suitable for the interface via the TV platform. Since they will probably only be executed exceptionally and probably not by the senior themselves, it is recommended that these functionalities are available via an alternative and less simplified solution.

6.3.2.2 Additional services

Requirement 32	**A third party should be able to make his services available via the platform**
Description	The platform should allow the addition of digital services from third parties that serve the senior in his/her comfort and wellbeing at home. Such digital services should be formally accepted by the HEREiAM platform governance body before they are made available in the service repository/store.
Rationale	In order to make the platform a complete support system for the senior, the platform should make certain services very accessible, such as Health care/Monitoring (Care/Cure) – Retail (Comfort) – Social Media (Contact). If such services cannot be reasonably provided because too diverse over Europe, HEREiAM will setup collaborations with third parties to provide these additional services and to make them digitally available to the seniors.

Requirement 33	**Universal framework for third party integration**
Description	The framework through which the third party makes its services available should be sufficiently universal to allow third parties to reuse a maximum of their existing (mobile) digital solutions. A cookbook will be provided to the third parties to stipulate the requirements of their solution (application) in order to be able to be accessed from within the platform. The third party should be responsible for the functionalities offered through their channel, while the platform should be responsible of the final presentation of the different channels in a uniform visual style (see section 6.1).
Rationale	Integration in the HEREiAM platform should have a very low barrier to allow a maximum of third parties to integrate. Third parties in the target audience of the HEREiAM platform already have a number of digital channels to reach their customers and might not be interested in collaborating in the HEREiAM platform if they are obliged to develop a new solution. It should be possible for these third parties to get digital access to a new target audience, including also seniors without previous digital experience. The Partnership will make HEREiAM platform access as smooth as possible for third parties.

Requirement 34	**White label solution**
Description	The platform also allows for third parties who provide a channel that can be reused by service providers who are not interested in creating a digital channel for their services.

Rationale	Local retailers (bakeries, greengrocers) might not have the interest to invest in a digital solution.

6.3.2.3 Seamless interaction between additional services through platform functionalities

Requirement 35	**Consolidated calendar**
Description	A third party is able to manage their appointment in the central calendar. The platform prescribes the contract on how to manage appointments in the calendar.
Rationale	The senior should not have to open each individual channel in order to have a complete view of appointments made. By accessing his/her central calendar (actively or not), the senior should be presented a complete and clear overview.

Requirement 36	**Uniform alerting mechanism**
Description	A third party is able to post an alert on the notice-board. Related to these posted alerts, a third party is able to access information on the read-rate and/or action-rate of the senior. The platform prescribes the contract on how to manage alerts in the calendar.
Rationale	Instead of creating alerts in each separate application, which might result in alerts that are never seen, all alerts towards the senior should be presented via the same channel (the notice board).

Requirement 37	**Consolidated contact list**
Description	A third party is able to insert contacts in the contact list of the senior. These contacts should be some way connected to the senior in a way that the senior knows when to contact this person or organization
Rationale	Whenever the senior needs to contact anyone, they should be available in the central contact list, in order to guarantee an intuitive and clear way of contacting the outside-world.
Requirement 38	**Intuitive return to starting point**
Description	Whenever a third party application is stopped voluntary or involuntary, the user should always be redirected to the same familiar starting point of the platform.
Rationale	In order to increase the usability and the acceptance of the system, the senior should always recognize his starting point instead of getting lost on a closing screen or any other confusing screen.

Requirement 39	**Selective presentation of error messages/system warnings**
Description	The senior should only be shown error messages or system warnings, in the case where he/she needs to take action to resolve the problem. In this case, the mitigation action should be presented. In other case, where the senior is not required to take action, the error message doesn't need to be shown. If possible, the system should exit the erroneous situation by itself and just go back to the regular starting point.

Rationale	In order to avoid confusion, error messages and system warnings should only be shown when they offer additional value.

Requirement 40	**Safe & closed environment**
Description	If there should be a valid reason for leaving the controlled environment (and connecting to other locations on the internet), this functionality should be well hidden so that the senior doesn't select the functionality unknowingly. Within the closed environment, all functionalities must satisfy the requirements towards familiarity and usability.
Rationale	In order to avoid the senior getting lost, and unable to return to the starting point, it should be counterintuitive to leave the HEREIAM controlled environment.

Requirement 41	**Reasonable usage of basic functionalities**
Description	Each third party must guarantee that it will not overload the basic functionalities of the platform, such as the calendar, with injections from within the third party application. Guidelines should be listed and spread amongst third party service providers to ensure this limitation.
Rationale	When the basic functionalities should become overloaded by one or more applications, the functionality will be rendered useless for the senior. This might even put the acceptance of the platform as a whole on the line.

Requirement 42	**Access to data of other third parties in the central functionalities (calendar, contacts, …)**
Description	It should be possible to configure what level of data is shared with each third party.
Rationale	Some applications might need to be aware of data in the central functionalities in order to correctly execute the services they provide (e.g. being aware when the calendar already contains an appointment on a certain timeslot). The level of visibility (e.g. only knowing whether the senior is free or busy vs. knowing what kind of activity created by which other third party) should be configurable by the HEREIAM platform governance body.

6.3.3 Configuration and management

6.3.3.1 Managing subscriptions/third party services

Requirement 43	**Clear overview of current subscriptions**
Description	It should be possible to easily consult the third party services which the senior is utilizing, possibly together with application-specific parameters and preferences.
Rationale	In order to manage the subscriptions to third party services, it must be possible to consult an overview.

Requirement 44	Easily adding/removing third party services
Description	Whenever the senior is interested in a new service provided by a third party, he or someone close to the senior should be able to add this new service. It should be possible to do this remote or at the home of the senior. New services should not be added automatically to the platform of the senior, but a message might be shown to announce the arrival of the new service in the repository/store of services. Note: the user should not be able to remove any of the basic functionalities of the platform.
Rationale	Each user should be able to configure individually which third party services he wants to utilize.

6.3.3.2 Managing user preferences

Requirement 45	Multi-lingual platform
Description	The system will be available in several European languages. The user (the senior himself or someone close to the senior) should be able to configure the preferred language of the senior. The configuration of preferred language should also control the language of the third party applications. It should not be possible to configure these separately.
Rationale	Every user must be able to interact with the system in their own preferred language.

Requirement 46	User profiles
Description	For each senior, it should be possible to choose from a limited number of options to configure his experience of the system. In the simplest of configuration it might be desirable to leave out certain functionalities if they are not essential and might confuse the senior. *(see section 6.1.5)*
Rationale	The group of seniors can be very diverse, ranging from very lucid, mobile and eager to learn to challenged in sensory skills, motor skills or cognitive skills. What they have in common is that at some point in the future they will have to make the decision whether to move to a form of assisted living in a nursery home or similar facilities. In order to make the adoption of the system easiest for every type/category of senior the system should have a different presentation (from “not overly simple” (i.e. stigmatizing) to “sufficiently simple”) and thus a suitable experience within the system.

Requirement 47	Choice of interface style
Description	It should be possible to change buttons from icons to words to voice-over guidance. The management of these preferences should be possible for someone close to the senior to manage (via the platform or from a distance)
Rationale	Seniors might have different challenges that don’t allow for a one-solution-fits-all (reading vs. hearing vs. understanding).

6.3.4 Non-Functional requirements

6.3.4.1 Usability requirements

Requirement 48	**Controlling the system**
Description	The controller should be sufficiently familiar to the senior in order to aid the acceptance process and to reduce the learning process of the system. The controller should be sufficiently intuitive by showing a clear resemblance between what is shown on the TV screen and the controls to be used.
Rationale	Next to understanding the interface, the big challenge will be for the senior to control the interface.

6.3.4.2 Security requirements

Requirement 49	**Privacy**
Description	The personal data of the senior should sufficiently be contained and protected within the system to avoid the data being made public and protected from malicious attempts to access the data. Personal data should only be made available to third parties when there is a clear indication for the need of such data. Also the data from one third party should be clearly separated and not be made available to other third parties unless there is a mutual consent.
Rationale	Since the platform will be treating personal and possibly medical data, confidentially of data is essential for the acceptance of the platform.

Requirement 50	**Single Sign On**
Description	The senior should not be required to identify himself with a password or other identification methods when opening a third party application. If the application requires authentication, this should be handled once in the configuration screen. In this case the passwords should be stored the necessary caution to keep these credentials secret.
Rationale	The senior might not be able to remember different passwords for different services, and should not be bothered with this for a system which can only be operated via the TV in his/her living room.

7. Technical specification

7.1 Introduction

The primary objective of the HEREiAM technology is to integrate all services specifications and at the same time, meet users needs, preferences and expectations. The Consortium has examined existing platforms and compared design alternatives based on the requirements presented in the previous section, in order to achieve the optimal solution for implementation. HEREiAM will take advantage of the open-source accessibility of Android technology to provide its users with innovative care services that allow them to continue living in their homes and maintain their independence.

Three main parts can be identified for the HEREiAM platform: Home based Hardware, Home based Software and Service level platform. Concerning the software architecture, Figure 91 depicts a high level overview that will be described in the following paragraphs.

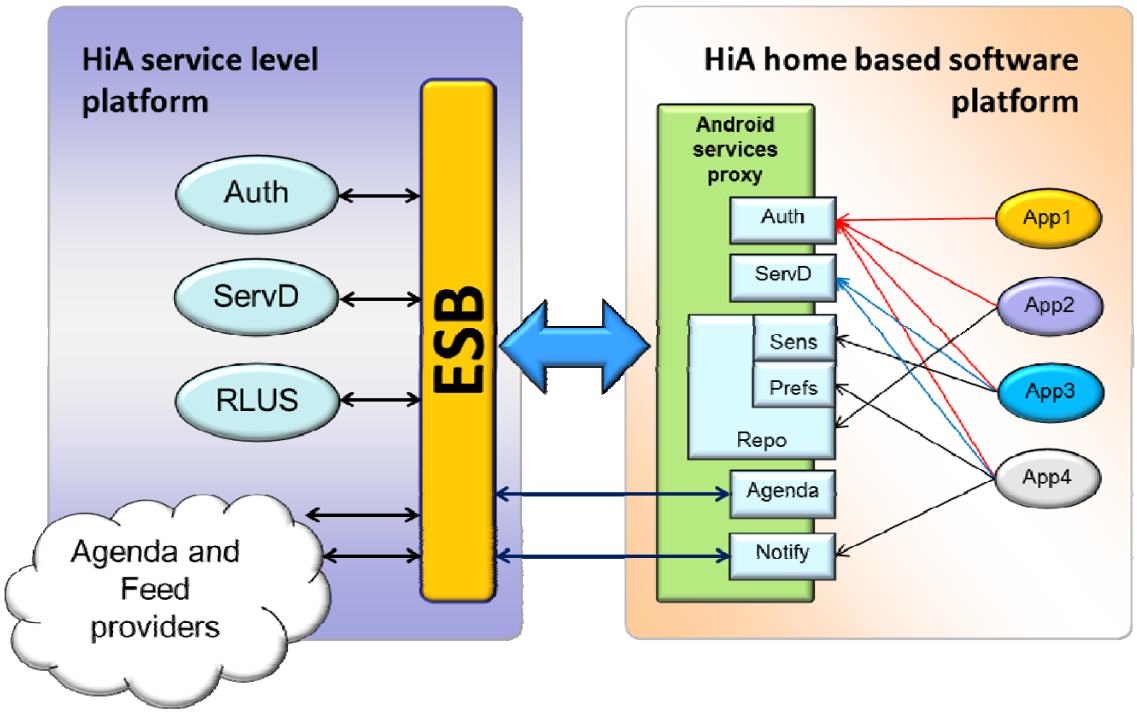


Figure 91 The HEREiAM software architecture

The box on the left represents the service level platform on the server side. Services are published in a mediated manner by an enterprise service bus (ESB). Other services published in the cloud (e.g Agenda, Shopping, …) will have a very lightweight mediation by the ESB that could be a sort of pass through configuration.

The box on the right represents the home based software platform. The invocation of services published by the HEREiAM service level platform, will be wrapped by an Android Service Proxy application. It will expose a set of APIs for accessing to functionality implemented by a set of services published by the server side. Please note that the list of APIs in Figure 91 is not exhaustive and could be extended during the implementation phase.

All HEREiAM enabled applications (App1 to App4 in the drawing) will be authenticated through Auth API. Listed below some use case scenarios:

- In the App3 use case, the app will use Auth API, will discover the monitoring management service (*Sens*) in the service directory (*ServD*), and for example will show the user current step and status in the telemonitoring pathway.
- In the App2 use case, for example, the app will access to the documental repository (*Repo*) to retrieve or store not predefined user objects. The app doesn't need to discover this service because *Repo* (with *ServD*) will be the core services of the HiA platform.
- The App4 will discover feeds in the *ServD*, it will register for notifications for a subset of them, and it will use the user preferences management service (*Prefs*) to save and register chosen feeds.

In the following sections the architecture of the HEREiAM platform and its main components are described.

7.2 HEREiAM Home based hardware platform

7.2.1 STB based on android platform

Android operating system has many advantages over traditional platforms. It is open source, simple and freely-accessed API. Moreover, Android assures a robust multi-layered security architecture that provides the flexibility required for an open platform, while concurrently providing protection for all platform users and their content (Beenius, 2014). Therefore, digital TV set-top-box (STB) based on Android platform will be used to develop the HEREiAM home based hardware. The Android STB will enable a set of basic applications and will give the possibility to download extra applications services when requested by users. There are several devices on the market at a reasonable price that can be used as Android STBs. Most of them are small boxes able to work with different kinds of remote controls, keyboards, and with common connectivity options, including an SD card reader, HDMI outputs, USB ports, Bluetooth, an integrated Ethernet port and Wi-Fi connection. A brief overview of existing devices running the Android operating system:

Device	CPU	RAM	Ethernet	Video Output	Bluetooth
MK802 IV [1]	RK3188 Quad Core	2GB	-	HDMI	✓
MK902[2]	RK3188 Quad Core	2GB	✓	HDMI, AV out	✓
CuBox-i [3]	i.MX6 Quad Core	2GB	-	HDMI	✓
Beaglebone black[4]	ARM AM335X	512MB	✓	HDMI	-
Raspberry Pi [5]	ARM 1176JZ-F	512MB	✓	HDMI, RCA	-
FXI Cotton Candy[6]	ARM Dual Core	1GB	-	HDMI	✓
Ugoos UT2[7]	RK3188 Quad Core	2GB	✓	HDMI	✓

[1] Rikomagic MK802IV, website http://www.rikomagic.com/en/product/showpro_id_39_pid_19.html
[2] Rikomagic MK902, website http://www.rikomagic.com/en/product/showpro_id_45_pid_20.html
[3] SolidRun CuBox-i4pro http://www.solid-run.com/
[4] Beaglebone black http://beagleboard.org/products/beaglebone%20black
[5] Raspberry Pi http://www.raspberry.org
[6] FXI Cotton Candy, website http://www.fxitech.com/
[7] Ugoos UT2,website http://ugoos.net/index.php?route=product/product&path=18&product_id=87

7.2.2 Custom HW devices

Different custom hardware solutions will be researched to meet the needs of users at home. The hardware modules included in the system will use the same wireless protocol interface towards the wireless expansion hub, according to the protocol specifications that will be implemented in the communication apps/API for devices at home. According to the desired services, the Android STB should be able to interact with medical device (such as a personal body scale, sphygmomanometer, blood glucometer), sensors (barcode reader, fall detectors, alarms), input devices (wireless keyboard, remote controller).

7.3 HEREiAM Home based software platform

7.3.1 Home screen replacement app

Turning on the set-top-box, the user will be authenticated by the HEREiAM platform and the Android launcher installed at home will be displayed, according to the user configuration profile. This launcher will be the HEREiAM welcome channel, a “kiosk app” that will provide the interface for launching HEREiAM verified apps. The kiosk app is the medium that will be used by the user to interact with the HEREiAM platform, therefore it must have an intuitive and simple interface, with the HEREiAM services available well highlighted.

To help the users perceive the HEREiAM welcome channel as a real TV-channel, it could be useful to include a video stream with custom content in the background. The kiosk app interface will be identical for every user, but the services displayed will change according to the user profile: each user will see a set of native apps, but only the third parties apps he/she decided to install. If there are reminders or new messages generated by an app in the agenda, they will be displayed automatically at the starting of the system. Inside the kiosk app, the user will also be able to look for and request new services available in the HEREiAM platform, through the "App Store" app.

7.3.2 HEREiAM native apps

Natively the system will provide the following services:

- Video-Chat
- Social Networking
- Help each other
- Agenda
- Message board
- Collection and sending of data from multiple Bluetooth medical devices

These services will be pre-installed in the Android set-top-box and available for each user. Thanks to the “Video-Chat” and “Social Networking” app, the user will be able to contact friends/relatives and reduce the feeling of loneliness allowing them to interact with other people and participate more in the activities organized by the Municipalities.

The “Help each other” app will allow the user to contact other people (relatives, friends, other HEREiAM users, volunteers, and so on) in case they need help for something. For example, if they need to buy groceries but they are unable to leave the house, they can use the app to ask somebody to bring the grocery to their home.

The “Agenda” app will allow other apps to save memos and show them to the user, for example, reminders of doctor’s appointments. The “Message board” will be used by the HEREiAM platform

or by third parties app to update the user on different topics. The “Health” app will allow the user to measure some simple physiological parameters, store them and (eventually) send them to their general practitioners or other people related to health services, according to the agreement.

7.3.2.1 *Controller Input management app/service*

Inside the Android set-top-box will be installed a service to manage the communications with different devices. This service will provide, for example, a standard way of interacting with the HEREiAM Home Platform by using a dedicated remote control and the APIs for the communication between the set-top-box and other custom devices that will be used by the user (e.g. Bluetooth medical devices, barcode readers). In case the user decides to download a new service that requires new devices, when the system is started, it will download and install the new app and update the management service with the relative libraries from the HEREiAM platform.

7.3.2.2 *App Store app*

The main functionality of the client App Store will be to provide end users with the ability to discover and install new apps and update existing ones. The UI of the App Store will be personalized based on the user’s profile. The App Store will also recommended new available apps based on the user’s preferences and also on currently installed apps. Whenever a new update is available for an installed app, the user will be notified and he will be able to install the new version of the app.

7.4 HEREiAM Service level platform

7.4.1 SOA based interoperability, HSSP standards, Enterprise Service Bus, Security

The HEREiAM project scenario involves heterogeneous applications and functional services.

HEREiAM interoperability platform has to be built as a loosely-coupled system guaranteed using a totally SOA based approach, with a clear definition of the services necessary to manage the integration among different stakeholders. This choice can guarantee a truly lightweight integration among the different systems involved. Actually the strong SOA and also **model driven** approach allow to separate the services interfaces from business logic that characterizes the possible implementations.

With the major goal to match the HEREiAM user requirements, the solution depicted aims at a fine-grained implementation of the services where all the interactions among the different systems are regulated by *clear service contracts* and there is an orchestrator to coordinate the overall process workflows.

In this case, the HEREiAM interoperability platform becomes a real integration middleware, in which:

- Business logic is managed by orchestrator systems
- Each application involved provides the end-points, in terms of service interfaces, to support the integration with the orchestrator and a logical continuity to the process.

It is worth considering that in this scenario the different actors exchange information referred to a third subject: the older adult. Furthermore, the model of organization that manages the integrations among different actors is based on production and sharing of documents that define contracts, certify events and are the basis for responsibilities. In HEREiAM organizational model, “documents” should be considered as the real focus, and in this context, the platform has to provide a concrete IT support for document management, maintaining thus the document oriented organizational model and still providing a sound SOA based architecture.

Based on these considerations, HEREiAM interoperability platform and its services architecture can be developed with two different approaches:

1. An integration **middleware** with a strong **orchestrator of services**
2. An **interoperability platform** based on documents management, with an **orchestrator of events**

The different elements typical of the two approaches will be shown in the following.

In both these approaches, the HEREiAM platform, that aims at guaranteeing the best interoperability among different actors, necessarily has to use technological standards to reduce the costs for integration, localization, maintenance and scalability. For this reason there is a specific section referred to standards, considering:

- Standards proposed by vendor as added value to improve the expected results;
- Standards de facto that are currently in use and that represent the technological state of the art.

These sections provide the reader with the necessary elements to understand what is the vendor's rationale for the proposed solution.

7.4.1.1 Integration Middleware

Recently in the field of application integration and, in particular, in the eHealth context, commercial business solutions often propose integration middleware solutions as the core of the integration, interoperability and applicative cooperation logics. Middleware systems have been proposed as a single interface to the interacting application modules for gathering, filtering, routing and transforming the information that need to be shared. These middleware systems are applied to all environments where data sharing is required.

In tightly-coupled systems, in which both the involved actors and the integration logic are well defined, the importance of these systems is unquestionable: they avoid the implementation of point to point integrations and reduce, for developers, the technical overhead related to the processing of data that need to be made "accessible" to other application modules.

On the other side, it is evident that in solutions based on integration middleware, adding a new information source or information consumer (actor) require the creation of an interface module (typically called adapter) between the middleware and the new actor, able to perform transformations of both protocols and data formats.

It is important to highlight that the integration middleware are completely transparent to the business logic which rules complex applicative information flow. These solutions often include tools for orchestration and/or processes management to define and support business processes but always starting from a technological vision of those processes.

Moreover, it should be noted that the service architecture with HEREiAM interoperability platform as a central element of interoperability is certainly not a tightly-coupled system. The involved systems are mostly working independently from each other and the information management is cross-sectional with respect to the requests of interaction resulting in the business processes. Therefore, by adopting an integration middleware approach, all the application systems of the HEREiAM stakeholders as well as the HEREiAM modules themselves would have to:

- expose a number of services interfaces equal to the number of single interactions that arise from the business to business service model;
- provide an implementation logic compliant with the granularity of the interactions

expressed by the service contract.

This type of solution requires, therefore, a strong investment by the stakeholders in order to make their systems compliant with the two mentioned requirements. Furthermore, this solution would have to face scalability issues whenever the infrastructure should be extended with additional services and/or new stakeholders. Finally, HEREiAM interoperability platform as orchestrator, must always be aware of all the actors that interoperate and of all the service interfaces they expose. The management of the directory service, therefore, is very heavyweight and contributes to undermine the scalability of the solution.

7.4.1.2 Interoperability Platform based on documental approach

In scenarios where applicative cooperation is complex, as for the implementation of Electronic Health Records (EHRs) for instance, the international community has identified an interoperability model based on document management. This approach is based on the ascertainment that the complex organizational and functional models to be supported are often based on the production, exchange and sharing of documents in well-defined points of the interaction process, where:

- Documents contain the information content necessary and sufficient to represent a specific event; in order to guarantee the automatic access to the documents content, the documents themselves should be produced using structured formats;
- Each document determines the owner, the context and the purpose of both the document and its content; these information are usually referred to as “metadata”;
- The document identifies the responsible for all these information.

This approach requires, first of all, the definition of a shared organizational model that, according to the business requirements to be met, establishes:

- Which documents have to be shared;
- Who is authorized to generate documents and who may access them;
- What are the procedures (possibly standard) to publish and retrieve documents;
- Which are the engagement rules among the actors.

From a technological point of view, the approach requires the deploy of interoperability platforms able to support an effective document management. This means that, using predefined procedures, the platforms have to guarantee the possibility to share, retrieve and use documents, according to the shared organizational model and its rules.

It is evident that an interoperability platform based on a documental approach has a strong semantic affinity with the application scenario to be supported and, in particular, with the organizational model that has been defined. In particular, this affinity is modeled through the management of the engagement rules of the interacting actors, i.e. by defining the events in which documents have to be published and/or accessed, the notification policies and the information flows.

To ensure these features, an interoperability platform based on documental approach comprises:

- An archiving system based on the registry/repository pattern to manage documents. The documents are stored into the repository that can be either centralized or distributed (federated). Documents have to be indexed using metadata that are stored and managed by the registry which represents the entry point for any actor that needs to access documents.
- System of actor profiling and notification management. These two features together

guarantee the implementation of engagement rules required by the organizational model. When the organizational model is particularly complex, especially in terms of information flow, this component has also to be supported by workflow management tools.

It is evident that a suitable organizational model, based on an interoperability platform with the characteristics described above, allows the stakeholders' applications to interact with the platform and operate within the shared model through a **small** number of **predefined** interfaces. These interfaces are essentially relating to:

- inserting and retrieving documents
- receiving a predefined set of notification messages

In comparison with the integration middleware solution, this approach aims at promoting the HEREiAM platform from a plain orchestrator to a true interoperability platform based on the documental approach.

As described above, this solution assumes that an organizational model is defined also, and in this model the stakeholders share the set of documents, their information content and the rules of engagement.

Each document is characterized by a set of structured information about a specific event in the reference domain (clinical, shopping, etc.) and, if necessary, it has to be digitally signed by the legal responsible. Each actor has the responsibility to share a specific document at the time and according to the procedure defined in the organizational model. HEREiAM interoperability platform will be responsible to provide suitable services to insert and retrieve these documents as well as suitable tools of orchestration to ensure that each type of information is available when required within the business processes.

Following this approach, the various application modules available to stakeholders need just to be able to send and retrieve documents, and react to notifications related to events which they are involved in.

7.4.1.3 SOA based interoperability and the HSSP standards

After a long time of debates and discussions around the best approach to building large IT systems has settled down. The issue of building large IT systems from scratch, possibly relying on single vendor solutions, has been opposed to approaching the problem from an integration oriented point of view. By now a few key aspects have to be considered fundamental truths when trying to focus on the development of heterogeneous IT systems:

- Legacy systems comprise a significant investment. Legacy systems make up the core of any business' portfolio. While some of these systems may require replacement that may not be true for the entire portfolio. In many cases, there is either too little benefit or too much cost in replacing these systems. As a result, legacy systems will continue to retain data that is too expensive or "dirty" to migrate.
- No single vendor is best-of-breed at everything. The reality is that heterogeneous environments are here to stay. Whether required by a clinical or business oriented peculiarity or mandated by government authorities, integration needs with unexpected systems and platforms will always exist.
- The need to exchange information across organizational and business boundaries is growing. Information sharing is happening among healthcare, administrative and government institutions that was unforeseen only a few years ago (e.g., shared care

delivery, public health reporting, chronic disease management, biosurveillence). The need to expose access to service capabilities is being increasingly driven by patient-directed and community-based care.

- Clinical medicine, workflow, and regulatory environment are ever-changing. The rules are changing, faster all the time, placing demands on organizations to more quickly react and support the needs of an evolving landscape.

SOA provides some unique abilities to more quickly react, adapt, and institute changes within an organization and its IT landscape due to the modular structure of services and ability to alter interactions among those service components. SOA is a proven architectural approach that is mature in many market sectors showing benefits in healthcare organizations as well. Ultimately, organizations that have chosen to utilize SOA solutions, have done so to improve their agility (ability to respond to changing requirements), to more effectively develop and deploy IT systems, and to improve business ownership, accountability, and consistency.
The following table pretty well summarizes the positive business impact of the SOA approach.

Business Impact	**SOA Relevance**
Foster business agility	Provides a foundation for rapid reconfiguration, responsiveness to changing needs, flexibility to alter workflow
Retained value from existing health technology investments	SOA provides mechanisms to leverage existing investments by "wrappering" legacy applications using SOA interfaces extending their usable life while reducing lock-in risks associated with given platforms and tools
Ability to deploy best-of-breed solutions	SOA allows products to be selected based on fitness to support business functions and integrate architecturally with other products.
Achieve consistency in business-facing services	Bringing together disparate delivery mechanisms into a service-architecture harmonizes inconsistencies and unifies customer-facing business capabilities.
Improve alignment between IT and business needs	SOA applications and interactions more closely mimic real business processes and interactions, reducing the "impedance mismatch" between business and systems
Foster interoperability through adoption of standard interfaces	Integrating business capabilities using a services-backplane, applications integrate into the bus and not each other. This reduces custom interfaces, and allows for system replacement/substitutability with lessened impact.
Improved ability to adapt workflow	Since workflow in SOA systems is usually dynamic, using business process management (engines) to coordinate activities, rules and flow changes can be made quickly and done by business staff/analysts and not programmers.
Improved visibility into business process	Use of dashboards / drilldown capability offers management insight into execution of business process, improving visibility to identify and correct concerns; transaction information is available in real-time.
Improved IT organizational responsiveness	Better tools and minimized integration dependencies allow IT organization to be more responsive to business needs, reducing maintenance burdens.

Starting from this context, the Healthcare Service Specification Program (HSSP) is a collaborative

effort between standards groups HL7 and OMG to address interoperability challenges within the healthcare sector. **Although HSSP standard is non-domain specific and could be used in a variety of domains**. In particular, HSSP adopts the SOA approach by clearly separating the interface of a software component from its implementation and puts the two artefacts on two different logical levels of the system.

The design approach is strictly contract-based and model-driven meaning that the interfaces are agreed upon at a very early stage of the system design workflow. Formal adherence to the contract is enforced at every level of interaction design and different levels of specification of the interfaces, ranging from computation independent model to platform specific model, are achieved by subsequent model transformations.

On the other hand, absolutely no technical, technological or algorithmic assumptions are made in relation to the component's implementation which is considered to be a real black-box.

HSSP takes this approach even further. It actually excludes from the interface specification every reference to the semantic meaning of the data handled by the services at a given site or in a given scenario. This is achieved by the introduction of the generic services. A generic service is a fully defined service interface where parts of the operations' input and output parameterization, namely the ones strictly related to applicative semantics, are defined to be generic. The provision of the exact definition of those parts is a normative requirement for the implementer willing to provide a specialized implementation. A generic service could be equipped with meta-operations that allows supplying this exact definition and registering the specialized implementation.

With the help of generic services, the porting of a standard service to handle a novel data type becomes at interface (thus interoperability) level a configuration issue and no applicative level code will be needed at all.

The customization of the data types for a specific applicative scenario is called semantic signifier and the set of available semantic signifiers for a specific applicative site is called semantic profiling of the services.

7.4.1.4 Authentication, authorization and single sign on (Auth)

The HEREiAM platform will comply with the OAuth 2.0 specification (RFC6749 and RFC6750) and with OpenID Connect Basic Client Profile 1.0, to support authentication, authorization and single sign on of users and applications. Specific services will be made available in the Service level platform.

7.4.1.5 User preferences management (Prefs)

Application and user preferences will be modelled in xml documents. The handling of preferences will be compliant with HSSP RLUS document management services described in §7.4.3. The result will be a sort of “map” of configurations that will be stored and managed on server side instead of client side (the set top box): the direct consequence is that changing the set top box will not require any new configuration. Examples of preferences are the list of subscribed apps linked to a specific user, or the preferred location for meteorological information linked to both the specific user and an identified app, and so on.

7.4.2 Service directory (*ServD*)

The Services Directory (ServD) management services are **a core component** of the HEREiAM

platform, that by definition is a platform of services for old users. The number of offered service could be very dynamic, and for this reason we need a services directory.

The HEREiAM platform will comply with HSSP ServD standard specification. This specification provides an SOA model to support the discovery of, and access to, service provider, individual, and organizational information, including: locations, associations, contact details, services, identifiers, and many other relevant characteristics or attributes. This specification has been developed to meet the needs of interoperability in healthcare and community services, although at its highest level of abstraction ServD is non-domain specific and could be used in a variety of settings where there is a need for directory-based search facility and secure transmission of sensitive documents among a large and dispersed population of service providers.

The design of the ServD solution is to not provide a single centralized directory, but to support a federation of interconnected ServD directories. The central point of this structure is the ServD Locator that behaves as a kind of Domain Name Services (DNS) for ServD Searching within the Federation.

The ServD standard defines the following interfaces:

- Locator interface: provides a way for Searching Applications to locate relevant ServD Core instances in the ServD Federation that expose the Search interface. In simple terms it is an indexer of (or DNS for) ServD Core instances.
- Locator Maintenance interface: provides a way to maintain the federated index of ServD Core instances managed by a ServD Locator.
- Search interface, that is the core interface in the ServD specification. It provides operations to search for lists of summary information about Organizations, Sites, Services, and Providers. The address (URI) of the ServD Core instance's Search interface is provided by the ServD Locator.
- Retrieve Details interface: provides a way to retrieve detailed information about Organizations, Sites, Service Sites, and Providers. The address (URI) of the ServD Core instance's Retrieve Details interface is provided in the results for each item returned by the Search interface.
- Maintenance Interface: provides a way for an authorized Maintenance Application to maintain directory data.
- Verify Details Interface: provides a way for Maintainable ServD Core instances to verify updates made by a Maintenance Application to attributes that are configured to be validated by calling an external application. This is the mechanism for certification/registration organizations to be able to electronically validate attributes of Organizations, Sites, and Providers.

In the following tables, there is a list of ServD operations and a brief description.

Locator Interface	
LocateSearchEndpointsForCoverageArea	This operation locates and returns a list of ServD

	Core URLs that implement the ServD Search interface.
GetReferenceListDetails	This operation locates the URLs of the codes/descriptions reference lists of the defined types.

LocatorMaintenance Interface	
RegisterSearchEndpointForCoverageArea	This operation registers a ServD Core instance with the ServD Locator.
UnregisterSearchEndpointForAllCoverageAreas	This operation removes all coverage areas allocated to this ServD Core endpoint.
UnregisterSearchEndpointForCoverageArea	This operation removes a set of CoverageAreaCodes from the index for a specific ServD Core endpoint.

Search Interface	
Search	Perform a search for information in the ServD Core.
MoreOrganizations	Retrieve the requested page of Organization summary items based on a previous search.
MoreSites	Retrieve the requested page of Site summary items based on a previous search.
MoreServiceSites	Retrieve the requested page of Service Site summary items based on a previous search.
MoreProviders	Retrieve the requested page of Provider summary items based on a previous search.

RetrieveDetails Interface	
RetrieveOrganizationDetails	Retrieve the complete set of details about the Organizations based on the Identifiers returned in a search.
RetrieveSiteDetails	Retrieve the Complete set of details about the Sites based on the Identifiers returned in a search.
RetrieveServiceSiteDetails	Retrieve the Complete set of details about the Service Sites based on the Identifiers returned in a search.
RetrieveProviderDetails	Retrieve the Complete set of details about the Providers based on the Identifiers returned in a Search.
RetrieveServiceSiteProviderDetails	Retrieve the Complete set of details about the Service Site Providers based on the Identifiers returned in a search.
RetrievePublicKeys	Retrieve the Public Keys for the requested records based on the Identifiers returned by the Search.

Maintenance Interface	
OrganizationAdd	Add a new Organization. This will always create an un-approved Organization record. Organization records must be approved by a Content Manager before they will be available via the search interfaces.
OrganizationUpdate	Provide the details of an Organization that needs to be updated (including any child object information).
SiteAdd	Add a new Site to an Organization.
SiteUpdate	Update the details of a Site.
ServiceSiteAdd	Add a Service Site to a Site (by Site ID)
ServiceSiteUpdate	Update the details of a Service Site.
ProviderAdd	Add a new Provider.
ProviderUpdate	Update a Providers Details.
ServiceSiteProviderAdd	Associate an existing Service Site with an existing Provider.
ServiceSiteProviderUpdate	Update a specific Service Site Provider record.
UploadSiteCertificate	Upload a Public Key Certificate for a Site.
UploadServiceSiteCertificate	Upload a Public Key Certificate for a Service Site.
GetRecordsRequiringApproval	This method retrieves a list of added or updated records that are awaiting approval.
ApproveRecords	Approve the data as specified in the list of Identifiers. This method must be performed by Approvers or Content Managers. New Organizations and Providers must be approved a Content Manager.
RejectRecords	Reject the data as specified in the list of Identifiers.
DeleteRecords	Delete one or more records of a specified record type.

VerifyDetails Interface	
VerifyOrganization	Verify an Organization Attribute.
VerifyProvider	Verify a Provider Attribute.
VerifySite	Verify a Site Attribute.

7.4.3 Document management service (*Repo*)

The whole HEREiAM functional architecture will be based on a document oriented SOA and therefore the Documental management service represents **a core component**.

In order to guarantee interoperability through a documental approach, the HEREiAM platform and the external systems have to share the following specifications:

- The publication of a new document on repository includes the supply of predefined

metadata.

- The registry module has to be notified of the presence (or updating) of a document by sending the set of metadata and the entry of the document in the repository.
- The retrieve of documents requires a metadata based query to the registry in order to get the entries of the required documents.

In order to facilitate the compliance with this requirements for third parties and HEREiAM applications, we will adopt the HSSP RLUS standard interfaces.

RLUS realizes, at its core, a basic set of CRUD capabilities plus location for generic information resources management, standardizing the way in which the resources are exposed and consumed independently from their nature and format. RLUS is a "business-to-business" service level interface specification independent but compatible with underlying aspects like security, data models deployment and delivery mechanisms.

The business cases supported by RLUS are common to healthcare and other business scenarios and they are defined and implemented over and over again. RLUS provides a way to uniformly model and expose these services once and easily adapt to all applicative particularities reducing the overall impact on the preexisting infrastructures and systems.

In RLUS the nature and format of the resources is managed by means of the implementation of Semantic Signifier concept. The Semantic Signifier defines a mechanism to abstract the RLUS capabilities from different kind of resources and data structures that can be managed in a flexible and standardized way.

RLUS exposes two large families of services:

- Management and query interface, to manage the persistence and retrieval data;
- Metadata interface, to configure and manage the Semantic Signifiers that assign the right meaning to the information of data to be processed.

In the following table the detail of RLUS operations is shown.

Management And Query Interface	
GET	This is an operation for retrieving a single logical record based on parameters uniquely identifying a single record.
LIST	This operation is for returning a list of logical record instances and it's capable of streaming many records from the underlying source to the calling client.
PUT	This operation is for inserting/updating an instance of a logical record to the RLUS implementation.
DISCARD	This operation is for discarding (either physically or logically deleting records from the underlying source).
LOCATE	This operation is for returning a list of RLUS service locations where the desired logical record can be found.
INITIALIZE	This operation is used to send a record from an internal source system

	onto an RLUS network in response to record create, update, or delete events "inside-out" from a local system to a registry.
DESCRIBE	This operation is used to output the detailed schema definition of the associated semantic signifier.

Metadata Interface	
CreateSemanticSignifier	This operation provides the means to create a semantic signifier definition.
FindSemanticSignifier	This operation provides the means to retrieve the semantic signifier definition by name.
UpdateSemanticSignifier	This operation provides the means to update a semantic signifier structure.
ListSemanticSignifiers	This operation provides the means to list all available semantic signifiers that an RLUS service implementation supports.
ListConformanceProfiles	Returns the list of named conformance profiles that the service implementation supports.

7.4.4 App Store services

These services will act as back-end services for the App store front-end and also as core services for other components and apps. The **Registration Service** will be responsible for managing the creation of new third party users, as well as updating their user information and other specific information.
The **App Management Service** will be in charge of handling the process of uploading new apps, and updating and modifying the app's metadata. The **App Discovery Service** will provide a set of features that will allow various apps and services to view and retrieve information and apps that are available in the HEREiAM platform.

7.4.5 App Store front-end

The **Registration Service GUI** will be created in a simple and straightforward manner in order to help third parties to easily create accounts on the platform. The HEREiAM operators will be able to view and manage the created accounts.

The **App management GUI** will provide several functionalities:

- the ability to upload new apps in the system
- the ability to delete previously uploaded apps
- the ability to create and modify information about the available apps: app description, app category, app provider description, app icon, app screenshots.

The **Validation Module** will allow HEREiAM operators to validate an uploaded app before making it available to other services and apps. The operators will be able to verify the app by assessing the uploaded screenshots and also by verifying the provided information for each app.

7.4.6 Notification service (*Notify*)

The notification service of the HEREiAM platform will rely on Atom (proposed) standards defined in

RFC4287 (Atom Syndication Format) and in RFC5023 (Atom Publishing Protocol). In the context of the HEREiAM platform, during the user enrolment procedure, a user dedicated feed will be created onto which both HEREiAM and third party applications may post entries. This will be the default feed available in the HEREiAM platform.

Users will also be able to subscribe to other feeds published and listed in service directory according to ServD standard interfaces described in §7.4.2. The persistence of feeds subscriptions will be managed by application preferences management service (§7.4.1.5). Feed aggregator applications that are in charge of displaying notifications on screen will be available in the HEREiAM app store. Compliant applications will be required to support common standards at least Atom and possibly RSS.

7.4.7 Agendas synchronization service (*Agenda*)

For management and synchronization of agendas, the HEREiAM platform will adopt a cloud based calendar, probably an existing one like Google Calendar. Using this approach, HEREiAM could define one google account (the HEREiAM google account), and a set of calendars, one for each user. The Google Calendar API cover all agendas HEREiAM needs, offering application interfaces to create, update and delete calendars, to create, update, and delete events, to define access control rules, and to share calendars between HEREiAM and third party applications (external to HEREiAM platform also). Google Calendar API exposes RESTful web services so, if it will be the chosen calendar, these RESTful services have no need to be wrapped by the HEREiAM interoperability platform. The calendar to be adopted in HEREiAM architecture will be identified in the implementation phase of the project.

7.4.8 HEREiAM measures management service (*Sens*)

The HEREiAM interoperability platform will use the document management approach described in §7.4.3 and will provide a set of services to start, manage, monitor and finally stop, remote care and monitoring pathways.

The pathways will be managed according to the workflow approach exposed by the Cross Enterprise Tele Home Monitoring (XTHM) specifications: a pathway is associated with a document and each new step in the path will cause this document to be updated with the new information. The document associated with a pathway shows in any moment the progress of the overall path. XTHM document specializes the Cross Enterprise Document Workflow (XDW) format, and the XTHM pathway is defined as an implementation guideline.

The workflow document (XTHM) will be then updated when XTHM “documental events” happen, i.e. events associated with information exchange between measuring devices and the HEREiAM platform application software executing on STB. These data will be sent according to the documental paradigm and the standard protocol HSSP – RLUS. The same paradigm is used to access the XTHM for its management and oversight by the clinical staff.

The format of data will be represented as an XML message with a three level encapsulation. The two highest levels are the SOAP message and the operation requested for HSSP-RLUS service (PUT, GET, LIST, etc.), and are formalized by service standard contracts, while the third level will be HEREiAM specific and will be defined at implementation phase.

All XTHM documents will be persisted in a documental repository provided by the HEREiAM interoperability platform, and for each document will be maintained a set of metadata suitable to trace put and/or update operations. Documents can be retrieved through web service standard interface and no transformations will be applied to the document being returned by a GET operation in response to a query. The presentation of results will be assigned to specific rendering third party applications not yet identified.

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ATTACHMENT 1

User session in the Netherlands - Service platform provider questionnaire

1. Korte beschrijving van uw organisatie.

2. Korte beschrijving van uw dienstenplatform.

3. Wat is de kracht van uw platform in vergelijking met die van de andere marktspelers? (unique selling point)

4. Via welke interface(s) wordt uw dienstenplatform aangeboden?

- ☐ standaard PC met toetsenbord en muis
- ☐ laptop
- ☐ all-in-one touchscreen PC
- ☐ tablet
- ☐ smartphone
- ☐ TV
- ☐ andere, nl. ……..

5. Hoeveel gebruikers heeft uw platform momenteel, en wat zijn de groei-perspectieven naar de toekomst toe?

Elk dienstenplatform heeft verschillende gebruikers, verschillende diensten/functionaliteiten en verschillende gebruikers. In de komende vragen willen we graag wat meer leren over de functies die de eindgebruiker van het dienstenplatform – bijvoorbeeld een zelfstandig wonende oudere zelf kan gebruiken.

6. Op welke doelgroep richt uw dienstenplatform zich? Is het dienstenplatform gericht op ouderen in het algemeen, wordt er gefocust op een specifieke doelgroep als chronisch zieken (hartfalen, COPD, diabetes,…) of dementerende ouderen? Of is het niet eens ontwikkeld voor een oudere doelgroep?

7. Welke betrokken partijen gebruiken het dienstenplatform nog, behalve de eindgebruiker?

- ☐ Familie
- ☐ Vrienden

- ☐ Mantelzorger
- ☐ Welzijnswerker / sociale dienstverlener / Servicepunt
- ☐ Alarmcentrale
- ☐ Huisarts
- ☐ Praktijkondersteuner
- ☐ Paramedisch personeel (fysiotherapeut, psycholoog, diëtist,…)
- ☐ Medisch specialist (cardioloog, longarts,…)
- ☐ Andere, nl. ……..

8. Is het dienstenplatform gekoppeld aan andere technologie?

- ☐ Surveillance apparatuur (camera tbv. toezicht, valdetectie,…)
- ☐ Telemonitoring apparatuur (apparatuur om op afstand vitale waarden te meten)
- ☐ Activiteitenmonitor (stappenteller)
- ☐ Valdetector
- ☐ Personenalarmering
- ☐ Elektronisch patiëntendossier (EPD)
- ☐ Deur-video-intercom
- ☐ Sensoren in de woning
- ☐ Domotica-systeem (huisautomatisering)
- ☐ Huishoudelijke apparaten (koelkast, wasmachine,…)
- ☐ Andere, nl. …….

9. Welke applicatiediensten worden via uw platform aangeboden?

- ☐ Gemaksdiensten: diensten op het gebied van praktische en/of huishoudelijke zaken, niet specifiek gericht op mensen met een verminderde mobiliteit of zelfredzaamheid, maar in principe gericht op iedereen die hier voordeel van heeft.
  - ☐ Lokale evenementenkalender
  - ☐ Lokale radio/televisie
  - ☐ Gemeentelijke diensten
  - ☐ Marktplaats voor diensten
  - ☐ Besteldiensten
  - ☐ Spellen
  - ☐ Maaltijd/dieetrecepten
  - ☐ Gezondheidsinformatie
  - ☐ Weesrvoorspelling
  - ☐ Domotica/huisautomatisering
  - ☐ Andere, nl. …….
- ☐ Welzijnsdiensten: diensten die bijdragen aan het welbevinden van mensen in lichamelijk en geestelijk opzicht. Het kan gaan om hulp bij het verbeteren van de lichamelijke

situatie (vb. coaching op het gebied van beweging en voeding), maar ook om het verbeteren van sociale contacten.

- ☐ Video-communicatie/beeldbellen
- ☐ Sociale netwerken
- ☐ E-mail
- ☐ Chatservive
- ☐ Goedemorgendienst/welzijnsmelding
- ☐ Gedeelde mantelzorgagenda
- ☐ Coaching (beweging, voeding,…)
- ☐ Andere, nl. …….

☐ Veiligheid en bewaking: diensten die bijdragen aan het veiligheidsgevoel van mensen, doordat ze bijvoorbeeld in geval van nood makkelijker iemand kunnen waarschuwen.

- ☐ Contact met alarm/zorgcentrale
- ☐ Valdetectie
- ☐ Sensoren voor rook-, gas- en waterdetectie
- ☐ Leefstijlmonitoring
- ☐ Deur-video-intercom
- ☐ Bewakingscamera's
- ☐ Sleutelbeheerdiensten
- ☐ Andere, nl. …….

☐ Behandeling en verzorging: diensten die te maken hebben met medische begeleiding en/of bevorderen van zelfmanagement door patiënten, zoals het doen van thuismetingen.

- ☐ Contact met zorgcentrale
- ☐ Contact met medisch professionals
- ☐ Medicatiebegeleiding
- ☐ Doorsturen thuismetingen
- ☐ Gedeelde zorgplanning/EPD
- ☐ Andere, nl. …….

Tot slot behandelen we hier nog de twee meer technische lagen van een dienstenplatform. Op dit niveau speelt vooral de keuze voor en het gebruik van ICT standaarden en de koppeling/integratie van technische systemen.

- Platformdiensten: basisfuncties van het ICT-platform, die een voorwaarde vormen voor de werking van de apllicatiediensten. Zo zijn veel applicatiediensten alleen mogelijk als er in het ICT-platform een mogelijkheid tot gegevensopslag en/of videocommunicatie is.

- Netwerkdiensten: diensten die als doel hebben om een verbinding tot stand te brengen tussen verschillende onderdelen van het platform of met andere informatiesystemen op andere locaties.

10. Welke oplossing / ICT standaard is gekozen voor de volgende onderwerpen. Waarom? Zijn er uitzonderlijkheden te melden over dit thema? Zet de eigenheid van het platform goed in de verf.

A. Gebruikersinterface (input en output: vb. muis, toetsenbord, touchscreen,…)

B. Presentatiediensten (vb. broadcasting, webbrowser,…)

C. Video-communicatie

D. Audio-diensten

E. Gegevensopslag

F. Upload en download

G. Home gateway (verzamelen sensordata)

H. Privacy en security

11. Ook in de netwerklaag kan heel wat technologie en intelligentie gebruikt worden om het dienstenplatform robuuster en efficiënter te maken. Wat zijn de bijzonderheden bij uw platform met betrekking tot onderstaande onderwerpen?

A. Internettoegang

B. Wide area netwerk

C. Lokaal netwerk (vast en draadloos)

D. Device-device communicatie

E. Interoperabiliteit

F. Openheid

G. Netwerkbeveiliging

H. Monitoren van gebruik, data logging

I. Opsporen van storingen en problem solving

J. Onderhoud

K. Updates

L. Helpdesk

ATTACHMENT 2

User session in the Netherlands - General questionnaire

1. Algemene Vragenlijst

1.1 Deelnemers-code #:

1.2 Wat is uw geslacht?

- ☐ Man
- ☐ Vrouw

1.3 Wat is uw geboortedatum? _ _ /_ _ /_ _ _ _

1.4 Nationaliteit:_____

1.5 Niveau van uw scholing?

- ☐ Lagere school
- ☐ Middelbaar
- ☐ Hoger niet-universitair onderwijs
- ☐ Hoger universitair onderwijs
- ☐ Anders: _____

1.6 Volgt u op dit moment (erkend) onderwijs?

- ☐ Ja
- ☐ Nee

1.7 Uw voornaamste werk/beroep in uw leven: _____

1.8 Hoeveel jaren heeft u tot nu toe gewerkt?: _____

1.9 Echtelijke situatie:

- ☐ alleen
- ☐ getrouwd/ samenwonend
- ☐ weduwe/weduwnaar
- ☐ uit elkaar/gescheiden

2. Familie situatie

2.1 Hoe beschrijft u de mogelijkheid tot een werkelijke ontmoeting met uw naaste familieleden?

- ☐ zeer moeilijk
- ☐ moeilijk
- ☐ makkelijk

☐ zeer makkelijk

2.2 Wat is de afstand tot het naast familielid die het dichtst bij u woont?

☐ zelfde huis
☐ minder dan 5 kilometer
☐ 5 – 20 kilometer
☐ 20 – 50 kilometer
☐ 50 – 150 kilometer
☐ meer dan 150 kilometer

2.3 Ontmoet u uw naaste familie zo vaak u zou willen?

☐ Ik ontmoet geen naaste familieleden
☐ Soms vind ik het jammer dat ik hen niet zo vaak zie
☐ Soms vind ik het jammer dat ik hen zo vaak zie
☐ Ik voel mij gelukkig, zelfs als ik hen niet zo vaak zie
☐ Ik voel mij gelukkig omdat ik hen zo vaak zie

2.4 Hoe vaak ontmoet u andere familieleden?

☐ Nooit
☐ Minder dan 1 keer per maand en/of alleen tijdens vakanties
☐ Tussen de 1 en 3 keer per maand
☐ Eén of meer keer per week
☐ Elke dag

3. Socialie situatie

3.1 Hoeveel personen beschouwt u als 'vrienden'?

☐ niemand
☐ één of meer
☐ drie of meer
☐ vijf of meer

3.2 Hoeveel nieuwe vrienden heeft u gekregen nadat u met pensioen ging?

☐ niemand
☐ één of meer
☐ drie of meer
☐ vijf of meer
☐ niet van toepassing

3.3 Hoe vaak ontmoet u mensen buiten familiekring (vb. vrienden, buren)?

☐ Nooit
☐ Minder dan 1 keer per maand en/of alleen tijdens vakanties
☐ Tussen de 1 en 3 keer per maand
☐ Eén of meer keer per week
☐ Elke dag

3.4 Hoe vaak heeft u telefonisch contact met vrienden of familieleden?

- ☐ Nooit
- ☐ Eén keer per week
- ☐ Meer keer per week
- ☐ Eén of meer keer per dag

3.5 Hoe beschouwt u uw sociale contacten (in het algemeen) in vergelijking tot de sociale contacten die u had toen u jonger was?

- ☐ Slechter
- ☐ Een beetje slechter
- ☐ Niet slechter / niet beter
- ☐ Een beetje beter
- ☐ Beter

3.6 Is er iemand waarmee u intieme of persoonlijke zaken kunt bespreken?

- ☐ Ja
- ☐ Nee
- ☐ Ik weet het niet

3.7 In vergelijking tot de meeste leeftijdsgenoten, hoe vaak neemt u deel aan sociale activiteiten (mensen ontmoeten, buiten het werk)?

- ☐ Veel minder dan de meeste anderen
- ☐ Minder dan de meeste anderen
- ☐ Ongeveer evenveel
- ☐ Meer dan de meeste anderen
- ☐ Veel meer dan de meeste anderen
- ☐ Ik weet het niet

4. Vrijetijds activiteiten

4.1 Zou u meer tijd willen hebben voor vrijetijdsbesteding?

- ☐ nee, ik ben tevreden met de tijd die ervoor beschikbaar is
- ☐ ja, meer
- ☐ ja, veel meer
- ☐ ja, heel veel meer

4.2 Wat voor activiteiten voert u doorgaans uit?

- ☐ geen
- ☐ Activiteiten binnenshuis zoals TV kijken en/of radio luisteren
- ☐ Activiteiten binnenshuis van lezen tot klussen
- ☐ Activiteiten buitenshuis

4.3 Waar ontmoet u doorgaans uw sociale contacten?

- ☐ Ik heb geen sociale contacten
- ☐ Ik ontmoet mensen ‘hier en daar’ als ik uitga (bv. op straat, in een café, bij de dokter,…)

- ☐ Ik ontmoet mensen op specifieke plekken (bv. hobby club, sportlocatie,…)

Hieronder kunt u aangeven hoe vaak u de volgende activiteiten uitvoert

4.4 Uitgaan (bijv., winkelen, busreis, restaurant) met familieleden/vrienden
- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.5 Het organiseren van (sociale) ontmoetingen/etentjes
- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.6 Fysieke activiteiten (bijv., wandelen, sport, fitness)
- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.7 Informatie zoeken op het Internet
- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.8 Kaartspelen (bijv., bridge, poker, pesten)
- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.9 Naar culturele evenementen (bijv., musea, concerten)
- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.10 Reizen
- ☐ nooit
- ☐ jaarlijks

- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.11 Bordspellen (bijv., Monopoly, Risk, ganzenbord)

- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.12 Handnijverheid (bijv., klussen, breien, schilderen)

- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.13 Denksporten en puzzels

- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.14 Computerspellen

- ☐ nooit
- ☐ jaarlijks
- ☐ maandelijks
- ☐ elke week
- ☐ dagelijks

4.15 Zijn er nog andere activiteiten die u graag uitvoert, maar hierboven nog niet genoemd zijn? Zo ja, welke zijn dit?

_____

_____

5. Gezondheid and Controle

5.1 Over het algemeen vind ik mijn gezondheid:

- ☐ zeer goed
- ☐ goed
- ☐ redelijk
- ☐ slecht
- ☐ zeer slecht

5.2 In welke mate heeft u behoefte aan ondersteuning?

- ☐ Ik ben volledig zelfstandig
- ☐ Ik ben beperkt zorgafhankelijk
- ☐ Ik ben in grote mate zorgafhankelijk
- ☐ Ik ben volledig zorgafhankelijk

5.3 Ik heb weinig controle over wat mij overkomt:

- ☐ totaal mee oneens
- ☐ oneens
- ☐ eens
- ☐ totaal mee eens

5.4 Ik ben tevreden over mijn leven

- ☐ totaal mee oneens
- ☐ oneens
- ☐ eens
- ☐ totaal mee eens

5.5 Is er iets wat u in uw leven graag anders zou zien?

_____

5.6 Hoe zou u uw vermogen omschrijven om volgende zaken te herinneren?

	Heel slecht	Slecht	Gemiddeld	Goed	Heel goed
De naam van een persoon die zich net aan u heeft voorgesteld.					
Specifieke informatie uit een artikel of krant die u recentelijk heeft gelezen.					
Lampen uitdoen en de deur op slot doen als u uw huis verlaat.					
Het voornemen om iets mee te nemen (brief of paraplu) voordat u vertrekt.					
Iets herinneren, zoals een adres, dat juist aan u is verteld.					

5.7 Hoe beoordeelt u uzelf?

	Heel slecht	Slecht	Gemiddeld	Goed	Heel goed
Hoe omschrijft u uw geheugencapaciteit in vergelijking met anderen?					
Hoe omschrijft u uw geheugencapaciteit in vergelijking met vroeger?					
Denk aan het moment dat uw geheugen op het hoogste niveau was. Hoe zou u uw huidige snelheid beschrijven waarmee u nieuwe informatie kan verwerken?					

5.8 Volgende vragen gaan over kleine vergeetachtigheden, waar iedereen wel eens last van heeft, maar sommigen vaker dan anderen. We zouden graag weten hoe vaak de volgende zaken jou overkomen.

	Nooit	Bijna nooit	Soms	Best vaak	Heel vaak
Hoe vaak raakt u gefrustreerd vanwege uw huidige geheugencapaciteit?					

Hoe vaak heeft u het gevoel dat u zich weer in een dergelijke situatie bevindt?					
Hoe vaak maakt u het mee dat u hetzelfde verhaal meermaals tegen dezelfde persoon vertelt?					
Hoe vaak heeft u moeilijkheden om op een bepaald woord te komen dat u wilt gebruiken?					
Hoe vaak heeft u moeilijkheden om op een bepaald woord te komen dat op het puntje van je tong ligt?					
Hoe vaak maakt u mee dat u een persoon herkent van gezicht, maar niet kan herinneren wie deze persoon is?					

6. Technologie

6.1 Hoe vaak kijkt u TV?

- ☐ Nooit (ga verder naar vraag 6.3)
- ☐ minder dan één keer per maand
- ☐ meer dan één keer per maand
- ☐ wekelijks
- ☐ dagelijks

6.2 Hoelang kijkt u gemiddeld per week naar TV?

- ☐ Minder dan 30 minuten
- ☐ Tussen een halfuur en 1 uur
- ☐ Tussen 1 uur en 3 uur
- ☐ Meer dan 3 uur

6.3 Hoe vaak gebruikt u een mobiele telefoon?

- ☐ Nooit (ga verder naar vraag 6.5)
- ☐ minder dan één keer per maand
- ☐ meer dan één keer per maand
- ☐ wekelijks
- ☐ dagelijks

6.4 Waarvoor gebruikt u een mobiele telefoon?

- ☐ Telefoneren
- ☐ SMS / berichtjes sturen
- ☐ Agenda
- ☐ Internet
- ☐ Fotograferen / Filmen

6.5 Hoe vaak gebruikt u een computer?

- ☐ Nooit (ga verder naar vraag 6.7)
- ☐ minder dan één keer per maand
- ☐ meer dan één keer per maand
- ☐ wekelijks
- ☐ dagelijks

6.6 Hoelang maakt u gemiddeld per week gebruik van de computer (buiten de werksituatie)?

- ☐ minder dan 30 minuten
- ☐ tussen een halfuur en 1 uur
- ☐ tussen 1 uur en 3 uur
- ☐ meer dan 3 uur

6.7 Hoe vaak gebruikt u een tablet-computer, zoals een Ipad?

- ☐ Nooit (ga verder naar vraag 6.9)
- ☐ minder dan één keer per maand
- ☐ meer dan één keer per maand
- ☐ wekelijks
- ☐ dagelijks

6.8 Hoelang maakt u gemiddeld per week gebruik van de tablet / Ipad (buiten de werksituatie)?

- ☐ minder dan 30 minuten
- ☐ tussen een halfuur en 1 uur
- ☐ tussen 1 uur en 3 uur
- ☐ meer dan 3 uur

6.9 Hoe vaak maakt u gebruik van het Internet?

- ☐ Nooit (ga verder naar vraag 6.11)
- ☐ minder dan één keer per maand
- ☐ meer dan één keer per maand
- ☐ wekelijks
- ☐ dagelijks

6.10 Hoelang bent u gemiddeld per week op het Internet (buiten de werksituatie)?

- ☐ minder dan 30 minuten
- ☐ tussen een halfuur en 1 uur
- ☐ tussen 1 uur en 3 uur
- ☐ meer dan 3 uur

6.11 Maakt u gebruik van technologie om uw gezondheid te meten? (bloeddrukmeter, activiteitsmonitor, glucosemeter,…)

- ☐ Nooit
- ☐ minder dan één keer per maand
- ☐ meer dan één keer per maand
- ☐ wekelijks
- ☐ dagelijks

Hartelijk dank voor uw medewerking!

Ruimte voor eventuele aan- en/of opmerkingen betreffende de vragenlijst

User session in Italy - General questionnaire

1. Dati personali

1.1 Codice Partecipante #:

1.2 Sesso

- ☐ Maschile
- ☐ Femminile

1.3 Data di nascita _ _ /_ _ /_ _ _ _

1.4 Nazionalità: _____

1.5 Titolo di studio: _____

2. Interazione con le tecnologie

Con che frequenza guarda la TV?

- ☐ Mai (*passare alla 1.3*).
- ☐ Meno di una volta al mese.
- ☐ Più di una volta al mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

1.2. Per quanto tempo guarda la TV mediamente, in una settimana?

- ☐ Meno di 30 minuti.
- ☐ Tra 30 minuti e un'ora.
- ☐ Tra 1 e 3 ore.
- ☐ Più di 3 ore.

1.3. Con che frequenza utilizza il cellulare?

- ☐ Mai (passare alla 1.5).
- ☐ Meno di una volta al mese.
- ☐ Più di una volta al mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

1.4. Per cosa utilizza il cellulare?

- ☐ Per telefonare.

- ☐ Per inviare sms.
- ☐ Agenda.
- ☐ Internet.
- ☐ Per fare foto o video.

1.5. Con che frequenza utilizza il PC?

- ☐ Mai
- ☐ Meno di una volta al mese.
- ☐ Più di una volta al mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

1.6. Con che frequenza utilizza il Tablet?

- ☐ Mai.
- ☐ Meno di una volta al mese.
- ☐ Più di una volta al mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

1.7. Con che frequenza utilizza Internet?

- ☐ Mai
- ☐ Meno di una volta al mese.
- ☐ Più di una volta al mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

1.8. Utilizza la tecnologia per valutare il suo stato di salute (misura della pressione, monitoraggio di attività, livelli di glucosio)?

- ☐ Mai.
- ☐ Meno di una volta al mese.
- ☐ Più di una volta al mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3. Attività ricreative

3.1. Che genere di attività compie principalmente durante il giorno?

- ☐ Nessuna attività.
- ☐ Attività passive a casa (guardo la TV).
- ☐ Attività attive a casa (dalla lettura alle attività manuali).
- ☐ Attività all'aperto.

3.2. Dove avvengono principalmente le sue interazioni sociali?

- ☐ Non ho interazioni sociali.
- ☐ Incontro le persone "in giro" quando esco (in strada, nei bar, dal dottore).
- ☐ Incontro le persone in strutture pubbliche (centri per i cittadini, associazioni per anziani…).

Indichi la frequenza con cui esegue le seguenti attività:

3.3. Uscite (per esempio, shopping, viaggi in autobus, ristoranti) con parenti/amici.

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.4. Organizzazione di ritrovi/pranzi sociali.

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.5. Attività fisica (per esempio, passeggiate, sport, palestra).

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.

- ☐ Ogni giorno.

3.6. Partite a carte.

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.7. Partecipazione a eventi culturali (per esempio, musei, concerti…).

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.8. Viaggi.

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.9. Giochi da tavolo.

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.10. Lavori manuali fai-da-te.

- ☐ Mai.
- ☐ Ogni anno.

- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.11. Puzzle o indovinelli.

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.12. Giochi per il computer.

- ☐ Mai.
- ☐ Ogni anno.
- ☐ Ogni mese.
- ☐ Ogni settimana.
- ☐ Ogni giorno.

3.13. Ci sono altre attività che le piace svolgere (e che non sono già state menzionate)? Se sì: quali sono? _____

4. Situazione sociale

4.1. Con che frequenza ha incontri sociali con persone che non siano parenti (amici o vicini)?

("Incontri sociali" nel senso che incontra le persone per libera scelta e non per qualche ragione specifica o per obbligo).

- ☐ Mai.
- ☐ Meno di una volta al mese o solo durante le festività.
- ☐ Da 1 a 3 volte al mese.
- ☐ Una volta a settimana o più.
- ☐ Tutti i giorni.

4.2. Con che frequenza parla al telefono con i suoi amici o parenti?

- ☐ Mai.

- ☐ Una volta a settimana.
- ☐ Più volte a settimana.
- ☐ Una volta al giorno o più spesso.

5. Situazione familiare

4.1. Con chi vive?

- ☐ Da solo.
- ☐ Con la moglie/marito.
- ☐ Con n° ___ figli.
- ☐ Con n° ___ nipoti.
- ☐ Con la nuora/il genero.
- ☐ Con il fratello/sorella
- ☐ Con la badante
- ☐ Altro _____

4.3. Riesce a vedere i suoi parenti stretti abbastanza spesso o almeno quanto vorrebbe?

- ☐ Non li vedo mai.
- ☐ A volte mi sento triste perché non passano a trovarmi molto spesso.
- ☐ A volte mi sento triste perché passano a trovarmi molto spesso.
- ☐ Sono felice anche se non passano troppo spesso.
- ☐ Sono felice perché posso vederli tutte le volte che voglio.

4.4. Quanto spesso riesce a vedere gli altri parenti?

- ☐ Mai.
- ☐ Meno di una volta al mese o solo durante le festività.
- ☐ Da 1 a 3 volte al mese.
- ☐ Una volta a settimana o più.
- ☐ Tutti i giorni.

ATTACHMENT 3

User session in the Netherlands - Service platform testing tasks

Taken MiBida

Beeldcommunicatie

- Taak 1: Ga naar beeldcommunicatie en benoem wie beschikbaar is om mee te praten. Bel deze persoon en hang vervolgens weer op.
- Taak 2: Verander de profielfoto naar een foto van u zelf. Ga terug naar de dienst.
- Taak 3: Verander uw status in 'aanwezig, maar liever niet storen'.
- Taak 4: Ga terug naar het dienstenoverzicht.

Spelletjes

- Taak 1: Start het spel 'Vier op een rij' en speel het.
- Taak 2: Sluit het spel af en keer terug naar het dienstenoverzicht.

Radio

- Taak 1: Doe de radio aan.
- Taak 2: Verander de zender naar 100%NL.
- Taak 3: Doe de radio uit en keer terug naar het dienstenoverzicht.

Krant

- Taak 1: Open de krant en blader erdoor.
- Taak 2: Sluit de krant af en keer terug.

Prikbord

- Taak 1: Open het prikbord en voeg een notitie toe voor uw contacten.
- Taak 2: Geef de notitie een onderwerp en type de tekst van de notitie.
- Taak 3: Plaats de notitie op het prikbord.
- Taak 4: Verwijder de notitie.

Voor elkaar

- Taak 1: Start de dienst en wijzig uw status.
- Taak 2: Beantwoord de gestelde vragen.
- Taak 3: Je ziet een overzicht van je groepje. Hoe gaat het met Wil?

Geluid

- Taak 1: Zet het geluid naar 10%.
- Taak 2: Zet het geluid naar 100%.

Buienradar

- Taak 1: Kijk of het de komende uren gaat regenen in Eindhoven.

Taken ABC-TV

Foto's

- 1a. Ga naar de bibliotheek met foto's
- 1b. Blader doorheen de foto's
- 1c. Keer terug naar het foto-overzicht

Beeldbellen

- 2a. Ga naar het menu voor beeldbellen
- 2b. Kan je zien wie er beschikbaar is?
- 2c. Maak een video-telefoontje
- 2d. Beeindig het gesprek

Wereld

- 3a. Zoek de buienradar/weerbericht
- 3b. Bekijk de buien voor morgen
- 3c. Keer terug naar het menu
- 3d. Zet de radio aan op 3FM
- 3e. Zet de radio weer uit

Filmpjes

- 4a. Zoek het filmpje "Folklore in de regen"
- 4b. Start het filmpje.
- 4c. Beeindig het filmpje.
- 4d. Zoek het filmpje … (in andere map)
- 4e. Beeindig het filmpje

Agenda

- 5a. Ga naar Agenda
- 5b. Hoelaat moet je vandaag je medicijnen innemen?
- 5c. Hoe zou je aangeven dat je je medicatie ingenomen hebt?
- 5d. Hoe laat moet je zaterdag naar de dokter?

Taken Viedome Community

Beeldcommunicatie

- 1a. Ga naar beeldbellen en benoem wie beschikbaar is om mee te praten.
- 1b. Probeer Smart Homes 02 te bellen
- 1c. Blijkbaar neemt de persoon niet op, verbreek zelf de verbinding.
- 1d. Schrijf een berichtje naar Smart Homes 02 "Hoe gaat het?"
- Ga terug naar de startpagina.

Radio

- 2a. Zet de radio aan.
- 2b. Verander de zender naar Omroep Brabant / 3FM.
- 2c. Zet het volume een beetje zachter / harder
- 2c. Doe de radio uit.

Nieuws

- 3a. Ga naar het Nieuws-overzicht
- 3b. Welke nieuwsgroepen kan je zien?
- 3c. Pas je nieuwsgroepen aan
    - Je bent niet meer geïnteresseerd in Sport / Natuur
    - Voeg Sport / Natuur toe
    - Bewaar je veranderingen
- 3d. Bekijk meer sport-berichten
- 3e. Wat is de titel van het laatste sport-bericht?
- 3f. Keer terug naar de startpagina.

Advertenties

- 5a. Ga naar het overzicht met advertenties
- 5b. Kijk na wat andere mensen zoeken
- 5c. Keer terug naar de startpagina

Handleiding

- 6a. Zoek op in de handleiding hoe je nieuwe vrienden moet uitnodigen
- 6b. Sluit de handleiding

Taken Vicasa

Zusteroproep

- 1a. Bel de zuster
- 1b. Zeg ‘Hallo, ik ben …’
- Ga terug

Berichten

- 2a. Ga naar berichten
- 2b. Kijk of er nieuwe berichten zijn
- Ga terug

Persoonlijk adresboek

- 3a. Ga naar het adresboek
- 3b. Bel ‘1101 SmartCare Eersel’

- 3c. Annuleer de oproep
- Ga terug

Datum & Tijd

- 4a. Benoem hoe laat het is en de datum

Weer/Spelletjes

- 5a. Doe de radio aan
- 5b. Zet hem op Skyradio
- 5c. Zet het geluid uit
- Ga terug

Agenda

- 6a. Kijk in de agenda
- 6b. Benoem wat er vandaag voor afspraak staat
- Ga terug
- 6c. Benoem wie er in December jarig is
- 6d. Wanneer en hoe laat moet u medicatie nemen?
- 6e. Voeg in november een afspraak toe met een vriend/vriendin. U gaat samen winkelen om 10:00 uur in Eindhoven.

Nieuws

- 7a. Benoem het laatste nieuws dat zorg gerelateerd is

Weer

- 8a. Benoem hoe warm het is in Groningen

Slaapstand

- 9a. Zet het scherm in de slaapstand

ATTACHMENT 4

Informed consent form

HEREiAM project
AAL – Ambient Assited Living
DEELNAME TOESTEMMING FORMULIER

Titel van het project: HEREiAM
Coördinator: Prof. Luigi Raffo (Universiteit van Cagliari, Italie)
Locatie: Slimste Woning van Nederland (Smart Homes)

Financiering: Europese Commissie & ZonMw in opdracht van het Ministerie van VWS
Duur: 2013-2016

Naam van de deelnemer: __ __ __ __ __ __ __ __ __ __ __ __ __ __ __ __

Het onderzoek beschreven in deze tekst is een deel van het onderzoeksproject HEREiAM, gefinancierd door de Europese Commissie en ZonMw in opdracht van het Ministerie van VWS binnen het AAL subsidie programma. Als u na het lezen van dit toestemmingsformulier nog overwegingen of vragen heeft, aarzel dan niet deze te bespreken. Ook kunt u, voordat u een beslissing neemt, met uw familie overleggen of u wilt deelnemen.

1. INLEIDING

U bent uitgenodigd deel te nemen aan een onderzoek. Voordat u besluit om deel te nemen, lees eerst aandachtig dit toestemmingsformulier. Nogmaals, vraag alle vragen die u heeft om er zeker van te zijn dat u alle procedures begrijpt van het onderzoek, met inbegrip van de risico's en de voordelen.

2. DOEL VAN DE STUDIE

Het doel van het HERiAM project is om een dienstenplatform te ontwikkelen voor de TV - voor en met senioren. De diensten zijn bedoeld om senioren langer zelfstandig thuis te kunnen laten wonen.

3. DEELNEMERS AAN HET ONDERZOEK

U wordt gevraagd om vrijwillig deel te nemen aan het onderzoek. Dit toestemmingsformulier bevat informatie over het onderzoek. U kunt op ieder moment, zonder opgave van reden, stoppen. De eindgebruikersgroep waarop dit onderzoek is gericht zijn senioren (65 + jaar). Eerdere ervaring met technologieën is niet vereist.

4. PROCEDURES

In de eerste fase zal uw deelname bestaan uit het uitvoeren van een aantal taken op verschillende dienstenplatformen en het invullen van een vragenlijst. Aan het einde van het onderzoek zal er een groepsgesprek plaatsvinden om uw mening en bevindingen te bespreken.

5. RISICO OF ONGEMAKKEN

Er zijn geen risico's te verwachten bij deelname aan dit onderzoek.

6. VOORDELEN

Uw persoonlijke ervaring en mening zijn belangrijke informatie voor ons, omdat deze de basis zal vormen voor toekomstige onderzoeken en de ontwikkeling van dienstenplatformen voor senioren.

7. PRIVACY EN VERTROUWELIJKHEID

De informatie die u ons in het onderzoek zal geven, zal voornamelijk gebruikt worden in interne rapporten. Sommige resultaten zouden in de toekomst gebruikt kunnen worden in Journal- of conferentie artikelen. Uw naam zal losgekoppeld worden van de resultaten, waardoor de gegevens volledig anoniem zullen zijn. Alleen de direct veratwoordelijke onderzoekers hebben toegang tot de gegevens en resultaten van het onderzoek. De resultaten zullen bewaard worden in een kluis of afgesloten kast.

8. CONTACTPERSOON

Voor meer informatie over uw rechten als een onderzoeksdeelnemer, of als u niet tevreden bent met de manier waarop deze studie wordt uitgevoerd of als u vragen hebt of enig letsel in de loop van het onderzoek heeft opgelopen, neem dan contact op met de volgende onderzoekers:

Wil Rijnen, Henk Herman Nap
Stichting Smart Homes
Duizelseweg 4a
5521 AC Eersel
Telefoon: 0497-514984
e-mail: info@smart-homes.nl

9. BEVESTIGING

Als u nog steeds wilt deelnemen, kunt u de vakjes aankruisen en uw handtekening met de datum onderaan het formulier plaatsen.

1 Ik bevestig dat ik de informatie voor dit onderzoek heb gelezen en begrepen; daarnaast heb ik de mogelijkheid gehad om vragen te stellen. ☐

2 Na het lezen van de informatie geef ik toestemming om aan dit onderzoek deel te nemen. ☐

3 Ik geef toestemming voor het maken van geluidsopnames. ☐

4 Ik geef toestemming voor het maken van beeldopnames. ☐

5 Mijn informatie en gegevens mogen gebruikt worden voor het onderzoek zoals hierboven geschreven en communicatiedoeleinden. ☐

_____	_____	_____
Naam Deelnemer	Datum	Handtekening

_____	_____	_____
Naam Onderzoeker	Datum	Handtekening

ATTACHMENT 5

Post-Study System Usability Questionnaire (PSSUQ)

1. Overall, I am satisfied with how easy it is to use this system

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

2. It is simple to use this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

3. I can effectively complete my work using this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

4. I am able to complete my work quickly using this system

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

5. I am able to efficiently complete my work using this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

6. I feel comfortable using this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

7. It was easy to learn to use this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

8. I believe I became productive quickly using this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

9. The system gives error messages that clearly tell me how to fix problems.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

10. Whenever I make a mistake using the system, I recover easily and quickly.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

11. The information (such as on-line help, on-screen messages and other documentation) provided with this system is clear.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

12. It is easy to find the information I need.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

13. The information provided with the system is easy to understand.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

14. The information is effective in helping me complete my work.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

15. The organization of information on the system screens is clear.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

Note: The interface includes those items that you use to interact with the system. For example, some components of the interface are the keyboard, the mouse, the screens (including their use of graphics and language).

16. The interface of this system is pleasant.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

17. I like using the interface of this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

18. This system has all the functions and capabilities I expect it to have.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

19. Overall, I am satisfied with this system.

Strongly agree	1	2	3	4	5	6	7	Strongly disagree

User session in the Netherlands - Platform vragenlijst

Duid voor elk item aan hoe u het gebruik van de het systeem (scherm, knoppen, bediening, etc.) ervaren heeft. Doe dit met behulp van de volgende schaal.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

1. Over het geheel genomen ben ik tevreden over hoe makkelijk het is om dit systeem te gebruiken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

2. Het was makkelijk om dit systeem te gebruiken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

3. Ik kon de taken effectief uitvoeren door middel van dit systeem.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

4. Ik was instaat om de taken snel uit te voeren door middel van dit systeem.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

5. Ik was instaat om de taken efficiënt uit te voeren.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

6. Ik voelde mij om mijn gemak tijdens het gebruik van dit systeem.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

7. Het was makkelijk om dit systeem te leren gebruiken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

8. Ik vind dat ik snel productief werd in het gebruik van dit systeem.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

9. Het systeem gaf foutmeldingen die mij duidelijk maakten hoe ik problemen kon oplossen.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

10. Op het moment dat ik een fout maakte tijdens het gebruik van het systeem, kon ik deze makkelijk en snel herstellen.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

11. De informatie die het systeem gaf (zoals help, berichten op het scherm of andere documentatie) was duidelijk.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

12. Het was makkelijk om de informatie te vinden die ik nodig had.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

13. De informatie die voor het systeem gegeven was makkelijk om te begrijpen.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

14. De informatie was effectief om mij te helpen om de taken uit te voeren.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

15. De organisatie van de informatie op het systeem was duidelijk.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

16. Het scherm (interface) van dit systeem was prettig.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

17. Ik vond het leuk om de interface van dit systeem te gebruiken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

18. Dit systeem heeft alle functies en mogelijkheden die ik verwachtte.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

19. Over het geheel genomen ben ik tevreden met dit systeem.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

20. Ik had het gevoel dat ik controle had.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

21. Ik kon werken op mijn eigen manier.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

22. Wanneer ik iets van plan was, was ik in staat dit ook uit te voeren.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

23. Ik heb een redelijk goed beeld van hoe het systeem werkt.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

24. Ik voelde me verantwoordelijk voor een goede uitvoering van de taken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

25. Ik voelde me gedemotiveerd tijdens het uitvoeren van de taken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

26. Ik heb een goed gevoel over mijn presteren voor deze taken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

27. Op sommige momenten had ik liever willen opgeven.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

28. Ik zou nog een keer met dit apparaat willen werken.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

29. Het was leuk om uit te zoeken wat dit apparaat kan.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

30. Ik denk dat mijn vrienden dit apparaat wel leuk zouden vinden.

Volledig mee eens	1	2	3	4	5	6	7	Volledig mee oneens

User session in Italy – Questionario sull'usabilità

1. In generale, sono soddisfatto della facilità d'uso del sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

2. Utilizzare questo sistema è stato semplice.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

3. Sono riuscito a eseguire in modo efficace le azioni richieste usando il sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

4. Sono riuscito a eseguire velocemente le azioni richieste usando il sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

5. Sono riuscito a eseguire in modo funzionale le azioni richieste usando il sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

6. Mi sento a mio agio utilizzando questo sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

7. E' stato semplice imparare a usare questo sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

8. Credo che riuscirei a diventare produttivo velocemente, utilizzando questo sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

9. Il sistema forniva messaggi di errore che spiegavano chiaramente come risolvere il problema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

10. Ogni volta che commettevo un errore utilizzando il sistema, riuscivo a rimettermi in carreggiata facilmente e velocemente.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

11. Le informazioni (come supporto online, messaggi sullo schermo e altra documentazione) fornite col sistema erano chiare..

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

12. E' stato semplice trovare le informazioni di cui avevo bisogno.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

13. Le informazioni che sono state fornite sul sistema erano facili da comprendere.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

14. Le informazioni sono state in grado di aiutarmi a completare le azioni richieste.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

15. L'organizzazione delle informazioni sullo schermo del sistema erano chiare.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

Nota: L'interfaccia comprende tutti i dispositivi utilizzati per interagire col sistema. Ad esempio, il linguaggio, i pulsanti, le caselle di testo, etc.

16. L'interfaccia del sistema era gradevole.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

17. Mi è piaciuto usare l'interfaccia del sistema..

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

18. Questo sistema ha tutte le funzionalità e le possibilità che immaginavo avesse.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

19. In generale, sono soddisfatto di questo sistema.

Molto d'accordo	1	2	3	4	5	6	7	Molto in disaccordo

ATTACHMENT 6

Focus group questions

Focus Group vragen

- Voor wie zijn dergelijke platformen een meerwaarde? (Doelgroep)
    - Ouderen
        1. Intramuraal / extramuraal
        2. Alleenstaand
        3. Sociaal actief / eenzaam
        4. Computerkennis / geen computerkennis
    - Andere doelgroepen
    - Rol mantelzorger?
- Welke diensten vind je het leukst?
- Zijn er diensten bij die je niet zou gebruiken?
- Heb je ideeën vor extra diensten die je graag zou willen, maar die je vandaag niet gezien hebt?
- Zijn er activiteiten die je niet meer zelf kan, en waarbij een dergelijk platform je zou kunnen helpen?
- Graag op TV?
    - Platform via de tv, touch pc, Ipad of laptop
    - Voordelen van TV?
    - Nadelen van TV?
    - Specifieke diensten die je graag op TV zou doen ipv op computer?
    - Specifieke diensten die je juist niet op de TV zou willen
    - Sociale context / ontspanningsruimte?
    - Afstandsbediening
- Zou je dergelijk platform willen gebruiken voor zorg-toepassingen?
- Vind je dat zo een platform voor uzelf een meerwaarde biedt?
- Zou je één van deze platformen graag zelf gebruiken?
- Waarom dit wel/niet en een computer wel/niet?
- Bent u bereid om voor dergelijk platform te betalen?