

Understanding the User's Acceptance of a Sensor-Based Ambient Assisted Living Application

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Abstract. In this paper the acceptance of a sensor-based Ambient Assisted Living (AAL) application is investigated. To get an insight into the users' perception and needs, three fictive use scenarios were created that illustrated the potential features of the technology. Consequently, the scenarios were presented to primary (i.e., older adults) and secondary (i.e., formal and informal caregivers) user groups. Through focus groups and semi-structured interviews in France, UK and Belgium, fourteen design implications could be identified based on the preliminary analyses of the users' feedback. These implications will direct the future testing and development of the conceptual technology and can be meaningful to related AAL applications.

Keywords: Ambient Assisted Living (AAL) · Older adults · Technology acceptance behavior · User-centered design

1 Introduction

The vision of Ambient Assisted Living is to develop advanced ICT solutions that foster the autonomy, health, self-confidence, mobility and social participation of the aging community. The overall goal is to facilitate healthy and independent aging, support and unburden the care network and ultimately, control the expenses for health and social care [1, 2].

From a social and economic point of view, the development of these innovative technologies is almost inevitable, considering the demographic transition we experience. The elderly population is growing at a rapid rate and prognoses state that by 2050, one in every three persons in the more developed regions will be 60 years or older [3]. This leads to several challenges, including an aging workforce, more people with chronic conditions and in need of care, a shortage of caregivers and more responsibilities for family caregivers [2, 4]. However, more optimistic voices focus on the opportunities of this demographic shift. They consider this age group – especially the more affluent seniors – as an emerging market for innovative products and services that support healthy and active aging and help them to make the most of their third age [2, 5].

1.1 Ambient Assisted Living

As stated by Van Den Broek, Cavallo and Wehrmann [2]: “There is no common view about the precise definition of AAL” (p. 15). However, after considering different attempts for describing and defining AAL [2, 4, 6] we found some common ground.

AAL builds on the principle of Ambient Intelligence [7] by developing a new generation of assistive technologies which are embedded (i.e., unobtrusively integrated into the environment); context-aware (i.e., aware of the environment); personalized (i.e., tailored to the specific needs of the individual user); adaptive (i.e., responsive to the user and the situational context); and anticipatory (i.e., anticipating the user’s needs and desires without explicit request). The overall aim is to create digital environments that are empowering, supportive and safe for the elderly user.

AAL comprises various state-of-the-art technologies including smart homes, robotics and ambient, mobile and wearable sensors. Those technologies are combined with several advanced techniques, including activity recognition, context modeling, location identification, planning and anomaly detection (see [4] for a detailed review). In accordance with the variety of tools and techniques, the application domains of AAL are diverse. According to Van Den Broek, Cavallo and Wehrmann [2] AAL can be divided into three general application domains with each domain covering several sub-domains:

1. Ageing well at home
 - (a) health, rehabilitation and care
 - (b) coping with impairments and disabilities
 - (c) activity management and monitoring
 - (d) safety and security (personal and home)
 - (e) activities of daily life oriented support
 - (f) other common activities (i.e., shopping, eat and drink, social interaction)
2. Ageing well in the community
 - (g) social inclusion
 - (h) entertainment and leisure
 - (i) mobility
3. Ageing well at work
 - (j) access to working space
 - (k) assuring environmental working conditions
 - (l) support work activities
 - (m) prevention of work-related diseases and injuries
 - (n) safety and health regulation for employees

The current study was conducted as part of the SONOPA (SOcial Networks for Older adults to Promote an Active life) project. SONOPA focusses on the domains of aging well at home and aging well in the community. The following section describes the project and the conceptual application in more detail.

1.2 The SONOPA Project

The SONOPA project is part of the 5th AAL Joint Program Call termed 'ICT-based Solutions for (Self-)Management of Daily Life Activities of Older Adults at Home'. SONOPA aims to empower older adults to stay autonomous, active and socially connected and at the same time support and unburden their family caregivers [8]. Following this objective, SONOPA strives to provide an integrated solution, which combines smart home technology, a social network environment and activity recognition and matchmaking techniques. In essence, the conceptual SONOPA system consists of three major subcomponents.

1. A smart home environment with low-resolution visual sensors, PIR sensors and an intelligent user-interface. The intelligent user-interface is a web application that pushes information and recommendations at the appropriate time to the elderly in the home environment. The intelligent user-interface derives its input from various sources for example from the user's agenda, the social network activity, information pushed by family members and feedback from the SONOPA controller based on the sensor data. It is set up as a cloud-based solution can run on tablets or a smart TV.
2. An adapted and simplified social network that hosts all social interaction components like message system, friend management, activities and interest groups as well as real time chat and video calls.
3. The SONOPA controller that receives and processes all sensor data and data retrieved from the social network with advanced activity recognition and matchmaking algorithms.

At this stage the system is still in a prototype stage. By closely involving prospective users in the development and testing of the system, the system will be further improved and adapted to the user's feedback.

1.3 The Importance of User Involvement

AAL technologies could be the key to healthy and autonomous aging. However, while those technologies offer a promising outlook on the future of our aging society, technology adoption among older adults is typical low [9, 10]. Stereotyping, insufficient need assessment, and the cultural gap between developers and the older adult users are often reasons for non-adoption [9, 11]. Therefore, in the development and design of AAL technologies, it is crucial to closely involve older adults throughout the design and development process in order to fully understand their context, needs and desires [11, 12]. In addition, one should also pay attention to other stakeholders such as family and professional caregivers [4], as they are also facilitators of a successful adoption of AAL technologies. By closely involving the future users in this study, we aim to improve SONOPA to better correspond with their needs and hence be more likely to get accepted.

2 Method

To derive a better understanding of the users' needs and perceptions with regard to the conceptual SONOPA system, three use scenarios were developed and presented to the primary (i.e., older adults) and secondary (i.e., formal and informal caregivers) user groups. Focus groups and semi-structured interviews were conducted in the project's target countries France, United Kingdom and Belgium to collect the users' perspective.

2.1 Scenario Development

A workshop with all SONOPA consortium members was held to create use scenarios for the SONOPA system. The consortium consists of professionals from different backgrounds including behavioral researchers, computer scientists, technical developers, marketing professionals and professionals working closely with the primary and secondary target group. The workshop started with a brainstorm session to specify the potential features of the SONOPA system. Thereby, we included the results from an initial user study that was conducted at the very beginning of the project. After grouping similar features together, the session resulted in 38 features, which after discussion, were further narrowed down to 14 features. The remaining features were then grouped into three topics:

1. **Smart Secretary:** focusing on sensor-based reminders and activity suggestions as well as fostering the connection with family members and providing some peace of mind;
2. **Matchmaking:** focusing on exchanging knowledge and services, matching users with similar interest across generations and providing opportunities for volunteering;
3. **Activity Game and Care Logbook:** focusing on gaming to monitor and encourage activity and coordinating care.

The consortium split up into 3 subgroups to compose the first version of each scenario. Subsequently, each scenario was presented to the other consortium partners and feedback was collected to finalize the scenarios (see Annex 1).

2.2 Participants

The participants from the primary and secondary user groups were recruited through the network of the end-user consortium partner in each of the target countries.

Primary User Group. In total, 17 older adults aged between 55 and 82 years ($M = 73.41$, $SD = 6.88$) participated in this study. Gender distribution in this user group was fairly equal with ten female participants and seven male participants. Only five participants lived alone, the others lived with a partner, friend or family member. The majority of the older adults was retired, one participant was self-employed and another was a voluntary worker. Concerning their ICT experience, 76 % of the older adults in this study indicated to use ICT tools (e.g., computer, smartphone or tablet) on a daily

basis, mostly for purposes such as communication and mailing, writing and text editing, administration and finances, and information research. Only two participants rarely or never used ICT tools. About half of the older adults in this study used social network sites on a daily ($n = 6$) or weekly ($n = 2$) basis, the other had little experience with social network sites and rarely ($n = 1$) or never ($n = 8$) used social networks. The older adult participants in this study felt fairly healthy, active and socially connected according to their self-reported measures on a seven-point Likert scale ($M^{\text{Health}} = 6.12$, $SD = 1.36$; $M^{\text{Physical}} = 5.88$, $SD = 1.73$; $M^{\text{Social}} = 6.18$, $SD = 1.19$).

Secondary User Group – Informal Caregivers. Five female informal caregivers participated in this study. They were aged between 63 and 81 years ($M = 73.80$, $SD = 7.56$) and most of them ($n = 4$) were retired. Two participants took full-time care of their husband, one participant took full-time care of her daughter, another was looking several times a day after her mother and the last one was the informal caregiver of a friend who she supported several times a week. They were fairly experienced with ICT tools and all but one informal caregiver used these tools on a daily basis, mostly for the purpose of mailing and communication, and information research. Moreover, three participants were experienced and frequent social network users.

Secondary User Group – Formal Caregivers. Five female formal caregivers, aged between 26 and 56 years ($M = 45.8$, $SD = 12.38$) participated in this study. Their average work experience in the field of elderly care was $M = 15.00$ years, $SD = 8.94$. They were experienced ICT users and used these tools for professional and various private purposes. All but one participant in this group used social network sites on a daily or weekly basis.

2.3 Procedure

Before starting the focus groups and semi-structured interviews, the participants were asked to fill in an informed consent form and a short questionnaire to gather some demographic data. After that, a short introduction of the SONOPA project was provided. In the first part of each session, several questions accessed the user's general experience and opinion with regard to social networks, sensors and other care-related ICTs. In the second part, each use scenario was presented to the user and evaluated with several follow-up questions. The third part concluded with a short demo and subsequent usability evaluation of the first prototype of the smart user-interface, displaying different types of information, which could be pushed to the intelligent interface in the user's home. Each session lasted about 60 to 90 min and was recorded and transcribed for subsequent analyses. The recorded material was then coded and grouped into common themes.

3 Preliminary Results

3.1 General Impression

This section describes the participants' overall impression of each use scenario.

Scenario 1. The focus of the ‘smart secretary’ scenario was on sensor-based reminders and activity suggestions as well as fostering the connection with family members and providing some peace of mind. The older adults regarded the features in this scenario especially useful for people who live on their own, with limited ICT skills and who start to experience some problems in their daily routine. However, the formal caregivers could also imagine these features to be helpful for clients who are still active and mobile, to get some extra incentives for activities and to prevent age-related decline. The older adults believed that the features in this scenario could stimulate the user to be more active and feel socially connected. The formal caregivers agreed that the prompts provided by the system could stimulate activity, but had their doubts that the features could improve the user’s level of social connectedness. The support and peace of mind for the family, and the stimulating reminders were viewed as key benefits of this scenario. Concerns included among others, the potential intrusiveness of the system and also the burden it could put on a family member to be constantly in the loop of the whereabouts of his relative.

Scenario 2. The ‘matchmaking’ scenario focused on exchanging knowledge and services, matching users with similar interest across generations and providing opportunities for volunteering. Older adults, informal caregivers and formal caregivers thought that the features described in this scenario could stimulate activity and foster social connectedness. The participants thought that the key benefit of this scenario was that older adults were not just on the demand site but also contributed with their own skills and knowledge. Moreover, the features in this scenario helped the users to engage in new activities and find people with similar interests. Concerns were raised about the lack of added benefits compared to existing volunteer networks and the difficulty to find enough reliable and suitable volunteers.

Scenario 3. The ‘activity game and care logbook’ scenario put the focus on using gaming to monitor and encourage activity and coordinate care through an automated care logbook. Older adults, informal caregivers and formal caregivers perceived the features described in the scenario most suitable for older adults with an advanced need of care. The participants thought that the capabilities of the system to foster activity and social connectedness were limited as activity would be housebound and social interaction computer-mediated. A game that is entertaining and functional at the same time was viewed as a main advantage of this scenario. From the older adults’ and the informal caregivers’ perspective, another advantage was the possibility to get an objective view on the received level of care, which in turn increases the accountability of formal caregivers. However, according to the formal caregivers’ feedback, the care logbook did not provide a lot of added value, as they already have systems and procedures in place for coordinating and exchanging with other caregivers.

3.2 Design Implications

After analyzing the collected data, several common themes were identified from the users’ feedback and translated into specific design implications.

Specific and Flexible Value Propositions. The participants' feedback showed, that we have to rethink and specify some of SONOPA's suggested value propositions. For instance in contrast to our expectations, the formal caregivers showed little interest in using the collected sensor data in their role as professional caregiver. Moreover, gaming (scenario 3) was not perceived as suitable for all older adults. Several participants mentioned a lack of added value compared to existing solutions, e.g. with regard to the volunteer network (scenario 2) or the caregiver logbook (scenario 3). Another issue was the lack of need realization. One formal caregiver emphasized that some older adults do not realize that they need help and therefore, would not be receptive to technologies like SONOPA. Indeed, the older adults in this study found most features useful for other frail and lonely elderly, but not for themselves. To counter these issues, SONOPA should offer all services optional, so that the system appeals to the individual user's needs, wishes and abilities. These needs can change over time and SONOPA should be able to adapt to this change. For instance in scenario 1, a person with beginning cognitive decline should get more pushed information (i.e., reminders, alerts) than a person with better cognitive abilities. Flexibility is also important with regard to the context. For instance, in an emergency situation alerts should be pushed to the informal caregivers, while in a regular use mode sensor information could be pulled by the informal caregiver, whenever seen fit. Formal caregivers emphasized that SONOPA's value propositions must be clearly communicated to the older adults (e.g. by means of a short video) and that formal caregivers and informal caregivers could have a stimulating role in encouraging the older adults to try the system.

Foster Social Connectedness. The social interaction components of the SONOPA system (matchmaking, video calls, interest groups, event suggestions) were positively perceived by participants from all user groups. In general, the users believed that SONOPA could help older adults to stay in touch with family and friends, get linked to peers with the same interests, and consequently feel more connected and less lonely. In scenario 2, the informal caregivers and older adults especially liked that interaction was intergenerational. Moreover, the informal caregivers could imagine to use the social network component to connect to other informal caregivers in order to exchange personal experiences. However, participants emphasized that social interaction should not be limited to computer-mediated interaction, but that SONOPA should also foster face-to-face meetings.

Provide Leisure and Activity Features. In general, participants were positive about the suggested activity and leisure components. They liked that SONOPA could provide information and reminders about local events and stimulate activity. Participants suggested that SONOPA should be used as a channel to promote activities of local clubs and associations. A few older adults also liked the gaming aspect (scenario 3). The formal caregivers thought that the activity reminders (scenario 1) were also suitable for clients who are still active and mobile to prevent beginning functional decline.

Offer Information, Reminders and Daily Life Support. The participants in this study thought that the SONOPA reminders (scenario 1) were a good prompt to help the user to remember important things such a eating regularly or visiting the doctor, especially for people with beginning cognitive problems. The older adults also liked the

social network for exchanging services (scenario 2) as it would offer them a platform to ask for help with daily life tasks. It was suggested that SONOPA should also include other informational features such as date, time, contact information of doctors and caregivers, and opening hours from local stores.

Include Health and Safety Features. Although the focus of SONOPA is not on health and safety features, informal caregivers and older adults suggested including pill reminders in the SONOPA system. One formal caregiver also suggested, that for older adults to adopt sensors in their home, more health or safety benefits have to be added to the SONOPA system. Older adults from the UK perceived the main benefits of scenario 3 to be the increased accountability and traceability of caregivers, to ensure that proper care is provided and nothing gets stolen from the house.

Empower Not Patronize. It was emphasized multiple times, that SONOPA should empower and not patronize the elderly user. Luckily, several formal caregivers perceived the reminders and event suggestions (scenario 1) as a positive stimulation. One formal caregiver even viewed SONOPA as a “buddy” who gives suggestions for activities without forcing them on the older adult. However, others feared the reminders could be perceived as annoying, intrusive and possibly infantilizing. Following this argumentation, participants liked about scenario 2, that older adults were not just on the demand site but also contributed with their own set of skills and knowledge. This in turn might increase their level of self-confidence. Moreover, the older adults liked that the users in this scenario decided on their own whether they needed help. In line with this, formal caregivers and informal caregivers alike, stressed that the clients or relatives should be in control of their life and decide if they want to use SONOPA; where sensors are placed; and which data is shared and with whom.

Provide Peace of Mind without Burdening the Informal Caregiver. Participants from each user group appreciated that SONOPA can support the informal caregivers and provide some peace of mind, by allowing them to check on the older adult from distance, alerting them in case of abnormal behavior, provide recommendations and reminders on their behalf, and logging care visits to the older adult’s home. SONOPA was perceived as a useful support tool for the primary informal caregiver as well as for the supportive informal caregiver, who might live further away from the older adult. However, older adults and formal caregivers were concerned that SONOPA could put an extra burden on the informal caregivers by pushing too much information about the well-being of the older adult. This could be countered, by leaving it up to the informal caregiver, which data is consulted and when.

Clear Roles. A related requirement concerns the role allocation within the SONOPA context. The formal caregiver emphasized that it has to be clear, which caregiver is in charge of checking on the older adult to avoid conflicts with other caregivers. Another role conflict could emerge if professional caregivers become part of the SONOPA social network. They underline that there should be a clear distinction between the seniors’ profiles and the professional caregivers’ profiles as they just want to be contacted in their role as a professional.

Do Not Replace Human Contact. Participants from all user groups stressed that technologies like SONOPA cannot and should not replace the human caregiver and personal, face-to-face interactions. SONOPA was acknowledged as an supportive tool but not as a substitute, e.g. when coordinating care (scenario 3) or stimulating activity (scenario 1). Communication via the SONOPA system should strengthen family bonds and not replace personal visits. Ideally, computer-mediated communication via SONOPA should lead to face-to-face encounters.

Beware of Unwanted Side Effects. The participants' feedback made us alert for potential unwanted side effects of the SONOPA technology. First, SONOPA should not take over tasks, which the older adults can still perform on their own, thereby taking away their own initiative, instead of stimulating autonomy. Second, computer-mediated activities should not replace outdoor activities (scenario 3). Third, informal caregivers should not be overloaded with information, to avoid that notifications of serious events will perish in the sheer amount of data.

Increase Usability. According to the feedback of the participants, the SONOPA system needs to be user-friendly and easy-to-use. Luckily, the first impression of the intelligent user-interface was rather positive with regard to the overall usability and design. To further increase the usability, SONOPA should be able to integrate existing ICT systems and services that are already used by the prospective users. This way, they do not have to get acquainted to yet another new system.

Ensure Reliability and Data Security. It is of high importance that AAL technologies like SONOPA are reliable and work properly. The feedback of the participants made us alert for several challenges. First, it is a mistake to presume that older adults have the same routine every day and our activity recognition algorithms have to be able to cope with that. Second, for scenario 2 it could be difficult to find good matches between the older adults and the service providers. Third, in scenario 3 some caregivers doubted the quality and completeness of the collected activity data. Finally, another critical aspect is data security. Informal and formal caregivers pointed out that all sensitive and personal data collected by the system must be managed and stored securely, so the data cannot be misused.

Ensure Privacy and Unobtrusiveness. Privacy concerns and intrusiveness were prevalent concerns with regard to SONOPA, especially in scenario 1. Therefore, SONOPA reminders have to be adjusted to the individual user's needs and wishes. Moreover, the system should not be too visible or noisy, and should not tolerate intrusive advertisements in the social network environment.

Make the System Accessible and Affordable. Based on the feedback of the participants we can conclude that costs are a major decisive factor for adopting AAL technologies like SONOPA. Therefore, SONOPA should strive to be reasonably priced and accessible to all older adults, despite their potentially limited income.

4 Conclusions and Future Work

In this paper, we tested a conceptual sensor-based AAL application called SONOPA. To investigate potential acceptance issues, three fictive use scenarios were developed and presented to primary (i.e., older adults) and secondary (i.e., formal and informal caregivers) user groups. After a preliminary analyses, the collected feedback was grouped into common themes and translated into fourteen design implications that will guide the future development and testing of the SONOPA technology: (1) Specific and Flexible Value Propositions, (2) Foster Social Connectedness, (3) Provide Leisure and Activity Features, (4) Offer Information, Reminders and Daily Life Support, (5) Include Health and Safety Features, (6) Empower Not Patronize (7) Provide Peace of Mind without Burdening the Informal Caregiver (8) Clear Roles, (9) Do Not Replace Human Contact, (10) Beware of Unwanted Side Effects, (11) Increase Usability, (12) Ensure Reliability and Data Security, (13) Ensure Privacy and Unobtrusiveness, (14) Make the System Accessible and Affordable.

Although these implications derive from a small sample and data were collected in the context of a specific AAL application, these results follow up on previous work. For instance, Peek et al. [13], conducted a systematic review of factors influencing the acceptance of technologies for aging in place and identified ‘high cost’ and ‘privacy implications’ as most frequent concerns, while ‘safety’ was the most prevalent benefit. The ‘perceived need’ for a technology was also a very important acceptance factor in that study. Beer and Takayama [14] who studied the acceptance of a mobile remote presence system for older adults found ‘privacy’ and less ‘face-to-face contact’ among the major concerns while ‘socialization’ was perceived as a benefit. Therefore, it can be assumed that the identified design implications are not just relevant for the further development of SONOPA, but that these guidelines are also meaningful to other AAL technologies.

Future work will focus on expanding the data analyses and testing SONOPA in the field, to gather feedback in a more natural use-setting. Despite their preliminary nature, we believe that the identified implications will be valuable for the improvement of SONOPA and provide other researchers and developers of AAL technologies with valuable insights to shape their own technology according to the users’ needs.

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Appendix 1

Scenario 1. *Mary’s wake-up call at 07:00 didn’t happen, because Sonopa detected that she is already out of bed and in the bathroom, but Sonopa does remind her, on the tablet by her bed, that she has an appointment with the optician. Sonopa sees that Mary has not planned any activities after the optician’s appointment, as a result a recommendation is proposed to her via the tablet to go to an art exhibition that takes*

place 15 min from the optician's place. She still has time to prepare and enjoy a fine breakfast. She is following some advice that she got from Sonopa about the importance of having a nutritious breakfast. The Sonopa system had noticed that Mary often skips breakfast.

As she is preparing to leave the house, Sonopa detects her presence in the corridor near the main door, and as she picks up the keys, Sonopa registers that she is about to leave the house and reminds her to buy some groceries. Mary consults her grocery list which her son, Steve, left in Sonopa when he visited yesterday and inspected the fridge. When Mary comes back after an eventful day, Sonopa tells her via the big screen in the kitchen that today was the last day of school for her granddaughters, and maybe she can send them a message and ask about their grades? Mary sends a text message via a speech messaging tool. Fifteen minutes later, Susan (her grandchild) pushes her school report to Mary's tablet and requests a short video chat via the screen. Mary and Susan have a nice video chat and Mary tells Susan that her eyes are improving and that she enjoyed the art exhibition afterwards. Since Mary uses Sonopa she feels more in touch with her family, especially with her grandchildren. Her family also likes Sonopa because of Mary's shared sensor data that they can consult. This way, they always know how Mary is doing and have more peace of mind.

Scenario 2. *Charles is 70 years old and lives alone as his wife passed away a couple of years ago. Charles was always engaging in a lot of different activities with his wife such as cycling or hiking but since she died, he has not found the motivation to do that anymore. He feels that since he has stopped being active, his general wellbeing has decreased. Charles often feels lonely now and doesn't have the energy to do much. He also gets out of breath more easily than before. This worries him and his family. Charles' family is trying to organize activities with him but they are living three hours away from his place, which makes it hard to meet on a regular basis. That is why his daughter has suggested to him to try the Sonopa system that puts him in touch with people who carry out different activities with him in his hometown. Charles has created a Sonopa profile on which he indicates that he is looking for persons who could motivate him to go more outdoors and carry out activities with him. Via the Sonopa matchmaking platform Charles got matched up with John. John is 35 year old and lives in Charles' hometown. He is currently out of work but wants to start a career as a fitness trainer. To try out his coaching skills and get some experience in this field he applied to be a member of the Sonopa network. The Sonopa company screened John to verify that he is a trusted coach. John offers fitness coaching via telepresence and also organizes fun fitness activities such as hiking tours every Sunday. Charles immediately got interested when Sonopa suggested to him to meet with John as he loves hiking. He also likes the video-training which he can conveniently perform at home. Additionally, the Sonopa system provides Charles simple activity recommendations based on the sensed activity levels. For instance, based on the weather report, the system will recommend a walk in the afternoon, but only if Charles has not left the house before noon, and only after 14:30, because the system has discovered that Charles usually takes a nap until then. Charles and John are very happy that the Sonopa sensor data shows that Charles has been much more active since he started using Sonopa. Therefore, Charles continues to participate in John's activities every Sunday where he*

also made a couple of new friends. At least once a week Charles gets in touch with his family via the video calling tool included in Sonopa. During these calls he explains the different activities he has carried out during the week and his daughter understands that the Sonopa system has helped him to become more active and involved.

Scenario 3. *Emma receives a notification on her screen that another elder in the Sonopa social network wants to play a game. She accepts and joins the game. Challenges are proposed to them using the screen that make them move in the whole house such as ‘go in your room and look for an old object, come back and show it to the screen’. This is an opportunity for them to talk face to face and remember past events. While she goes to her room to retrieve the object, the PIR sensors follow her movements and compare her speed with the measures from previous games. Players pass levels, get rewards, and new, more complex challenges are proposed (e.g. increase the number of visits, which could be motivation to call relations, family or neighbors to participate and come). Each time one of the carers who visit Emma comes, his entrance is logged by the visual sensor placed at the entrance of the house. All carers receive periodically by email a report on earlier visits of caregivers when they came, and how intense was the visit (how long, in how many rooms). The information is also archived in a shared agenda(*). This information will aid them to coordinate their help. Also are included monitoring parameters such as long term behavior changes, and a profile of the user’s activity. Without Sonopa, (1) carers such as family would have to rely on asking the elder about visitors during the week, and about their activity levels. The answers would be subjective and not very accurate. This is a well-known phenomenon even for people with top mental capabilities, let alone for possibly forgetful elders. (2) carers do not know who has visited the elder. Several professional organizations come to the elder’s home, but today there is no exchange of information, and these agencies do not always know what other professional carers do. Thanks to the report, they can know each other and coordinate their activities. Sonopa provides the care givers with more in-depth, comprehensive and objective information about the elder’s activities. The report is the basis for quickly focusing on what is most relevant for the specific user and for sharing information more quickly, knowing for example if a carer had any problem (such as missing money to go shopping, or lack of drug.) It also gives a measure of the elder’s socialization, if the elder went outside or if the elder has moved to hospital. This also helps to reassure the family. Using the Sonopa system the help can be given to the right person at the right time.*

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