



# IMPROVING THE WELL- BEING OF INDEPENDENTLY LIVING SENIORS USING ICT

HOW CAN A PERSONAL SERVICE BE USED TO IMPROVE THE  
SELF-EFFICACY, SOCIAL ENGAGEMENT AND SECURITY  
AWARENESS OF INDEPENDENTLY LIVING SENIORS?

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# **Improving the well-being of independently living seniors using ICT**

How can a personal application or service be used to improve the self-efficacy, social engagement and security awareness of independently living seniors?

by

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## Abstract

This research is part of a larger project that focuses on enhancing the self-efficacy, social engagement and security awareness of different target groups. It is expected that interaction with personal applications and/or services will support those groups in achieving this. This particular research focuses designing the functionality of a service that will enhance the self-efficacy, social engagement and security awareness of seniors that still live independently, because society expects them more and more to take responsibility of their own lives. Seniors are the group of people of 65 years and older.

The service has to support the act of (senior) people making face-to-face contact with their neighbors in order to create a social support system that enables them to live independently for a longer time. How large their social network in the neighborhood should become should depend upon their own wishes and needs. There are three groups that should be able to and should want to use the system: physically frail, psychologically frail (or both) and not frail seniors. For all of them it should be easy to use the system with limited instructions. In addition, the service should also interact with users in such a way that they are motivated to keep using it. The service should therefore tailor itself to preferences users might have, like for example if they want to have a large or a small social network. Furthermore, the service should offer an easy way for neighbors to help each other by means of reciprocity, facilitating seniors in asking for help and/or facilitating their neighbors in overseeing possible difficulties that seniors might experience.

This research follows a user-centered design process. First, background information about the user is gathered to gain insight into their wishes and needs. A first concept is designed using this background information. After this, an evaluation was held with vital seniors and one with more frail seniors. After each evaluation the design of the concept was changed according to the new insights into wishes and needs.

The final design is a service which seniors can sign up for. It can be used with a communication device of someone's own choice: a computer, tablet, smartphone, mobile phone, or a combination of a landline phone with a digital photo frame. In addition to these devices, users can choose if they want to be monitored by sensors, so they will automatically get help if something happens.

Seniors can use the service to send out a request for help to people in their contact list, or to a database of volunteers that have signed up for the service. Within the service, groups can be created to make communication within groups easier. Activities can be organized, for these groups but also for other people in someone's contact list or for people that have specific hobbies or interests. Furthermore, the service can also be used to send messages to others that have no other purpose than making contact.

The service aims to optimize the reciprocity in the neighborhood and make sure every needy senior is able to get the help they need. In order to achieve this, the service will motivate each senior based on their profile. The motivational strategy will be based on three factors: if the senior needs help, if the senior wants to give help, and if the senior wants to socialize (outside of their social network). The ultimate goal is that all users receive as much help as they give. The service will base its information on the interaction between the user and the service, and on the contacts that they have in their contact list.

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## 1. Introduction

This research is a part of COMMIT. COMMIT *"is a public-private research community solving grand challenges in information and communication science shaping tomorrow's society"*. Within COMMIT there are different projects and within those projects are work packages. This research is part of the project IUALL (Interaction for Universal Access) and the work package Inclusive Design for 3S (self-efficacy, social engagement and security). This work package focuses on three target groups: children; illiterates & non-native citizens; seniors. It is believed that if the self-efficacy, social engagement and security awareness of those target groups are enhanced, they will be able to function better in their living environment and will have a better quality of life. It is expected that interaction with personal applications and/or services will support those groups in achieving this. This particular research focuses designing the functionality of a service that will enhance the self-efficacy, social engagement and security awareness of seniors that still live independently, because society expects them more and more to take responsibility of their own lives. Seniors are the group of people of 65 years and older [10].

This research is conducted within TNO. TNO is the Netherlands Organization for Applied Scientific Research. It is the largest research institute of the Netherlands, with about 4000 employees. It has as a goal to apply scientific knowledge into practice [45]. In this project TNO works together with small and medium enterprises (SMEs). In the application or service for the seniors, the SME that is involved is BSS (Broadfield Security Services).

BSS is a small enterprise that is owned by two people who also manage the company, and has links to around 50 small businesses and self-employed professionals. Its goal is *"to deliver an effect on actual security issues within privacy and/or public entities"* [49]. Their contribution to the COMMIT project is designing and building an application that can be used by seniors in acute situations. Preferably this application should be combined with the service that is designed in this research.

This research will focus more on non-acute situations. It will focus on supporting seniors to keep living independently and feel safe.

### 1.1.Previous work by TNO

This research builds further on previous research regarding the wishes and needs of senior citizens.

In November and December 2012 a case study was performed by TNO that included two workshops, a cultural probe and interviews. The first workshop was held with 13 vital seniors. The second workshop was held with 7 vital seniors and in this workshop the cultural probe was discussed. The interviews were held with two more frail seniors. The goal of this case study was the exploration of the factors that contribute to the experienced social security awareness of seniors in their own environment.

In the first workshop, the participants were asked two things: *"What are your thoughts about the subject 'safety in the neighborhood'?"* and *"In which way could you provide us with insight into your daily life?"*. The first question led to the conclusion that a social/human theme is the most important factor for their feeling of security. This theme includes aspects like 'good friends' and a 'warm and

cozy home (environment)'. The themes role government and traffic/street came on the second place. The second question led to the completion of the cultural probe.

The 'cultural probe' was used to gain more insight into the daily life of seniors. A cultural probe is a kind of diary they had to fill in for a period of five days, with questions and instructions for every day. Results from this cultural probe were that overall they feel safe in their neighborhood, and that their contacts are family, friends, neighbors, hobby friends and others, like their general practitioner.

This cultural probe was discussed in the second workshop and this gave even more insight into their lives. They said that seniors themselves have to do something about their own security, and that they thought that the social network of frail seniors is very small and that some of them do not even want contact. Half of the vital seniors used a computer or a laptop a lot and had a mobile phone, but only two of them used the social network site Facebook. The computer was mainly used to send emails or to find information on the internet.

After the case study with these vital seniors, interviews were held with two seniors that had physical restrictions, in order to see what the differences were between those groups. The two frail seniors had a positive feeling about their neighborhood, mainly because the neighbors are involved with each other, and they have an active network of friends in the area. The two frail seniors did not use computers or mobile phones.

Another workshop performed by TNO, was a co-design session with 6 vital seniors. It took place in August 2013 and had as a goal to explore why seniors would or would not want to change their own living situation to improve their sense of security, and what possible reasons there are for them to change or not change their living situation. This was done by first asking the seniors to indicate which activities they like, and if they were afraid they would not be able to perform some of these activities in the (near) future on their own. Then they were asked to indicate what their social network regarding to this activity looks like and if they could define what could be done to help them to keep performing the activity on their own.

Concluding from this workshop is that mobility of seniors is the basis of their independence and that exercising also is a way to meet people. Meeting people is important, especially because family almost never lives nearby and building a social network is difficult at an old age. Having a social network is important for (more frail) seniors, because the people in this network can offer help and they can stimulate the seniors to be active. The seniors also thought reciprocity was an important factor to the social cohesion in the neighborhood. In addition it is difficult for (more frail) seniors to ask for help and that is why others do not always know the problems seniors have. Furthermore, a conclusion that resulted from the workshop was that when seniors have physical problems that make them unable to perform an activity, they do not have or do not know any alternatives to this hobby. Besides that, many seniors do not go out after 20:00 because they do not feel safe. Product ideas that the seniors gave: support (frail) seniors in asking for help; notify active seniors about possible needs frail seniors have; activate, stimulate or motivate seniors to do something; give insight into own behavior.

The main conclusion from previous work is that the social network of seniors is one of the most important aspect that should be maintained and improved in their lives in order to enhance their self-efficacy, social engagement and security awareness. Having a social network stimulates seniors

to be active and is needed for the seniors to get the help they need. The social network of frail seniors is often very small. In addition, mobility is an important aspect of someone's independence and exercise is a way of meeting people. Facilitating a request for help and motivating seniors to do something are two things that could help seniors feel safer. As a mobile phone and computer or laptop was only used by half of the vital seniors and not by the frail seniors, the technology used should not be restricted to this.

## 1.2.Aims of this research

This research aims to design an interactive system that helps seniors in enhancing their self-efficacy, social engagement and security awareness. This will be achieved by supporting the seniors in solving the problems that became clear in the previous work: seniors have to do something about their own security; the social network of frail seniors is small; not every senior uses a computer; (frail) seniors find it difficult to ask for help; others do not always know the problems seniors have. These problems will be solved using personal applications and/or services. So the applications and/or services have as a goal to help seniors to create and maintain a social network and motivate them to be active. In addition, the interactive system may also offer the possibility of asking for help in both critical situations as for daily chores.

The main question of this project is *"What should the functionality of a personal application or service be to improve the self-efficacy, social engagement and security awareness of independently living seniors?"* According to the previous work, in this research the following questions should be answered in order to answer this main question:

- *How can a personal application or service help to extend and maintain the network of a (frail) senior?*
- *How can a personal application or service help to notify neighbors/friends about possible needs a senior might have?*
- *How can a personal application or service help motivating the senior to be (socially) active?*
- *Which technology should be used in order for every senior person to (be able to) use the personal application or service?*

### 1.2.1. Structure of the research

The first part of this research will give some background information and will give some examples of related work. Chapter 2 gives some background information about relevant subjects in this research. First of all, the information is about self-efficacy, social engagement and security awareness. Furthermore, information about seniors themselves is given. About frailties they could have, about their social network, and about their interaction with technology. Other stakeholders are also mentioned. Then, in chapter 3 some examples of related work are given. This includes information about interventions, social network sites, tangible products and monitoring seniors.

In the second part of this research the idea phase is described. In chapter 4, requirements of the service are mentioned, and a more detailed description about what the goal of the service is. Then, some ideas of possible solutions are given. After that, in chapter 5 the first concept is introduced and possible problems that might occur when using this concept will be described. A prototype of this first concept is introduced in chapter 6.

The third part of this research is the evaluation with the first concept. The prototype is used in an evaluation with five vital seniors. This evaluation together with its result is presented in chapter 7. In addition, a small survey was held with activity groups for seniors, which can be found in chapter 8 (without using information about the first concept). Results from both studies leads to the improved concept, which is described in chapter 9.

The fourth part of this research is the evaluation of the improved concept, which is done with some frail seniors. The description of this evaluation and its results can be found in chapter 10. This evaluation led to the final design of the concept, which can be found in chapter 11.

In the last part of this research, a conclusion, discussion and reflection are given. This can be found in chapter 12.

## 2. Background information

In this chapter an explanation about the self-efficacy, social engagement and security awareness is given, the target group is described in detail, and other stakeholders are briefly introduced.

### 2.1. Self-efficacy, social engagement and security awareness

As mentioned in the introduction (chapter 1), one of the goals of the COMMIT UIAL project - of which this research is a part of - is to increase the self-efficacy, social engagement and security awareness of seniors. As was mentioned before, the one thing seniors need in order to keep or improve their well-being is to increase their social network in the neighborhood. This should go hand in hand with improving the self-efficacy, social engagement and security awareness in the life of seniors.

#### 2.1.1. Self-efficacy

According to Bandura, self-efficacy is *"concerned with people's beliefs in their capabilities to exercise control over their own functioning and over events that affect their lives. Beliefs in personal efficacy affect life choices, level of motivation, quality of functioning, resilience to adversity and vulnerability to stress and depression."* [4]. Actually it is a kind of self-support. Though this report focuses on building a social network and thus social support, this is not totally in contrast with letting seniors be self-supportive. As Allen also argues, 'self-support' may differ from 'independence' in the way that independence can be interpreted as having no support and self-support means that the support that is present is provided by the self [2]. Sometimes this can mean that someone provides their own support with the help of others, or that someone arranged their own support by asking others to support them. So to increase the self-efficacy of seniors, they should ask for help themselves if they need it, and thus support themselves as much as possible.

#### 2.1.2. Social engagement

Social engagement is about participating in society. According to the 'participation wheel' created by Movisie, there are six goals within participating: independent functioning; social contacts; community participation; community contribution; gaining skills; own income [48]. To increase the social engagement of seniors, these goals have to be met as much as possible.

#### 2.1.3. Security awareness

The security awareness of people can be seen as the perceived safety that they have. In the context of seniors who still live independently, this is perceived community safety, which can be seen as social safety. A community is perceived as a safe environment when external threats from other people are lacking [19]. If people are familiar with their neighbors they are less likely to be afraid of what these neighbors might do. So to increase the security awareness of seniors in the neighborhood, they need to get familiar with neighbors.

## 2.2. Seniors

The amount of people aged 65 and above, increases significantly in the next years. This is because of the many baby boomers, the people born between 1946 and 1964. For example in the year 2030 in the Netherlands, the amount of people aged 65 and above will be about 4.1 million, a quarter of the

whole population. In 2011 this was only 2.5 million. Starting in 2025 the amount of people aged 80 will also start to increase. In 2050 40% of the people aged 65 and above will be at least 80 years old. Also the amount of frail seniors will increase. In 2010 the frail seniors were about 27% of the age group 65 and above. Because the average age of seniors will also increase and older seniors have a bigger chance to become frail, this percentage will go up with time [56].

When seniors become physically frail they can be listed for a care home. However, the government of the Netherlands wants to close many care homes and wants seniors to start to rely on the support of family and friends [57]. Nowadays about 83% of the frail seniors live independently [56], including physical as well as psychological and social frailty (for a definition see section 2.2.1). This is about 25% of all seniors that live independently. As there will be more (frail) seniors in the future and probably less care homes, the percentage of frail seniors that live independently shall increase. To make this possible, seniors have to stay as healthy as possible, both physically and cognitively. In addition, they should have a social support network they can rely on. As long as this is the case, they will be able to live independently [12; 13].

As studies show, the social network of seniors and the social cohesion in their neighborhood, help them to maintain their well-being and health and help to prevent them from becoming frail [12; 13]. So in addition to having support from family and having formal support, support from neighbors is necessary to help seniors live independently for as long as possible. 58% of seniors would like to have a more simple way of making contact with others and they would also like to have more contact with non-family members [25].

### **2.2.1. Frailty of seniors**

According to the Tilburg Frailty Indicator, seniors can be frail in three ways: they can be socially frail, psychologically frail or physically frail [28]. Physical frailty consists of eight components: unexplained weight loss, physical health, difficulty in walking, balance, vision problems, hearing problems, strength in hands, and physical tiredness. Psychological frailty consists of four components: cognition, depressive symptoms, anxiety, and coping. Social frailty consists of three components: living alone, social relations, and social support.

Psychological frailty goes hand in hand with physical frailty: people that are less psychologically frail are also less physically frail and the other way around. Furthermore, social frailty is not always related with psychological or physical frailty. When someone becomes permanently frail, their social frailty may decrease because they search for social support. On the other hand, when a person gets health problems, their social frailty may increase and the size of their social network may decrease, because it becomes more difficult for them to make contact with others [56]. However, several studies have also concluded that the amount of social support and psychological and physical frailty are connected, because both kinds of frailty increase when the social support decreases [34].

So when the size of someone's social network is large enough and they have enough social support, the chance that they become psychological or physical frail decreases. However, not every senior by definition wants to enlarge their social network or even wants to have contact with others. This may have something to do with how lonely they might feel. Loneliness can be divided into four types of loneliness [59]. Having either a small or large social network and in addition, having or not having feelings of loneliness. Social frailty can be directly linked to how lonely one may feel.

So to conclude, seniors that have a large social network and do not feel lonely are probably the healthiest of them all. Seniors that have a small social network and do not feel lonely are probably next. Because the amount of social support seems to be directly linked to the psychological and physical frailty, these seniors will be frailer than seniors in the first group. So they probably should increase their social network. The same goes for seniors that have a small network and feel lonely. Seniors that have a large social network and feel lonely are probably the most difficult group, because the loneliness probably does not go away if the social network will become even larger.

However, this research will not primarily focus on making seniors less lonely, but it will focus on (increasing and) making the most out of the existing social network of seniors, and thereby decreasing their social vulnerability. In addition to social frailty/loneliness, psychologically frailty and physical frailty should also be taken into account. This leads to four kinds of seniors that should benefit from the product that will increase their social network: vital seniors; physically frail seniors; psychologically frail seniors; physically and psychologically frail seniors.

Together with the different types of loneliness, this leads to 4x4 types of seniors, as can be seen in Table 2.1.

	Physically and psychologically frail	Physically frail	Psychologically frail	Not physically or psychologically frail
Socially frail + large social network				
Socially frail + small social network				
Not socially frail + small social network				
Not socially frail + large social network				

**Table 2.1: The different types of seniors**

## 2.3.Social network of seniors

As was discovered in previous work (section 1.1), the informal social network of seniors consists of family, friends, neighbors and hobby friends.

According to a study by Bloem, seniors have on average 15.6 members in their network and on average this includes about two neighbors [7]. However, in this study friends who were also their neighbor were not taken into account as neighbor. The neighbors did have to fit the criteria that they have enduring relationships with seniors and that they would be able to offer social support to them.

The most intense care often is given by the spouse – if any – or the adult children; the care that neighbors or friends give to seniors often is less intense and for shorter periods of time [58]. To seniors, friendships are probably more important for social support than family, as adult children tend to care for their parents less and less because of full-time jobs [30]. Not every senior might need intense care, sometimes they will just need occasional help with small chores in which case a

neighbor can help out. In addition, in a study of Giuliani et al. 123 seniors were given eight scenarios in which they needed help and were asked which strategy they would use [26]. In 18% of the cases the seniors chose to give up; older seniors (age 75 and above) were more likely to give up.

Most of the time it is a somewhat older neighbor that keeps an eye out for seniors, because they realize that soon they will be at risk to become frail and when that happens they would also like to have good support from others [57]. Keeping an eye on seniors sometimes is not as much work as it sounds, because most of the time this is done by daily routines like checking if the curtains are still open or delivering the newspaper [1].

The bond between neighbors also does not have to be strong for one of them to provide care to another; sometimes simply greeting each other once in a while already is enough. Research showed that 58% of 114 caregivers did not start the real association they have with seniors through conversation, but through caregiving [5]. After just some casual greetings this caregiving started. Especially caregivers under the age of 45 started their association with seniors through caregiving (86%); for the caregivers over the age of 45 this was significantly less (48%). However, it is important for seniors to first start these casual greetings in order to get familiar with somebody, so they will have a social network that is ready to help if necessary.

That is why seniors need to meet those neighbors. And in their turn, those neighbors have to be willing to add seniors to their social network and help them in case of need. It is probably best to focus on people over the age of 45, as they are the largest age group that gives care to seniors after they have got to know them [5]. This is despite the fact that seniors also like to have contact with younger people so they will feel younger [61]. However, the most important aspect is that seniors get the help they need. This is most likely given and accepted by someone over the age of 45, as they will keep an eye on seniors and bond with them. And seniors in their turn are more likely to receive support from people that they know [2].

## 2.4.Seniors and technology

The use of technology and especially the use of the internet keeps growing in modern society. People above the age of 55 do not have many digital skills [36]. This disadvantage is mainly caused by the fact that seniors could only start to learn these skills at a later age, while 'younger people' are raised with many forms of technology available to them. The usability of many products is also not adapted to the requirements of (frail) seniors. Although 75% of seniors have access to internet, most of them do not use it to make contact with others, probably because of the inadequate interfaces and the distrust they have in virtual environments [25]. Disabilities seniors have to overcome when using technological devices are visual losses, cognitive losses or motor skill impairments [3].

In a study of Giuliani et al., technological assistive devices were chosen 24% of the time in situations where seniors need help and can choose from one of the given solutions: give up; ask for help; adapt the environment; use technological assistive devices [26]. Younger seniors (age 62-74) were more likely to accept these devices. Furthermore, an online survey was held with 4761 members of SeniorWeb in the Netherlands. Those seniors are not completely representative of all online seniors, because they probably all use the internet a lot. However, in this survey almost half of the participants had the idea they belong more to society when they use the internet and they like that.

Notable is that the internet is mostly used for functional purposes, like sending an email or searching for information [17]. Being connected to society is important to seniors. In the study of De Schutter & Vandenabeele, ten seniors were asked about their passions, and during this study they stressed that in most cases, being connected to society was the underlying meaning of a particular passion they had [14].

So to conclude, the service should give seniors the feeling they are connected by society. In addition to this, the technology that should be used to accomplish this should be one that is adapted to the wishes and needs of (frail) seniors.

## **2.5. Other stakeholders**

As the service has to support the seniors in maintaining their offline social network and making the most out of it, all people that seniors interact with in daily life are stakeholders. The service has to know who the seniors should have contact with in order to support them in making that contact. Furthermore, if the stakeholders also need to use the service, their wishes and needs should be taken in account in the design phase. Five groups can be distinguished: family and friends, neighbors, volunteers, formal help, and activity groups.

### **2.5.1. Family and friends**

As mentioned before, the spouse or adult children are the ones that give the most intense care to seniors when needed. This may be because the relationship between seniors and their spouse or family is stronger than the relationship between seniors and their neighbors. Family and (good) friends are people that seniors can rely on, and seniors might find it easier to ask them for help than other people they know.

### **2.5.2. Neighbors**

Neighbors are people that seniors can get a real association with through caregiving. The relationship between them does not need to be very strong before some kind of caregiving arrangement starts, but it might grow during the caregiving period. However, starting with caregiving is a challenge on its own. First of all, neighbors have to know the senior beforehand, maybe only by casual greetings. But most importantly, neighbors have to be aware of the problems the senior might have.

### **2.5.3. Volunteers**

Family, friends and neighbors mentioned in the two sections above can be seen as informal help, but there is another group that qualifies as informal help: volunteers. These are people that do not know seniors beforehand, but they have registered themselves to want to help seniors in need. Seniors do have to announce that they need help to some kind of organization for volunteers, in order for the volunteers to know that they can help.

### **2.5.4. Formal help**

Formal help is paid help. People that help seniors for a living. The general practitioner, hospital personnel, and people that work in care institutions for seniors, all belong in this category. When a serious health problem starts to occur, seniors go to formal help, in order to get the medication, equipment, or other kinds of help, that they need.

#### **2.5.5. Activity groups**

Other stakeholders are activity groups that seniors take part in (voluntary work; bridge club; sports club; etc.). The senior sees the people in this group at a regular time each week (or two weeks), and therefore has regular contact with them. However, they do not always have to be the best of friends, and therefore asking for help will be more difficult. In addition, when seniors become incapable of doing the particular activity, the chance that the people of this group disappear from their social network is high.

### **2.6. Conclusion**

The self-efficacy, security awareness and social engagement of seniors in their own neighborhood should be improved. Therefore seniors should ask others for help when needed, they should get to know the people that live in their neighborhood, and they should participate in the community and possibly gaining new skills.

If these three aspects are improved, their social network and the social cohesion will be improved, which helps seniors maintain their well-being and health and help to prevent them from becoming frail. As the government of the Netherlands wants seniors to rely on the support of family and friends instead of going to a care home, seniors should stay healthy for as long as possible, so they could stay and live independently.

Not only seniors that are completely healthy should benefit from using the service, but also frail seniors should make use of it, therefore social frailty, psychological frailty and physical frailty are three aspects that should be taken into account when designing a service and/or technology. This service should give seniors the feeling that they are connected to society. In addition to the wishes and needs that seniors have, the wishes and needs of other stakeholders that might make use of the service should also be taken into account: family and friends, neighbors, volunteers, formal help, and activity groups.

Although seniors prefer having contact with younger people, the largest amount of interaction should be focused on older neighbors, as they are more willing to help if needed. In addition, those older neighbors are more likely to bond with seniors and seniors are more likely to receive support from people that they know.

### 3. Related work

There have been many studies on helping seniors cope in everyday life and more specifically, to help them manage their social contacts and social support. Examples of these studies are given in this chapter. Different kinds of solutions that help seniors in these areas are interventions, social network sites, tangible products and monitoring the seniors. Furthermore, another large project focuses on the same problems as this research.

#### 3.1. Interventions

One way of helping seniors become less lonely or helping them get more social support is by interventions; by connecting them with more people, thus expanding their social network. Masi et al. [43], Hogan et al. [34], and Glanz et al. [27] all describe different categories of interventions. Masi et al. focus on loneliness reduction interventions, Hogan et al. on social support interventions and Glanz et al. on social network and social support interventions. Although none of them describe interventions that are specifically meant for seniors, many of their examples are studies that involved the right target group.

The three main intervention categories that were actually described are: improving social skills; increasing social support (during the intervention); increasing opportunities for social interaction. Social skill training is used to increase and maintain someone's social support by helping them overcome their difficulties in making and keeping contact with others. Support is provided by connecting the participants with either professionals or volunteers, connecting them to other participants or strengthening their existing social network. Opportunities for social interaction are increased by either organizing some kind of activity at a regular time that the participants should come to or by using some kind of technological device that gives participants the opportunity to make contact through the internet. All those kinds of interventions can be performed either in a group setting or on an individual level.

#### 3.2. Social network sites (SNS)

Helping seniors in initiating and maintaining their social network through a technological device is mostly done through the use of SNS. The amount of seniors on SNS and specifically on Facebook seems to grow [47] and some SNS are adapted to or created specifically around the needs of seniors [20]. However, an age-related approach will not be sufficient as a way for seniors to meet others online, because the main reason that seniors use SNS to get in contact with family [47]. Furthermore, on the one hand they like for SNS to support social relationships [47], but on the other hand they really do not want face-to-face contact to go away, as was found in a study among 537 participants by Eggermont et al. [18]. As was already mentioned in section 2.4, seniors like to be connected to society.

What seniors really want from SNS is to keep in contact with family and meet people of all ages. In addition they like to learn, they like to express themselves, they want to be independent and they do not like it if they are stigmatized [61]. Apart from the explicit social functions that SNS can offer, seniors would also like those online communities to support other functions such as the opportunity

to organize events, to have access to emergency or health care services and they want SNS to offer locally-relevant information [29].

SNS that seniors use are the ones their (grand)children use as well, like popular SNS such as Facebook. Though online social networking does seem to strengthen the offline relationships that people have [29], those SNS do not have features that help people to make contact with people in their neighborhood, because most people use the internet to keep in contact with the people they know already [51]. Going out to meet people makes seniors maintain their physical well-being by being active. Furthermore the community involvement of people decreases as their internet use increases and introvert people may even suffer from an increase in loneliness [41].

### **3.3.Tangible products**

Other studies that help seniors in coping with their everyday contacts and social support use tangible products.

Some studies focus on making social media tangible by using products that are specifically designed for the purpose of showing information presented on social media. This makes it easier for the user to look at the information giving without being distracted by other sources of information or being burdened by having to use a device that is difficult for them to use. Examples of these tangible social media are ePortrait – where photos uploaded by family members are presented on a digital frame, and eBowl – a bowl that automatically shares a joke or status on a SNS when seniors put a specific object in it. It was tested with one family and it was received positively, as the seniors noticed that they had more to talk about whenever their family members came to visit [11; 24].

Some other studies focus on creating a specific application that will help seniors contact others. An example is the Social Calendar [1]. This is a device that encourages social interaction by suggesting activities that a senior can do with their family, monitors the lifestyle of this senior person and makes them and their relatives aware of a possible presence of depression. The implementation is a touch-based display that shows a calendar that uses pictures and icons to represent the activities and the family members. The family members can use the same interface to watch over their senior family member. This system was not tested, so unfortunately the advantages and disadvantages of using such an application cannot be used in this research.

Another example is the Building Bridges device [16]. This is also touch-screen based, but this time used to support social interaction amongst seniors themselves. It looks a bit like the well-known ‘Skype’ application, but designed specifically for seniors. It includes a senior-friendly user interface and in addition to phone calls and chats it provides broadcasts about particular subjects that seniors can join and freely listen to. It was tested with a group of nine seniors. An interesting conclusion is that when seniors started talking to each other for the first time a common interest was very important. In addition, the seniors mentioned that when communicating with someone, there is a point in which face-to-face contact will be needed, and the device could not take its place. Seniors that were already happy with their social network also did not feel the need to use this device. Furthermore, sometimes the seniors did not want to be reachable but they did not want to turn the device off, because they could forget to switch it on again; or they did not want to talk to specific

people and they were afraid a conversation would never end. It was a big issue for the seniors where they placed the device, because they did not want everyone to see it.

A device that can be used as an assistive device is a mobile phone, because it is a small object that people can take with them all the time. For example Haram and Sørenbø have designed a mobile application that has as a goal to motivate seniors to be social [32]. This is done in a playful way by showing an interactive interface with a tree that represents their activity level and by providing quizzes (as icebreakers in group meetings) in order to earn coupons and by inviting seniors to join events to meet new friends. It was received positively by the focus group that existed of three seniors. Another technological solution that includes mobile phones was presented by Häikiö et al. [31]. Their idea was to make it easier for seniors that were in a rehabilitation period to choose the meal they would like to eat each day (that was brought to them by a meal service) and it included a mobile phone provided with NFC technology. The users were provided with an NFC tag stand which has three tags on it; behind it was a paper meal list which was changed every week. The users were able to select their daily meal preference by just holding their phone in front of one of the three tags. This was overall received as an easily adopted interface.

Rukzio et al. did a study regarding physical mobile interaction techniques, like touching, pointing and scanning with a device [52]. Although they did not focus on seniors and had 134 participants in the age range of 17 to 59, one of their conclusions was that older people preferred physical mobile interaction techniques because they did not like to provide input on a mobile device (e.g. a mobile phone). As even the older people in that age range do not like to work with mobile devices the more frail seniors will certainly not like it.

### **3.4. Monitoring seniors**

There have been many studies on tracking the behavior of seniors in order to let them live more independently. Most track the location of a frail senior using GPS tracking [22; 53]. Some requirements that seniors had concerning such a device were that they need to be easy to carry, easy to interact with, and they must not have a stigmatizing appearance, because they do not want to be considered frail [39; 54]. There may also be some privacy concerns with constantly tracking someone's location, this is discussed in section 5.2.1.

However, tracking the social behavior of the senior is not something that is widely studied. There are a few studies in which portable devices are used to track the social behavior of people. Some of these studies indeed map the social network, but only do this for scientific purposes and do not use this information to help the user build its contact list. For example the studies by Do & Gatica-Perez [15] and Farrahi et al. [21]. Other studies use a portable device to make conversation easier between people, when they are close to each other. Studies that do this with a mobile phone can be found in [38]. Another device that is used in some studies is a conference badge that will be able to facilitate interaction at large social events [50]. These conference badges will provide relevant information to the user and help him/her bookmark his conversation partner. A study that does use physical proximity and time spent with each other to help users build their social network is Social Net [55]. Users of Social Net get a portable device which maintains their friend list. Users can add people through a mutual action that exchanges the unique IDs of the device and users' names. In addition,

the device detects other devices nearby and adds unknown devices to an 'unknown' list. If the user talks to a friend who knows people that own these 'unknown' devices, the device suggests an introduction with this 'unknown' person. However, all these studies are not focused on senior people. One device that is not portable, but does monitor the social behavior of seniors, is the Social Calendar, which is also mentioned in section 3.2. Studies using physical proximity between two people also bring along some privacy issues, which will be discussed in section 5.2.1.

### 3.5.Related project

A large project that also partly focuses on motivating seniors to extend their social network is the Co-living project [9]. This project has as a main goal extending the independent living of seniors by promoting their active living. It focuses only on healthy seniors or seniors with light health problems. In addition to promoting the social well-being of seniors, the project also focuses on promoting their physical activity. To do this, they are developing an application that has multiple functions: motivating seniors to be active, letting seniors create events, suggesting events and other people to seniors, managing social care teams around the seniors and monitoring the health of seniors [44]. To the best of my knowledge there is not yet any information available on the final application. Early evaluations gave the result that seniors are in general a bit intimidated by not having complete control over their social network [31].

### 3.6.Conclusion

There are different solutions that might help seniors live independently for a longer time, by helping them make the most out of their social network or by supporting them in other ways. The first solution is an intervention: connecting the senior with more people and expanding their social network. Another solution is an SNS, which gives seniors the opportunity to keep in contact with people from their existing social network. A third solution is by using tangible products that are - most of the time - specifically designed for senior users. These products might have as a goal to simplify remote interaction and/or motivate to have (face-to-face) contact. The last solution might be by monitoring the senior, which makes them able to do a lot on their own, because the ones who monitor their behavior will see it if something is wrong.

However, interventions need to be planned and somebody should organize them. As there will be many seniors in the near future, most of them have to rely on themselves. Therefore they themselves should be the ones to take the initiative; there is no individual and no group that will stimulate them to become (more) socially active. Without the help of others, the only external motivation seniors can get is through the media or through some kind of (technological) product that they own. However, to make someone less socially frail, the three intervention categories – improving social skills, social support or opportunities for social interaction – should be considered.

With regard to social interaction through technological devices, seniors want it to support their face-to-face relationships, not to be a replacement. As community involvement decreases as internet use increases, it is important that the service to be designed should help seniors in creating and maintaining a social network offline. Helping them to achieve this by monitoring their social behavior might bring along some privacy issues.

Furthermore, seniors would like to have some kind of service with which they can make contact with both informal and formal contacts, and they also would like to get locally-relevant information from it. But they want to avoid input on a mobile device, and they prefer tangible interactions. Also they do not want to be forced having to think about performing an action every day in order to use this service. Furthermore, they want to be the one in control of their own social network.

## 4. Generating ideas

The background information and related work gave insight into what seniors want and what they need. In this chapter, these needs and wishes were used to think about possible solutions to the problem. This was done by defining the goal of the service, creating personas and writing scenarios, setting up the requirements, and brainstorming about possible solutions.

### 4.1.Goal of the service

The service has to support the act of (senior) people making face-to-face contact with their neighbors in order to create a social support system that enables them to live independently for a longer time. How large their social network in the neighborhood should become should depend upon their own wishes and needs. There are three groups that should be able and be motivated to use the system: physically frail, psychologically frail (or both) and not frail seniors. For all of them it should be easy to use the system with limited instructions.

In addition to all this, the service should offer an easy way for neighbors to help each other by means of reciprocity, facilitating seniors in asking for help and/or facilitating their neighbors in overseeing possible difficulties that seniors might experience.

### 4.2.Personas

For three of the types of seniors mentioned in section 2.2.1, personas are created. One of these personas is Els. She is psychologically frail, socially frail, and has a small social network. She wants to socialize with more people, but is afraid to do this. Another persona is David. He is physically frail, but not socially frail. He does have a small social network, because he does not like to have contact with others. The third persona is Arnold. He is not frail and has a large social network. Complete descriptions of the personas can be found in Appendix A.

	Physically and psychologically frail	Physically frail	Psychologically frail	Not physically or psychologically frail
Socially frail + large social network				
Socially frail + small social network			Els	
Not socially frail + small social network		David		
Not socially frail + large social network				Arnold

Table 4.1: Types of seniors that personas are created for

All types of seniors in Table 4.1 should benefit from using the service/application, though this does not mean that all their problems should be instantly solved by using it. I did not make a persona of someone that has the loneliness type 'socially frail + large social network'. The biggest problem of those types of persons is that they are lonely, but cannot solve this by expanding their social network, and the (primary) goal of the application is not to make someone less lonely, but to make

sure someone has a good social network in their neighborhood. Furthermore I decided to use physical and psychological frailty and each type of loneliness, only once in the personas. Els is someone who does not need to expand her social network, but she wants to. David is someone who does not want to expand his social network, but he needs to. Arnold is someone who does not need to expand his social network and also does not explicitly want to. All possible problems will thus be addressed, but to keep it simple only three personas are created.

### 4.3.Scenarios

To get a clear view of when and how the service should be used, scenarios were written. Scenarios are short stories about the personas in situations when they would need the service. It is useful because it lets you think about the possible difficulties that the personas might have in these situations. There are three situations for which scenarios were created. The first is the moment when someone starts to use the service. *Where did they hear about it? Where did they get access to it?* The second situation is when the service motivates them to do something. *How is their attention drawn? When is their attention drawn? What is the motivational message?* The last situation is one in which the service is used to help maintain their social network. *In what situations can the service help them to maintain their network? How can the service help to maintain their social network?*

The scenarios are created using the goal of the service, but using as little technical descriptions of what the service should look like as possible. Doing this, the main functionality that the service should have can be discovered by these scenario's, but the technology that should be used to implement this functionality is still open for discussion. The scenarios can be found in Appendix B.

### 4.4.Requirements

After creating the scenarios, requirements were established based on the background information, related work, the personas, and the scenarios. The requirements are divided in functional requirements (what should the service do) and non-functional requirements (terms the technology itself should satisfy). The main requirements are mentioned and elaborated here, but sub requirements can be found in Appendix C.

#### 4.4.1. Functional requirements

Requirement	Elaboration
The service should help the users maintain (and increase) their social network in the neighborhood.	For the users to use their social network efficient and effectively, this network has to exist.
The service should be tailored to the wishes of the user.	The user has to give his/her own preferences in order for him/her to want to use the technology.
The service should make sure users stay active.	Staying (socially) active is a precondition for the user to stay healthy and live independent for a longer time.

The service should offer services through which help is easily obtained.	Once help is (really) needed it should be easy for the user to actually get it.
The service should motivate the user at the right time and place.	In order for the service to be effective, it should contact the user in an effective way.
The service should provide locally-relevant information.	In order for the user to stay active, he/she should know what they can do in the neighborhood.
The service should support groups that organize activities on a regular basis.	Being connected to a group is important for the social network of the user.

#### 4.4.2. Non-functional requirements

Requirement	Elaboration
Using the technology should be possible for every senior.	To make sure every senior can use the technology, seniors with every kind of frailty should be able to use it.
Using the technology should be beneficial for every senior.	To make sure every senior may want to use the technology, for every kind of senior the technology should have some beneficial factor.
Using the technology should be cheap.	The technology should be affordable for every kind of income.
In order to use the technology, users should not be obligated to own a computer, tablet or smart phone and they should not be obligated to give input on a mobile device.	Many seniors still do not own a computer or smart phone, but they should be able to use the technology.
Users must be able to sign themselves up for the technology from home or by someone else and when signing up they should not be obligated to anything.	Signing up should be possible for every type of user.

### 4.5.Ideas

The information provided in this chapter was used in a brainstorm session held by (only) me, and that led to three product ideas. A more complete description of the ideas can be found in Appendix D. These three ideas were combined into a first concept, which will be described in chapter 0.

#### 4.5.1. Idea 1: organizing activities by sending broadcasts

The user can send broadcasts (widespread messages) to one or more people inside their social network or to people outside their network, with a request to do something together.

A broadcast can be sent to both people in- and outside the social network of the user, by means of a computer/tablet/smartphone or an NFC-tag stand. Broadcasts and messages send by the service to motivate the user to be active, are received on a computer/tablet/smartphone or a digital photo frame that is also connected to the internet. Broadcasts can simply be ignored by the receiver and people can only meet if they have exchanged contact information. A disadvantage is that the service

does not offer services through which help is easily obtained. And a big challenge is to get the senior motivated to send out a broadcast instead of waiting for someone else to send one.

#### **4.5.2. Idea 2: building social network based on social activity of the senior**

The service builds the social network based on the social activity of a user. In a critical situation the service contacts someone in this social network, someone who is nearby and whom the user spend the most time with.

This is based on tracking seniors when they leave the house and when they meet with someone else. Everybody carries a keychain that uses RFID to see if the keychain is at home and/or if it is near someone else with a keychain. The keychain also possesses NFC, users can use the keychain to indicate on an NFC-tag stand, what kind of activity they are going to do. In addition to this keychain, users may receive motivational messages on a computer/tablet/phone or on a digital photo frame that is connected to the internet. Some disadvantages are that people who do not own a keychain cannot be added to a social network, and that there are huge privacy issues with this service.

#### **4.5.3. Idea 3: connecting people with the same interests**

The service connects people with each other that have the same interests after both sides have given the message that they are willing to meet someone new or participate in a specific request/support activity. The service will propose a get-together.

The get-together can be a normal activity or reciprocal help. The get-together can be a way of meeting new people, but it can also be between two people that already know each other. Users can choose if they want to have get-togethers with someone again in the future. Users have to indicate that they want to meet someone new, but get-togethers between two people that know each other are proposed by the service. The get-togethers can be arranged through computer/tablet/smartphone/normal phone. A disadvantage of this idea is that the service might think a senior is not socially active, when they meet people without using the service. A big challenge is to let the service be able to propose a relevant time and place for the get-together.

### **4.6. Summary**

In this chapter the design phase was described. First of all, the goal of the service is described. In a nutshell, the goal is to support frail and vital seniors in making face-to-face contact with neighbors and sending out a request for help. Three personas are created that cover the different kinds of frailty, and three scenarios are written for each persona. Requirements are defined by using all information that is gathered thus far in this research and based on all information in this chapter, three product ideas are designed.

All data gathered in this chapter is the foundation of the first concept, which will be introduced in chapter 5.

## 5. The first concept

The three ideas that are described in section 4.5 are combined into a first concept. The concept is a service that will motivate users and let them interact with each other. The scenarios of David, Els and Arnold were rewritten using this first concept; these scenarios can be found in Appendix E.

### 5.1. Functionality

The goal that the service has is to support seniors in living independently for a longer time and to help make their neighborhood a safe and secure environment. The service therefore is a means of increasing social cohesion in the neighborhood, by helping seniors in maintaining their social network and making the most out of this network. When seniors have social support they are less likely to become frail, and knowing their neighbors gives them a more positive feeling about their neighborhood and this makes them feel safer.

The main function that the service has is that it gives everyone the opportunity to make contact with others (by using the communication device of their own choice). Also new contacts can be made. This creates a community feeling, where everyone is reachable, but nobody is obligated to reveal any contact information. The functionality will be elaborated more by using the five main aspects: settings of the user; send messages; receive text messages; monitoring of the user; supporting the user in certain actions.

Might there be a situation (in the future) when help is needed, the service can be used to send an emergency call to a friend or neighbor that is nearby, and that has a good relation with the user. As was mentioned in the introduction, this function is elaborated in more detail by the company BSS.

Each of the five aspects will now be elaborated. A short overview of the functions can be found in Table 5.1.

	<b>The first concept</b>
<b>Settings of the user</b>	
Creating a profile	Personal information; hobbies; chores they can perform; preferences.
Changes in behavior/life	Service adjusts behavior according to behavior of user and by asking questions.
<b>Send messages</b>	
Send requests for help	Reciprocity of small chores of certain types. Will be sent to people that can help with this type of chore.
Organize an activity	You can organize an activity with someone in your social network.
<b>Receive text messages</b>	
Receive motivational messages	User gets motivated to be (socially) active.
Receive messages from others	User receives requests for help and invitations to activities.
<b>Monitor the senior (optional)</b>	
Monitoring social contacts	Monitored to automatically maintain contact list.
Monitoring if and when the senior leaves the	Monitored to check everything is okay.

house	
Monitoring the location of the senior	Monitored to support certain requests for help and in case of emergency.
Monitoring the movement of the senior	Monitored to make sure senior exercises enough
<b>Supporting the senior in certain actions</b>	
Maintaining contact list	Contacts can be added both manually and automatically.
Preventing diluted friendships	The service sends reminders to users about friends.
Groups of people	The service offers the function to create groups of people.

**Table 5.1: Functionality of the first concept**

#### **5.1.1. Personal settings**

Initially, users have to fill in a profile in which they reveal their personal information, which will be used to tailor the behavior of the service to the user. Registering to use the service can be done using a website or application. People that are unable to create a profile themselves should ask help from others. Preferably they should ask their general practitioner or caregiver. Users have to fill in their basic information (name, address, etc.); their hobbies; the chores they can perform; and last but not least their preferences. These preferences include how much social contact they want, with which groups they want to have contact, and which groups they want to help with chores. These groups include family, friends, neighbors, hobby friends (as taken from previous work, section 1.1) and acquaintances.

To make sure the preferences are filled in correctly and to tailor the behavior of the service even more to the user, the service should adjust itself according to the behavior and response from the user. In the first period of time in which the user uses the service, the service should ask the user specific questions about its behavior to see if the user thinks this behavior is fitting. Based on the answer of the user, the behavior should be adjusted.

#### **5.1.1. Send messages**

Another function is that the service supports the reciprocity of small chores. If someone wants help with a particular chore, they can find someone to do that through the service, in exchange for a chore that they can perform. Users can choose if they want to send this to people in- or outside of their social network. They indicate what type of chore the request for help is, and the service will find someone that can help with that type of chore. Types of chores can for example be ‘gardening’, ‘computer’, or ‘shopping’. This facilitates the request for help, and this increases the support network of someone without making them obligated to get to know someone well beforehand. When a user needs help, but is not able to do something in return, someone else can be found in the same way.

In addition to this, the user is able to organize a meeting with someone in their social network by proposing a time, place, and activity.

#### **5.1.2. Receive text messages**

As already seen in chapter 2, every senior has their own preferences with regard to their social network. In order to motivate seniors to actually make use of the service, the behavior of the service should be tailored to these preferences. The service should send motivational messages to the user,

but only as many motivational messages as is needed, because otherwise the messages could become annoying or the effect of the messages could wear off. Also messages from others should be restricted to those messages that the user actually wants to receive.

If users decide not to share their contact information with someone, they can still be contacted by this person through the service (though they themselves can indicate the amount of messages they want to receive). If someone did not register to use the service, the service can still contact this person if the user knows his email address or telephone number.

#### **5.1.3. Monitor the senior**

Something else that will help users, is that the service is able to measure if users have been active: if they left the house or had contact with anyone. If there seems to be no activity, the service will check with the user if everything is okay. If there is still no activity, the service will contact someone in their social network to go and check on him/her. The service will do this by sending a message to someone that is most emotionally and physically close to the user. This person has to respond if he/she will check on the user. If after a certain time the person did not respond, the service will send a message to the next person that is most emotionally and physically close to the user, and so on. If nobody responds, the service will send a message to formal caregivers.

In addition to this, the service can also monitor the amount of movement users have, so it can motivate them to exercise more if this is too low.

#### **5.1.4. Supporting the senior in certain actions**

The service helps users in maintaining their contact list. Persons can be added both manually and automatically. Manually this can be done by just entering name and contact information. Automatically this can be done by using the service. Once users have had contact with someone, and they are both monitored, the service knows that they have had contact with each other and can suggest adding this person to the contact list.

The service also keeps track of with whom users spend a lot of time with, and with whom they do not. Using this information, the service also helps preventing diluted friendships, by sending reminders to both parties if they did not see each other for too long a time. This helps seniors keep their network of social support, even if they become (more) frail.

To make it easier for users to find their contacts and to find activities they like, the service offers the function to create groups of people. Everyone can create a group. The person who created the group becomes the contact person of that group (or can appoint someone else to be the contact person). If someone who is not a member of that group has a question about the group, this arrives at the contact person. If new members want to join the group, they can contact that person. If people from that group want to send out a request for help, they can send it to the entire group.

### **5.1. Technology used**

To achieve the desired functionality, the used technology should possess three characteristics.

The first characteristic is receiving text messages. The text messages can be received by either email or telephone. This can be achieved by using a computer, tablet, smartphone, mobile phone, or a digital photo frame with its own email address.

The second characteristic is sending messages. The messages can be sent by either email or telephone. This by using a computer, tablet, smartphone, mobile phone, or a landline phone (with a telephone service where you can press number buttons to reach the goal you want).

The third characteristic is monitoring the user. This is not explicitly necessary to use the service, but can be used to tailor the functionality of the service to the behavior of the user. This can be achieved by using a portable device with GPS and an RFID chip. It uses GPS to track the location of seniors. RFID is used to track the seniors' social activity (if someone else uses this device as well). If an RFID reader is placed in the home of seniors, it can also be tracked how often they leave their house. This portable device can be a mobile phone with RFID or an RFID keychain with transmitter.

In section 2.4 and 3.2, the technologies that seniors use to send or receive messages have already been discussed. The conclusion was that most seniors do not use the internet and they also do not like input on a mobile device (e.g. a mobile phone). Furthermore ePortrait was discussed, a digital photo frame that was used to make social media tangible, by letting family members upload photos. This was received positively. The hypothesis therefore will be that using the combination of a landline phone and a digital photo frame, the service will be made more accessible to (frail) seniors. In addition to this, the more vital seniors that have more knowledge of technology can also use the service with a computer or a mobile phone. Making the service available through such devices might also help the seniors feel more connected to society, which is something they like. The service should therefore be able to send messages to everybody with an email address or telephone number that is known by either the service or the user.

## **5.2.Challenges of the concept**

The idea of the service brings two challenges with it. The first one are the privacy issues that seniors might have when using the service. The other one is how the service should motivate seniors to actually make the most out of their social network.

### **5.2.1. Privacy issues**

This service might evoke privacy concerns of seniors. First of all, the service is able to track users wherever they go. Secondly, the service keeps track of the activity of users, and even notifies their contacts if they are not active enough according to certain guidelines. Thirdly, users have to reveal their preferences according to their social life. This might contain information that is difficult to quantify and that they do not want to share with others. Lastly, their neighbors are able to contact them and they might not want to be reachable to everybody.

Regarding GPS tracking, many studies have been conducted on the tracking of Alzheimer patients. Using GPS to track wandering Alzheimer patients takes a lot of weight off the shoulders of the caregivers. Therefore family caregivers also prioritize the safety of their Alzheimer relatives over their autonomy and privacy. However, if their relatives are taken care of by others, they prioritize their autonomy and privacy [42]. Though not all users of the service will have Alzheimer, their family

members might think they need to be monitored when they continue to live independently. However, it is important that the senior also gets a vote in this. Even with the tracking of Alzheimer patients it is important that they will get a vote in deciding if they want to be tracked, in the earlier stages of their dementia, as it is their autonomy that will be given up [35; 42].

In addition to devices specifically designed for tracking, a lot of mobile phones and smartphones nowadays also have GPS. A study has been done on users' privacy concerns regarding location-based services and position-aware service on a mobile phone [6]. Location-based services are services that rely on tracking people's location by others and position-aware services are based on the knowledge of the device's own position. The study involved 16 participants and they rated the position-aware services as less intrusive than the location-based services. Interestingly enough, they thought services that they rated as intrusive, also could be very useful.

Regarding tracking social contact, fewer studies have analyzed the privacy issues that come along with it and especially user studies are rare. For example, Farrahi et al. mentioned that large-scale use of mapping social networks will be difficult, because of privacy considerations of people, though they do not mention the exact reasons people might have problems with it [21]. A conclusion from a field test of Social Net, was that people would not immediately add someone as a friend once they are introduced [55]. Though Social Net is not focused on seniors, this may be a prediction on how seniors would react to a suggestion to add a friend.

This implies that people would want to keep control over their own information, location or activity, which is confirmed in multiple studies. In a study of Kanis et al., six seniors were interviewed and filled in a questionnaire regarding an ambient assisted living system for monitoring the daily activities of senior residents [40]. The seniors had no prior experience with these systems, but had indicated that they had an interest in having such a system installed. They indicated that they were willing to have most of their daily activities monitored, but they only wanted to share this information with medical specialists. Not with friends or family and especially not with neighbors. In addition, they thought that they should be the ones to indicate when it is most important to be monitored. Also in the study of Steele et al., 13 seniors had decided that technology might override their decision only in a critical situation and if it is absolutely sure [54].

Another interesting fact is that it seems that the more frail people get, the less privacy concerns they have, especially for senior persons. A survey about privacy and data security in E-health was completed by 104 seniors aged between 21 and 98 years of age [60]. The privacy issues – confidentiality, anonymity, intimacy, invisibility to outsiders and not stigmatizing design – were considered to be more important to healthy persons than to frail persons. Also within the 27 seniors (age 60-98) who completed the survey, a difference could be found between healthy and frail seniors. The healthy seniors seemed to think of intimacy, confidentiality and invisibility to outsiders as more important.

Lastly, it seemed to be that seniors want to use technology if it is useful to them, even if it invades their privacy. Steele et al. asked 13 seniors about embedded sensors to monitor them [54].

Surprisingly, the seniors reacted positively and their main concern was about the pain of insertion and removal. They said that *"if the thing is good, and it works, then we go for it. However, if we see something that is useless, and obtrusive, and is change for change's sake, then no. Not interested."*

### 5.2.2. Persuading seniors

The second challenge is about persuading seniors. In addition to making it easier for the seniors to make contact with others, the seniors also have to be motivated to actually use the product and build or maintain their social network. Therefore the seniors should be motivated; they should be persuaded to have the amount of social interaction that they need. Many different persuasive technologies already exist, but persuading people to be social seems to be something that is rarely done. Some studies that tried to do this have already been described in section 3.3. One of them is the mobile application that tries to motivate them by showing a visual representation of their activity level, by letting them earn coupons if they are social, and by inviting them to join events. The other one is the Social Calendar, which encourages social interactions by suggesting activities they can do with their family.

The first step in designing a persuasive technology is about choosing the target behavior [23]. However, in the context of social interaction, the target behavior may be not that clear at first sight and may differ for each user. The main goal can be described as having the required social network size and the required amount of social interaction. However, every user will have a different view of how much social interaction they should have and how many people they should have contact with.

Motivating people to have the amount of social interaction that they need can be done both explicitly or implicitly. The most basic form of explicit motivation is sending a motivational message. A form of implicit motivation can be rewarding the person every time they did some good thing. The service should implement both explicit and implicit motivation. Implicit motivation can be less irritating, but once in a while the users should be reminded of the service and of what they should do in an explicit form.

One way of motivating people is to show the right information at exactly the right time. Intel mentioned four components of an effective strategy to motivate behavior change, using just-in-time information: the message should be simple and tailored; the message should be given at an appropriate time; the message should be given at an appropriate place; a non-irritating strategy should be used [37]. However, just-in-time information means that the information is presented at the same moment as the user should make a decision. As users are not obligated to use a portable device on which they can receive text messages, the service should not use just-in-time information. But the components also seem to be relevant for motivation that is not just-in-time.

The form of a motivational message that is given to the user should present itself as being credible [46]. This means that the source of the message should be someone that is looked up to, or that a fact that is given is proven to be true by research. It also helps when the source of the message is someone the user seems to know or like, or someone that they are obedient to. People tend to compare themselves to others: often the behavior of others is copied, especially when these others are similar to themselves. So when one person is doing it, others will follow. This also goes for repaying others if they provided something. Furthermore, people seem to behave consistently with the commitments they make, and they seem to be attracted to scarce items (which can include messages) [8]. So the messages that the service sends should include a source that a user might interpret as being credible. The messages might also include information about the behaviors of others, as this might motivate users to change their behavior. In addition, users should be able to set their own goals, so they will be inclined to meet these goals. A reward may be used in the form of a

message when users indeed reach their goal. If this message is different each time users reach their goal they may be inclined to make sure they will get these messages.

In addition to being persuaded when using the service, the users should also be persuaded to adopt the service itself to begin with. It would be useful if a credible source recommended the service, or if people around the senior already used the service. The service also should offer some value to senior users, because only then will they be able to accept it [54]. When the seniors started using the service they should also be motivated to keep using it. The service therefore also should keep offering value to users, even if they are perfectly happy with their social life and do not think they need any assistive service. As long as there are people that send requests for help once in a while, the users without any needs might keep using the service because they can help others. However, to find out what the real reason is that people want to keep using or stop using the service, the service should be introduced in a neighborhood and it should be examined how and if those people make use of the service.

### 5.3.Summary

The service can be used with multiple types of technology. There are three characteristics that the technology should possess: the ability to send messages; the ability to receive text messages; the ability to track the user. One technology that can achieve this all in one is a smartphone or a mobile phone with GPS. If seniors do not own such a device they can use their landline phone, a digital photo frame and a special key chain with GPS. The technology will then be accessible to all seniors, but vital seniors are not forced to use a specific technology if they already own a smartphone.

The service itself has five main aspects: settings of the user; send messages; receive text messages; monitoring of the user; supporting the user in certain actions. Settings of the user can be subdivided in the settings that users initially fill in and settings that change according to their behavior. Messages that can be send are requests for help to neighbors that are able to help, and invitations to activities to someone in the social network of the user. Users can receive motivational text messages from the service or requests for help or invitations to activities from other people. Seniors will be monitored when they leave the house, or when they have contact with others. Furthermore their location and their physical activity will be monitored. Based on the tracking of social contact, the service helps users in maintaining their contact list and in preventing diluted friendships. Furthermore the service offers the function to create groups of people to which people can send a request for help.

The design of the functionality of the service brings two main challenges along with it: privacy issues and how to persuade seniors. Privacy issues might especially occur when information about the senior that is monitored by the service will be used, even if this should be for their own benefit. There are not a lot of studies regarding privacy issues that seniors might have when they are being tracked, and to the best of my knowledge there are no studies when this concerns tracking the social behavior of seniors. Existing studies show that seniors probably want to decide themselves which information is monitored, and frail seniors would probably have less problems with being monitored as it will be more useful for them. The seniors should also be persuaded to start using the service, keep using the service, and indeed build and maintain their social network. There are a lot of studies

that focus on how to motivate people to do something. First of all the service should offer some value to seniors in order for them to start and keep using it. Secondly, in order to motivate them to change their behavior, they should receive motivational message or be rewarded when they did something good. Motivational messages should be simple and tailored and it should present itself as being credible.

The next step of the research is to explore the privacy issues that seniors might have with this first concept, and what values they think this concept has for them to actually use it.

## 6. Prototype

To visualize the idea of the service, an offline, simplified prototype has been created using HTML, CSS, Javascript and PHP. This prototype could be used in the evaluation that is described in chapter 7. The prototype visualizes two aspects of the service: creating a profile and receiving messages from the service. There has not been paid much attention to the usability of the prototype. I tried to make the prototype user friendly by making everything fit on the page without having to scroll, by placing buttons or text with the same functionality at the same place on the page, and by using simple colors. The complete text used in the prototype can be found in Appendix F.

### 6.1. Creating a profile

Before seniors are able to use the service, they have to create a profile, as was already mentioned in section 5.1.1. In the prototype, first a small introduction of the service is given. In addition, users are told that they are not obligated to reveal anything but their name. See Figure 6-1.



Figure 6-1: The welcome-page in the prototype

When users start to create a profile with the prototype, they have to follow four steps: personal information; hobbies and interests; preferences; services.

#### 6.1.1. Personal information

Personal information includes the name and contact information of the user. In addition, users can choose to add a profile picture. See Figure 6-2.

**Persoonlijke gegevens**

Naam:

Adres:

Huisnummer + toevoeging:

Postcode:

Woonplaats:

E-mailadres:

Telefoonnummer:

Mobiel nummer:  ☐ Heb ik niet.

Geboortedatum:

Burgerlijke staat:

Wilt u een profielfoto toevoegen? ☐ Ja ☐ Nee ☐ Weet ik nog niet

Figure 6-2: Personal information in the prototype

### 6.1.2. Hobbies and interests

After users filled in their personal information, a list is presented with hobbies. The list is spread over two pages. Users are asked to select those that they like. If a particular hobby is very general, users can specify this by filling in a text field. See Figure 6-3.

**Hobby's en interesses**

**Wat doet u graag in uw vrije tijd?**  
Meerdere antwoorden mogelijk.

☐ Naar de bioscoop  
☐ Naar het theater  
☐ Culturele evenementen bezoeken  
☐ Musea bezoeken  
☐ Op vakantie  
☐ In de natuur zijn  
☐ Uut eten  
☐ Naar een café  
☐ Winkelen

☐ Wandelen  
☐ Fietsen  
☐ Erop uit met de auto  
☐ Erop uit met de motorfiets

☐ Actief zijn in de politiek  
☐ Actief zijn in verenigingen of stichtingen  
☐ Werken, namelijk:

☐ Vrijwilligerswerk, namelijk:

☐ Sporten, namelijk:

Figure 6-3: Hobbies and interests in the prototype

### 6.1.3. Preferences

To tailor the behavior of the service to the wishes and needs of the user, users need to answer questions regarding their preferences. The questions are spread over three pages, and are:

- How social are you?
- Who can send you messages through the service?
- To what extent do you want to help acquaintances/neighbors/club members/friends/family?
- How much exercise do you want?
- If for some time, you did not make contact with others or leave your house, we want to verify if everything is okay. After how many days do we have to worry?

Most questions that need to be asked, may be interpreted differently by different users. For example, someone may think they are very social when they have four best friends, and someone else may think they are not social, because they only have four. To make it easier for users to answer these questions, and also to make it easier for the service to interpret the results, standard answers are provided. For example, the answers to the question 'How social are you?' range from 'I would rather be alone' to 'I want as much social contact as possible, with as many people as possible.'. See Figure 6-4.

**Voorkeuren**

**Hoe sociaal bent u?**

- ☐ Ik ben liever alleen.
- ☐ Aan één of twee contacten heb ik wel genoeg.
- ☐ Ik vind sociaal contact leuk, maar soms vind ik het ook fijn om alleen te zijn.
- ☐ Ik wil elke dag wel met iemand praten.
- ☐ Het liefst praat ik elke dag met meerdere mensen.
- ☐ Ik wil zoveel mogelijk sociaal contact, met zoveel mogelijk mensen.
- ☐ Wil ik liever niet zeggen.

**Wie mag berichten naar u sturen via de Buurt-app?**

- ☐ Iedereen die in de buurt woont, ook als ik ze niet ken.
- ☐ Iedereen die in de buurt woont en die ik tenminste bij naam ken.
- ☐ Iedereen die in de buurt woont en die ik tenminste een keer gesproken heb.
- ☐ Alleen mensen die ik regelmatig zie of spreek.
- ☐ Alleen mensen waarvan ik aangeef dat ze contact met me op kunnen nemen.
- ☐ Wil ik liever niet zeggen.

Verder

Figure 6-4: Preferences in the prototype

#### 6.1.4. Services

To establish the reciprocal neighborhood, users have to indicate what kind of services they can and want to do for their neighbors. See Figure 6-6.

**Diensten**

Een 'voor wat, hoort wat'-principe past goed in een buurtgemeenschap. Wat zou u voor uw buren kunnen en willen doen?

- ☐ Ik kan pakketjes in ontvangst nemen.
- ☐ Ik kan een boodschap meenemen.
- ☐ Ik kan iets te eten maken.
- ☐ Ik kan schoonmaken.
- ☐ Ik kan dingen tillen.
- ☐ Ik heb kennis van technologie.
- ☐ Ik kan overweg met naald en draad.
- ☐ Ik kan tuinieren.
- ☐ Ik kan klussen.

Verder

Figure 6-5: Services in the prototype

## 6.2.Receiving messages

In the prototype, three messages are created that the user would receive by the service: sending a message to someone they have not seen in a while; adding someone new to their contact list; asking someone who is in the supermarket a favor. These messages appear after a few seconds. The background image is one that might be the background image of the real application. It exists of four buttons: edit profile; maintaining contacts; sending a message; my messages. In addition it has two figures that indicate to users how much contact they have had with others that week and how much exercise they have had. By indicating the percentage of activity of what they want to have, users will be motivated to be more (socially) active if the percentage is low. See Figure 6-6.

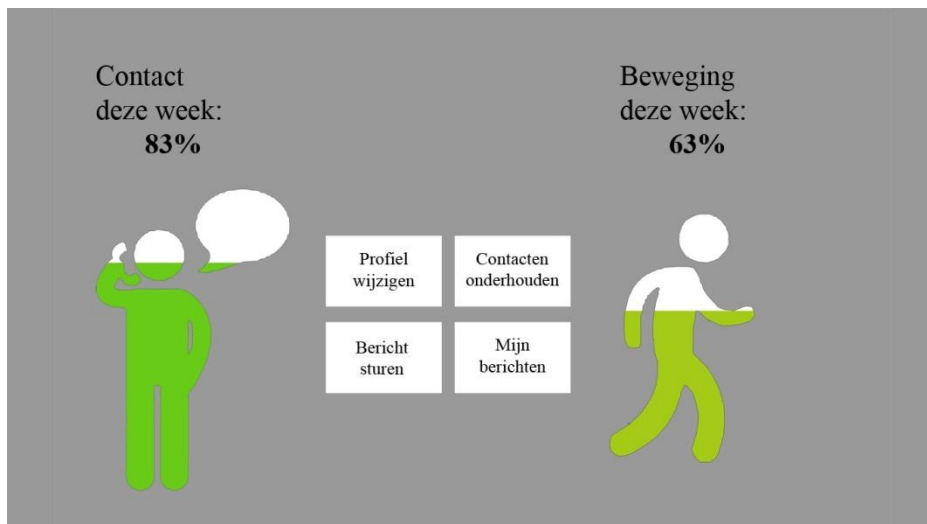


Figure 6-6: Background in the prototype

### 6.2.1. Sending a message to someone

The first message in the prototype is a message that should help users in preventing the dilution of friendships. It says that the user did not see someone for the last three weeks, and asks if the user wants to send a message to this person. See Figure 6-7.

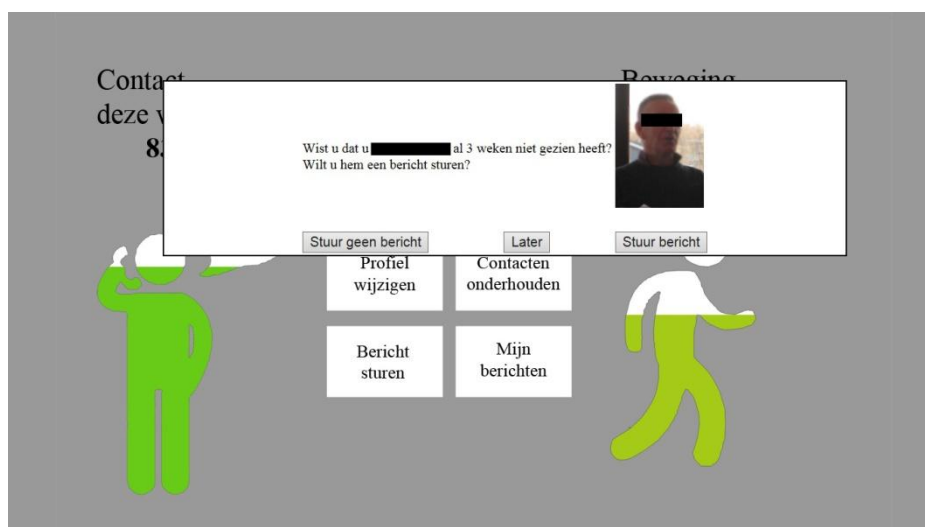


Figure 6-7: Message about friend in prototype

If users decide to send a message to their friend, they will go to their profile page. This profile page has four buttons: one to call their friend; one to send an email to their friend; one to organize a meeting with their friend; and one to go back to the main page. See Figure 6-8. If users decide to organize a meeting with this person, they can choose the activity, the time and the location and send this request to their friend.

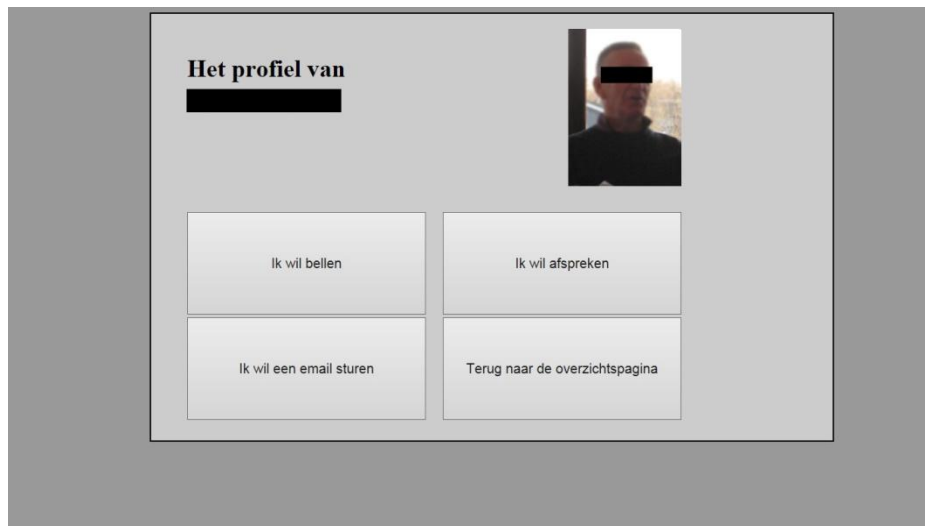


Figure 6-8: Profile of a friend in the prototype

### 6.2.2. Adding someone to contact list

The second message in the prototype, is a message that should help the user in maintaining its contact list. It says that there has been monitored that the user recently had contact with someone, and asks if the user want to add this person to their contact list. See Figure 6-9. If users decide to do this, they can choose whether they want to share their email address, phone number, and/or address.



Figure 6-9: Message about new contact in prototype

### 6.2.3. Asking someone a favor

The third and last message in the prototype, is a message that notifies the user of the fact that one of their friends is in the supermarket, and asks if the user wants to send him/her a request to buy some tea for them. See Figure 6-10.



Figure 6-10: Message about asking a favor in prototype

## 7. Evaluation session vital seniors

The first concept and prototype were evaluated with vital seniors.

### 7.1.Goal

The first evaluation has two main research questions:

1. *Which privacy concerns do seniors have regarding the data that is shared with the service?*
2. *Which functions should the service offer in order to persuade seniors to start using it?*

Those two questions are somewhat in relation with each other. As was concluded from section 5.2.1, seniors are willing to give up something if they get something back that is useful for them.

The first question mainly is about privacy concerns that seniors may have. There are two kinds of personal data that can be shared. The first one is personal data that they reveal themselves. This is the information that users have to fill in when they create an account to use the service, i.e. their contact information; preferences regarding (social) activity; services they can offer; hobbies and interests. The second one is data about themselves that the service observes, i.e. if they leave the house; what activities they perform; whom they spend time with. Furthermore there is the question who the seniors want to have their personal information. Maybe they only want the service to have it, so it can improve their lives. But they may also choose to share with their best friends, or maybe even share some information with people that they do not really know.

The second question is about the advantages that seniors see in the service. There are three main functions the service has that users might find useful. The first is the facilitating of making contact with neighbors. Not only regular contact can be made more easy, but also the reciprocity in the neighborhood can be easily established, and asking for help will be facilitated. The second function is that the service helps users in staying as (socially) active as they prefer. The service sends motivational messages and suggestions about activities to users if they are not (socially) active enough. The last function is that the service supports certain actions that users might normally forget or find difficult. For example help with preventing friendships from diluting and help with keeping their contact list up to date.

### 7.2.Method

#### 7.2.1. Participants

The evaluation session is held with five seniors (3 male, 2 female) that already participated in previous workshops (section 1.1). Their age ranged between 73-79. They are vital seniors that are still active, both socially and physically, that live together in the same neighborhood and also know each other. Therefore they are not representative of all target groups. Four of them live together with a partner and one of them lives alone.

#### 7.2.2. Filling in profile & receiving messages

The first part of the evaluation is individual. In this part of the evaluation the prototype described in chapter 6 is presented to the participants, without any extra information. Every participant gets

his/her own laptop together with a computer mouse. All participants are placed in the same room, though some space is left in between participants to create a more private feeling.

### **7.2.3. Scenarios**

The second part of the evaluation is semi-individual. There are 8 scenarios about situations in which the service is used. The topics of these scenarios are: maintain network (2x); physical exercise; helping each other; ask for help; help another; making new contacts; adding new contacts. Each scenario is read out loud, after which the participants individually filled in some statements. There are statements that are about information that the participants are willing to reveal in this situation, and about what they like to get in return for it. For each statement, each participant has to say if they agree, are in doubt, or do not agree with that statement.

The complete text and statements that is used in this part of the evaluation - including the responses - can be found in Appendix G.

### **7.2.4. Technology BSS**

The third part of the evaluation is about the technology that BSS has developed. It is about an application that supports the 'request for help', by defining situations in which the seniors might want to ask for help, and creating a circle of people that will receive the request for help when this situation occurs.

### **7.2.5. Final discussion**

The last part of the evaluation is one in which a final discussion takes place regarding everything that has been evaluated in the first three parts of the evaluation. There are two large sheets of paper that are the basis of the discussion.

On the first sheet of paper are written 10 statements regarding the advantages of the service:

- Getting help building contact list
- Distinction between friends and acquaintances
- Contacts do not dilute
- Searching for help chore
- Monitoring contact
- Monitoring exercise
- Overview activities contacts
- Sending message to multiple persons
- Making contact without exchanging contact information
- User decides everything

On the second sheet of paper are written 10 statements regarding the information users have to reveal in order to make full use of the service:

To the service:

- my location
- with whom I have contact
- how much they exercise
- my contact information
- my hobbies and interests

- my services
- To contacts:
- my location
- if I am still active
- activities I perform
- opportunities to ask a favor

The participants are given the task to place 3 red and 3 green stickers near statements that they respectively disagree or agree with. The results from these stickers form the basis of the discussion. They can be found in Appendix H.

## 7.3.Results

### 7.3.1. General impression of the prototype

Though not much attention was paid to the appearance and the usability of the prototype, the seniors quickly went through it and no questions were asked about how it worked. Afterwards they said that they liked the idea.

### 7.3.2. Which privacy concerns do seniors have?

#### Data that they reveal

At first sight it seemed to be the case that the seniors had no problem sharing information about themselves, as they filled in (almost) everything in their profile. However, the discussion revealed that they might have some problems sharing some information.

First of all, revealing their contact information. Creating their profile, a few seniors refused to share their email address and telephone number. The statements showed that almost everyone thought sharing this information was a good thing when giving help, but questionable when making new contact. During the discussion it became clear that most participants were a bit hesitant in sharing this information with some people. When giving contact information to a needy senior, this means that this senior can contact them any time to ask for help, and they do not have time to help this senior with all his/her problems. That is the reason why they do not want others to be able to simply contact them, and why they do not want the service to know their contact information.

Secondly, revealing their preferences regarding (social) activity. They answered every question. During the evaluation it became clear that they especially want to control what the service does for them. Sharing their preferences with the service fits in well with this thought, because the service would be able to adjust its methods to the preferences of the user.

Thirdly, revealing which services they can offer. Everybody indicated which services they could offer, and the statements also showed that most of them were positive about sharing the services they could offer in their profile. However, in the discussion there was some resistance concerning these services, because they find it difficult to get asked to help with a problem described by a general term. They do not know exactly what they can help others with, and they are afraid they would get that one question they do not know the answer to. Helping will be easier if there is a specific and detailed request for help. Also, they are afraid that their services will be abused when someone

knows they have a certain skill. They do not want to get messages all the time in which someone appeals to their services. However, in the overview of statements at the end of the evaluation, sharing their services was considered one of the most positive aspects of the service.

Lastly, revealing their hobbies and interests. When filling in their profile, they seemed to really want to reveal every hobby or interest they have. The filled in statements also suggested that they are willing to share this. However, during the discussion it became clear that not everybody saw the added value. Though this is certainly not the main functionality of the product, this also does not seem to be a stumbling block.

### Data that is observed

The seniors were mostly hesitant in the information they want the service to observe. In the overview of statements at the end of the evaluation this became very clear, as all data that was observed was labeled as negative. Especially observing if they have contact with others and how much time they spend with someone else. Also in the earlier statements this was considered as negative by almost everyone. In the discussion it became clear that they did not see the added value from this.

Being traceable was considered negative in the statements, though somewhat less negative in a help giving situation than in a situation to maintain their social network. However, sharing their location with friends was considered more negative in the help giving situations. Overall the seniors rated sharing their location as more positive than being traceable. In the discussion it became clear that most of them actually only want to share their location with others at moments that the advantage can be seen right away, like in case of an emergency or to carry out specific services. The fact that they are afraid their services will be abused may be the cause of the more negative attitude towards sharing their location in help giving situations. During the discussions about giving help, they did mention that it will be a good thing if they can choose which requests for help they want to accept and that they can simply ignore the others.

In the statements the participants indicated that they did not want to share their activities. In the discussion it became clear that they thought every minor activity will be shared, like doing the dishes. They indicated that if sharing a specific activity with others will have an added value, it may be useful to share.

Some people agreed and others disagreed with the statements about observing their physical activity. An interesting fact is that they all indicated in the discussion that they would like to keep track of their own physical activity themselves. One of the researchers had some kind of bracelet that measures his activity and they all indicated they would like to try that. Actually this is also a service that observes their physical activity, but they did not seem to interpret this the same way. They also indicated that it could be nice to share this information with a select group of people, for example the children. This group can then keep an eye on whether their physical activity level is high enough.

Letting friends automatically know if they have not been active for a while was also agreed as well as disagreed with within the statements. From the discussion it turns out they thought that it is useful for both vulnerable seniors as for seniors who live alone. But they thought it was especially useful in

acute situations and their activity does not have to be measured constantly. It was hinted that in a less acute situation, people would communicate this themselves to their contacts, using the service.

## Conclusion

The most important conclusion regarding information that seniors want to share, is that they would like to control what they share with whom. That is why they like the idea of creating a profile in which they set their own preferences. In addition, they do not constantly want to get messages from their contacts. They want to be the one to decide how many messages they want to receive. Also, they want the service to observe their life as little as possible. From the data that is observed, most of the time they want to be the only one to see this data. Only for relevant purposes they want to share this with the right persons.

### 7.3.3. Which functions should the service offer?

#### Facilitating making contact

The participants were vital seniors with a good social network, but in the statements they still indicated it as positive to facilitate making contact with others and having a conversation topic at first contact. The discussion confirmed this, but a few seniors also thought it was not necessary. They said it would go automatically, without having to use any kind of technology or service. Also, they rarely seemed to meet new people, especially people in their age category. Furthermore they indicated that someone their age cannot build a new social network; they had to do this when they were young.

Sending out a request for help which is not acute through the service was received positively, both in the statements and in the discussion. This was especially the case when it would be possible to send it to multiple people, without anyone being obligated to react. Asking for help and receiving a request for help will get easier this way, as asking someone face-to-face is harder to do than sending a message, and ignoring a message is easier than ignoring someone face-to-face.

According to the statements, the participants do not want to offer their services in exchange for the services from someone else, but they do always want to do something in return when asking someone a favor. In addition, the participants indicated that they always would like to offer their services if this hardly takes any extra time or work.

#### Helping users stay as (socially) active as they prefer

The statement about being motivated to be social was something most participants agreed with. They also indicated that activities they normally do alone, they want to perform with others. Lastly a suggestion for a social activity was also found to be positive. However, during the discussion it was clearly stated that it depends on the person if they want to be social with them. With some people in their social network they only want to have little contact.

The statement about being motivated to be physically active was agreed as well as disagreed with. As mentioned before, in the discussion it became clear they would all want to monitor their own physical activity. So they actually would want some motivation to be physically active. The statement about getting suggestions about the physical activities of their social contacts was not agreed with by everyone. One of their arguments in support of this statement is that performing physical

activities with people they know is a good incentive. An argument against this statement is that when you are content with your physical activities, you do not feel the need for this. Whether someone wants support in being physically active probably depends a lot on the person.

### Supporting certain actions

Another function regarding the request for help that was positively rated in the statements is getting suggestions from someone who can help with a problem. Also in the overview of statements at the end of the evaluation this was noted as positive. In general they think getting support for the request for help is positive.

Letting the service help to check if someone is still active was also considered to be positive, in both the statements and the discussions. During the discussion it became clear they think it is useful if they are being notified if someone is temporarily less active, and that someone can easily notify everyone if they will be less active for a while. Within clubs this problem may not be as important, because people call or send an email when they will be absent at a particular time. The statement about noticing others when you have been less active was disagreed with by most of the participants. However, in the overview of statements at the end of the evaluation it was considered to be positive.

Automating actions that include privacy sensitive data is not something that the seniors want. This became clear both from the statements and during the discussion. An example of such an action is automatically maintaining their contact list. Seniors want to have total control of these kinds of actions. In the overview of statements at the end of the evaluation they did rate the idea of making a distinction between friends and acquaintances positively, but they probably want to make this distinction themselves.

An additional fact that seniors gave during the discussion, was that within clubs, there are different people that organize activities (besides their normal activities). So it is not always the same person that tries to get others to be active.

### Conclusion

The most important conclusion is that they think it is useful to send a request for help using the service, to multiple people at once. The reciprocity between them should however be more natural, and not forced after a favor is asked. In addition to this, they also would like to be motivated to be social, as long as it is with the right people. That is why being able to make a distinction between friends and acquaintances, is also something they think is important.

## 7.4. Conclusion and discussion

A few of the conclusions are in agreement with earlier findings. That seniors want to have control over their own social network was also mentioned in section 3.5. A conclusion from this evaluation is that seniors indeed want to have control over whom their contacts are and who can have their contact information. In addition, that seniors only want the service to override their decision as a final resort was mentioned in section 5.2.1. This is in agreement with that the participants want to have control over what the service does for them. In section 5.1 was also already implied that

seniors might have problems with letting the service observe their location and contacts. However, another conclusion from this evaluation is that seniors want to share their location with others at moments that the advantage can be seen right away. Something that is in agreement with the fact that seniors want to use technology if it is useful for them, even if this invades their privacy (section 5.2.1). However, the participants were not sure if they would want others to find out when they become less active, which is in agreement with the fact that they do not want to be considered frail (section 5.1). Furthermore, the seniors were afraid that people would abuse their willingness to help, so sometimes they would want not to be reachable, what was also the case with the Building Bridges device (section 3.3). When using the Building Bridges device, a common interest seemed to be very important, but this was not agreed on with all participants in this evaluation.

Other conclusions can also be drawn from the evaluation. First of all some conclusions about helping can be made. There are not enough people that are willing to help seniors for the amount of help that is needed. The vital seniors would like to know exactly what a problem is before helping someone. When they ask for help it would be useful to get a suggestion of someone who could help, and they would want to do something back, but this has to go naturally. However, the senior in need must be the one that sends out the request for help. Secondly there are some conclusions about monitoring the activity level of the senior. The participants thought that the only time that automatically sharing possible problems is useful in acute situations. If they want to keep people in their network up to date if their activity level drops, they would only want this to be their most closest contacts, for example their children. Furthermore there are some conclusions about building a social network. The participants would like to be motivated to be social, but they did not think that it was possible for a senior person to build a social network. They thought that this should be done at a younger age, because otherwise you would be too late.

## 8. Survey activities for seniors

In addition to the evaluation of the first concept, a survey was conducted to map the communication that takes place between board members of activity groups and seniors. The survey that is conducted can be found in Appendix I.

### 8.1.Goal

The core of the social support network of a senior is the people they see on a regular basis, for instance at activities that they participate in each week. Once an activity becomes unavailable to a senior, due to a decrease in physical or cognitive functions, this social support network tends to decrease as well. One of the challenges of the service should be to help the senior keep in contact with the people in that social support group, without being obligated to take part in the activity as well.

The wishes and needs of the organizers of such activities should be taken into account when designing the service, as they are stakeholders as well. Therefore a small survey has been conducted. This survey was meant to get information on the communication that takes places between the organizers of the activities, the members and possible new members. The survey focused on the means of communication that are used.

The was aimed at the organizers of activities that take place on a regular basis. The activity should be visited by the same seniors every time, so they will know each other by means of the activity. Furthermore the total number of members should not be too large, so it will in theory be possible to know everyone.

### 8.2.Method

An online survey was created. To recruit organizers of activities to fill in the survey, an email was sent to different departments of the Algemene Nederlandse Bond voor Ouderen (ANBO). The ANBO is an organization that represents the interests of senior citizens in the Netherlands; its goal is to maintain and improve the quality of life of senior citizens in the Netherlands. Its primary goal therefore is not to organize activities for seniors. However, the ANBO does have contact with many senior citizens. The different departments within the ANBO may therefore also know some activity groups for senior citizens within their area. In the email, a request was made to forward the survey to such activity groups, and a request was made to fill the survey in themselves if they had organized such activities.

### 8.3.Results

Unfortunately, it was not clear to some receivers of the email for whom the survey exactly was meant. Therefore some board members of different ANBO-departments also filled in the survey although the number of members in their department was much too high. In the end 43 board members completed in the survey. I decided to include the completed surveys from board members of activity groups that had less than 120 members, which will from now on be called relevant activity

groups. This number was taken from the mean social network size people have, which seems to be around 125 [33]. This resulted in 17 relevant activity groups.

The results of the 17 relevant activity groups are described here. However, the other 26 completed surveys also gave some interesting results that were not really contradictory with the 17 surveys that were used. When the results of all activity groups clearly contradict with the results from the 17 used surveys this is also mentioned in the results. The other 26 activity groups will from now on be called non-relevant activity groups, though some of their answers might seem interesting. When I am talking about all activity groups, I will say explicitly all activity groups.

### **8.3.1. Participants**

The average number of members the relevant activity groups seemed to have was about 53 (SD=32.9). 3 of these groups were located in a big city (17.6%), 2 in a small city (11.8%), and 12 in a village (70.6%).

Of all the activity groups, the average amount of members was 482 (SD=541.8) and of all activity groups only 21 were located in a village (48.8%).

### **8.3.2. New members**

In the relevant activity groups, word-of-mouth is mostly used to attract new members; 15 of 17 mention this (88.2%). In addition to that, the paper, journals and flyers are used occasionally (17.6%, 11.8% and 11.8%). Facebook was mentioned once. Another source they depend on to find new members is through the ANBO newsletter. A comment that was made by a non-relevant activity group was that seniors are told about activities when they move to a home in their neighborhood.

Most of board members of the relevant activity groups did not know if they were willing to spend more time on recruiting new members (53.0%), 29.4% of them do not want to spend more time, and only 17.6% are willing to spend more time. Only 1 board member said that they were willing to buy some kind of device that would help them get more members. The board members of all activity groups are more likely to spend more time on recruiting new members (51.2%).

### **8.3.3. Members**

Within the relevant activity group, contact between the board members and general members is kept through telephone (52.9%) and email (64.7%). Contact between the members themselves is also kept through telephone (76.5%) and email (70.6%). Text messages through mobile phones and contact in person are both mentioned 2 times (11.8%).

15 out of 17 board members (88.2%) of the relevant activity groups said that there were members who became physically or cognitively impaired during their membership. In 26.7% of these cases, other members of the activity group stayed in contact with the impaired member. In 40.0% they only stayed partially in contact and one board member did not know if they stayed in contact. In 26.7% they did stay in contact.

### **8.3.4. Comments**

In addition to the predefined answers that the participants of the survey had to give, they were also given the opportunity to give some other remarks at the end of the survey. A few interesting aspects were mentioned.

Two of the board members of all activity groups mentioned that it is more important for them to recruit younger seniors as new members than older seniors. But they also said that younger seniors do not want to be associated with organizations or activities for seniors, because they feel they are too young for that.

Furthermore one board member of an ANBO department mentioned that only about 25% of the members make use of email, because many (older) members do not own a computer.

Lastly, many relevant activity groups do not explicitly recruit new members, because 'everybody knows they exist' and 'everybody is free to join'. Word-of-mouth really seems to be the most important means of communication within groups of seniors. Board members of relevant activity groups also mentioned they do not spend a lot of time on recruiting new members, on average this was less than half an hour each week.

#### **8.4. Conclusion and discussion**

With regard to the service, a few results can be kept in mind while designing. First of all the means of communication used in the service should probably be telephone and/or email. It is important that the users of the service can easily send messages about a certain activity to others, as a new form of 'word-to-mouth' communication. Easily sending messages is in agreement with the conclusions from the evaluation with vital seniors (chapter 7).

One way of automatically informing possible new members about the activity is sending them a message about it when they move to the neighborhood for the first time. Another way is by sending out a newsletter each month or so, to remind them the activity exists. For the organizers of activities, this should not take much more time and certainly not a lot of money, as most board members were not willing to buy some kind of device to help them. Therefore the service should facilitate them in every way possible.

As a final remark, getting younger seniors to use the service seems to be important. Not only do senior activity groups wish to have more younger members, younger people are also important to provide a secure and safe environment for those who must to rely on others once in a while.

## 9. Improved concept

The results from the first evaluation have been used to improve the concept of the service. In this chapter, I will explain the adjustments and additions that should be made to the service with respect to the first concept of the service which was explained in chapter 0. After that, the interaction between (different kinds of) users and the service is explained in more detail. The scenarios of Els, David and Arnold are again rewritten and can be found in Appendix J.

### 9.1. Adjustments and additions

The service should still have the same three characteristics: it should be able to send messages, receive text messages and monitor the user.

However, the biggest adjustment to the service is that it should not be able to monitor the social contacts of the user. It will be more difficult to tailor the behavior to users when their social activity is not measured, because the service will not know with whom they spend most time with. More about tailoring to the user is described in section 9.2.

The adjustments and additions will be presented by using the same five aspects as are used in chapter 0: settings of the user; send messages; receive text messages; monitoring of the user; supporting the user in certain actions. An overview of the changes can be found in Table 9.1.

	The first concept	Improved concept
<b>Settings of the user</b>		
Creating a profile	Personal information; hobbies; chores they can perform; preferences.	Same as before + living situation; social groups.
Changes in behavior/life	Service adjusts behavior according to behavior of user and by asking questions.	Same as before + information about whereabouts; illness.
<b>Send messages</b>		
Send requests for help	Reciprocity of small chores of certain types. Will be sent to people that can help with this type of chore.	Reciprocity more naturally. No general terms, but personal message. Users select who they want to send request to.
Organize an activity	You can organize an activity with someone in your social network.	Same as before + activities can be organized for groups.
Send personal messages	-	A simple personal message can be send to contacts.
<b>Receive text messages</b>		
Receive motivational messages	User gets motivated to be (socially) active.	Same as before + user gets motivated to help others once helped.
Receive messages from others	User receives requests for help and invitations to activities.	Same as before + user receives personal messages.

Receive messages on message board	-	All messages that are addressed to someone will also be send to his/her own message board
<b>Monitor the senior (optional)</b>		
Monitoring social contacts	Monitored to automatically maintain contact list.	-
Monitoring if and when the senior leaves the house	Monitored to check everything is okay.	Same as before.
Monitoring the location of the senior	Monitored to support certain requests for help and in case of emergency.	Same as before + user can choose which locations he/she wants to share.
Monitoring the movement of the senior	Monitored to make sure senior exercises enough	Only for personal use.
<b>Supporting the senior in certain actions</b>		
Maintaining contact list	Contacts can be added both manually and automatically.	Contacts can only be added manually, but people can be added by selecting them from a list.
Preventing diluted friendships	The service sends reminders to users about friends.	-
Groups of people	The service offers the function to create groups of people.	Same as before + privacy settings for each group separately.

Table 9.1: Functionality of the improved concept

### 9.1.1. Personal settings

The service still keeps adjusting itself to the user. However, due to the wishes of the participants of the first evaluation, creating a profile requires more settings. They still have to fill in their contact information; preferences regarding (social) activity; services they can offer; hobbies and interests.

In addition to this, they also need to fill in with whom they want to share some privacy sensitive information and from whom they want to receive how many messages. The seniors liked the idea of making a distinction between friends and acquaintances. To make it easier for the user, pre-defined groups will be available. These groups are based on the most common contacts mentioned in previous work (section 1.1), only instead of neighbors and hobby friends there will be acquaintances and vague acquaintances. Neighbors or hobby friends can be seen as either friends, acquaintances or vague acquaintances, depending on the relationship the senior has with them. This leads to the four social groups 'family', 'friends', 'acquaintances' and 'vague acquaintances', for which users can give privacy setting. Though it was and will never be the intention of the service to share private information, the user has to get the feeling that they are indeed in control of their own data. To let them start using the service as soon as possible, they are also asked to add some people they know as contacts right away.

Furthermore, some questions will be asked about their living situation: if they live alone or if they or their partner needs daily help. This may have influence on their perception of safety. Users should

also be able to notify the service when they are ill for a longer time and are in need of more help from neighbors and friends. Whenever someone needs help for a longer time from different people, these people should be able to share with each other what kind of help they provide. Doing that, everyone who offers help is up to date with the current situation.

Information about the whereabouts of the users should be used to improve the use of the service. When users give permission to measure their location and they are for instance out of the country, the service should make use of this information and stop sending non-relevant information. If users did not give permission to measure their location, they should be able to notify the service themselves that they are out of the country.

### **9.1.2. Send messages**

Sending out personal messages to people through the service seemed to be something that the seniors really liked. A personal message is a message that is not predefined by the service, but that the user writes his- or herself. The service should include the function to send such a message to both one person, to multiple persons, or to a group they are a member of.

The users should also be able to organize activities for multiple people, that are in a specific group or in their social network.

A request for help should also be formulated with a personal message. This makes the request more specific. General terms are not always understood and seniors might not be sure if they are able to perform a service with a general message. If the problem itself is described in detail, the receiver might know if they are able to help.

Seniors themselves should select the persons they want to send a request for help to. This should be people inside their own social network, or friends of people inside their own social network. They should be able to send out this request to multiple persons at once.

Furthermore, reciprocity should not be taken literally, but it must be a more natural process. Whenever person A helps person B, they do not immediately know something that person B can do for person A. Person B should be encouraged to help person A (or someone else) with something at a later moment, as soon as help is needed.

### **9.1.3. Receive text messages**

When users receive a message from someone, e.g. a request for help, they should be able to ignore or reject the message, without explicitly having to say that they do not want to help. Then, the receiver of the request does not feel obligated to help.

Users will be encouraged to help someone else once they had sent out a request for help. This encouragement is important in order for the seniors to use the service. . This will be done by sending more messages with a request for help to them and motivating them to seek if there is someone that needs help. Another solution might be giving the user some kind of reward when helping someone else (through the service).

Because users can limit the amount of messages they want to receive (but maybe do want to help), the messages with a request for help should also be visible at some other place. Each user therefore will have some kind of message board on which they can see every possible message that is

accessible to them. Whenever a senior accepted help that is offered to them, so when help for a request is found, the service will automatically change the status of the message on the message board.

#### **9.1.4. Monitor the senior**

The service should not be able to measure whether one has contact with someone else. The measurements that the keychain should be able to do should be optional to the user. This includes measuring if the senior leaves the house; measuring the location of the senior; and measuring the movement of the senior. When the user creates a profile, it should be made clear what the different measurements can be used for, so users know why they should decide to turn them on.

For some specific requests for help, a location might be relevant. For example, the supermarket, when a user wants to ask somebody to do some shopping for them. Users may choose to share their location automatically with the service or with friends, when they are at that particular location. This might make it easier for others to ask for a favor, as they know that the person is - for example - already in the supermarket, and it will be not too big of a burden for them to buy an additional item.

#### **9.1.5. Supporting the senior in certain actions**

Because the service does not have the ability to measure with whom the user has contact, users have to manually create their list of contact persons. Just like before, this can be done by filling in name and contact information. But to make it easier for users to complete their contact list, they also can add people by selecting them from a list. This list consists of people who live in the neighborhood and have given permission to place them in that list. Contact information of a user is not provided in that list, but can be automatically shared with someone who may contact the user. Each contact can be classified as family, a friend, an acquaintance, or a vague acquaintance. The privacy settings for this contact will be inherited from the privacy settings of that whole social group, which is set in the user's profile.

When the user starts to spend more time with – for instance – an acquaintance and this becomes a friend, the service will now be unable to make this distinction, because it does not measure the contact between two people. To support users in making this distinction manually, the service may send questions to the user if the information is still up to date. This can be done if users added someone as their contact in the last month, or if they suddenly send out many messages to that person using the service.

Preventing dilution of friendships will be more difficult when it is not measured if people have contact with each other. Therefore it is more important to motivate users to keep being social. The service can measure if they call or email someone, or if they leave the house. If this activity drops, users should be motivated to be more socially active. With whom, will then be their own decision.

An addition to this function is that activities in groups are organized by different people, so the service should facilitate those different people to be active within the group. So every member of the group should have the same rights: they can send messages to everyone in the group, organize activities for everyone in the group, invite new members, or remove themselves from the group. If necessary, the contact person can remove people from the group.

To make sure that being a member of a group would not be annoying, privacy settings are important. Every member of the group should be able to choose if they want to receive every message that is sent within the group, or just messages from particular people. In addition, they should be able to choose if they want to receive invitations to activities. It should also be possible to see the messages of the group on request.

## 9.2. Interaction

### 9.2.1. Different users

In section 2.2.1, seniors with different types of frailty were already described. However, in addition to these different types of frailty, the willingness of users to give help is also an important factor. From the evaluation with vital seniors became clear that there are not enough people that are willing to give help for the amount of help that is needed by frail seniors. As there will be more and more seniors that need help, it is important that the balance between the people that give help and the people that need help is restored. Therefore each type of person should be motivated in such a way that reciprocity in the neighborhood will be optimal and that every needy senior is able to get the help they need.

In order for the service to know what kind of motivation a user might need, it is important to identify which type of person they are. Therefore an overview is made of the different types of users that could exist. This overview is based on three different factors. The first factor is if the user needs help him- or herself; a factor directly linked to the fact if the user is physically or psychologically frail in any way. The second factor is if they are willing to help others. The third factor is about their willingness to socialize with people other than their closest friends; a factor which is directly related to the combination of social frailty and size of social network in Table 2.1, only users that are not socially frail and have a small social network can be identified as people that are not willing to socialize with others.

These three factors combined result in eight main types of users that should be treated differently. Which type a user is depends on their profile information, which might be changed automatically by the service if their behavior seems to differ from the information they gave. The transition between different types of users therefore also is not strict; the motivation given to each user is tailored exactly to the needs and wishes set in their profile, and this motivation will be adjusted each time settings of the user are changed by either the user or the service. When someone for example seems to ask for more help, he/she gets motivated more to also help others, without his/her user type being immediately changed to a help-taker. In Table 9.2 an overview can be seen of the different types, after which each type is explained.

	Help-giver & help-taker	Help-taker	Help-giver	Non-help
Wants to socialize	1	2	3	4
Does not want to socialize	5	6	7	8

Table 9.2: Different types of users

### **Type 1: Socializing help-giver and help-taker**

These types of users need help, but are also willing to give help to others, including people they do not know that well. Important with these users is that the balance between giving and receiving help is kept. The service keeps track of how often users ask for help, and try to motivate them to give help just as often. If users give a lot of help, but do not ask for it, the service will inform them of the possibility to ask for help once in a while. In both cases, statistics can be used to notify users of possible imbalance between help-giving and help-taking.

### **Type 2: Non-socializing help-giver and help-taker**

These types of users need help. They also want to help others, but only want to have contact with people they know very well. These users should be motivated to expand their social network. The service will inform these users about the possibility to help people outside of their own network and will try to motivate them to do this. If there are others in their neighborhood who do help people outside of their own network, information about this might be included in the motivational message (taken into account privacy issues).

### **Type 3: Socializing help-taker**

These types of users need help. They do not want to help others, but do like to have contact with others. These users should be motivated to help people. The service will inform them about the fact that they ask a lot for help, but do not give it. Furthermore it will present the user with facts about other people that both ask for help and give help.

### **Type 4: Non-socializing help-taker**

These types of users are the most difficult users. They do need help, but do not want to do anything in return or have contact with people outside of their social network. These users should be motivated to expand their network. The service should motivate them to go and meet other people, for example by using facts that having a social network will improve their well-being.

### **Type 5: Socializing help-giver**

These types of users are important, because they help those who need help but do not have a big social network to rely on. However, important is that these users also keep contact with people who are not needy, so that when they become needy themselves they have people that they can rely on. The service will know which of their contacts are needy or not needy and will propose meetings to them with people in their social network that are not needy.

### **Type 6: Non-socializing help-giver**

These types of users want to help others, but only want to have contact with people they know very well. These users should be motivated to expand their social network. The service will inform these users about the possibility to help people outside of their own network and will try to motivate them to do this. If there are others in their neighborhood who do help people outside of their own network, information about this might be included in the motivational message (taken into account privacy issues).

### **Type 7: Socializing non-help**

These types of users do not want to help others, but do like to have contact with others. These users should be motivated to help people. The service will inform them about the fact that they can give

help to others and what they can gain from it. This might be short term advantages like improving their relationship with someone else, but it might also be long term advantages like getting other people to help them when they become needy.

#### **Type 8: Non-socializing non-help**

These types of users do not have a big network and although this does not seem like a problem, because they do not need help, they may need help in the future. Therefore these users should be motivated to expand their social network. The service should motivate them to go and meet other people, for example by using facts that having a social network will decrease the possibility that they become frail.

#### **9.2.2. Flow charts**

To visualize how different interaction flows between the user and the service will go, a few flow charts have been created. The flow charts are created for: creating a profile; adding contacts; creating a group; adding a new user to a group; sending a request for help; organizing an activity. These six flow charts include all situations in which the initiative is taken by the user. The flow charts can be found in Appendix K.

No flow charts are made for situations in which the initiative is taken by the service. These situations are: when the service tries to motivate users; when the service notifies users about their decreasing activity (when a user has given permission to the service to do this). Both methods are achieved by sending a message to users that is tailored to the motivation or information that a particular user needs.

### **9.3.Summary**

The five main aspects of the service are somewhat adjusted: settings of the user; send messages; receive text messages; monitoring of the user; supporting the user in certain actions. Settings of the user can still be subdivided in the settings that users initially fill in and settings that change according to their behavior. Messages that can be send are requests for help to people of the user's own choice, invitations to activities to someone in the social network of the user or to groups, and personal messages. In addition to just receiving messages, each user now will have his/her own message board on which every messages is placed that is addressed to him/her. Seniors will not be monitored when they have contact with others anymore. Thus the service cannot automatically add people to the contact list of users and the service cannot prevent diluted friendships. Instead, the service motivates the user to be social in general.

To support users even more in making the most out of their social network, they should be motivated according to their own preferences and behavior. In order for the social cohesion in the neighborhood to be optimal, all users should receive as much help as he/she offers. This does not have to be at the same time; a senior might offer help when vital, and then ask for help if he/she became frail. There can be distinguished eight types of users that should be motivated differently, based on three factors: if the user needs help, if the user gives help, and if the user wants to socialize with people outside of their own social network.

## 10. Evaluation with more frail seniors

The improved concept is evaluated with more frail seniors. Because frail seniors have a higher chance to have difficulty with using a computer, and due to limited time, no new prototype is made.

### 10.1. Goal

The second evaluation has three research questions:

1. *In what situations should frail seniors use the service?*
2. *Why and when would frail seniors want to use the service?*
3. *Is there enough tailoring to the user?*

The only time where frail seniors were included in this project was at the end of 2012, when two frail seniors were interviewed (see section 1.1). Up to now, the only evaluation with the designed concept was done with more vital seniors. Therefore it is important to obtain insight in the experiences and desires of frail seniors, as they are the ones who really need support.

The first question tries to obtain insight in situations in which seniors should use the service, to prevent them from moving to a retirement home. Until now, the personas and user scenarios are based on literature research. To verify if these expectations are true, background information from the living situations of frail seniors can be used.

The second question is more about the needs and wishes of the frail seniors themselves. It is important to see what the frail seniors think of all the functions the service offers. As was mentioned in section 2.2, social cohesion helps seniors maintain their well-being and health. Especially for frail seniors this is important, and that is why they should want to use the service.

The purpose of the third question is to see if all needs and wishes are really addressed. This goes for each function that will be addressed in the second question. In the evaluation should be monitored if there is some kind of tailoring that is needed that is not yet included in the service. Tailoring also includes the different types of users mentioned in section 9.2.1, and how they should be motivated. Users may not know that they should change their (social) behavior in order to live independently for a longer time in a safe and secure environment. However, they should be persuaded to change their behavior in the right way, and this right way differs for every user.

### 10.2. Method

#### 10.2.1. Participants

Individual interviews were held with 4 senior female participants who live in retirement home the Ariënsstaete in Enschede, the Netherlands. A caregiver from the Ariënsstaete selected these participants based on the requirements that they should overall be very independent. Their exact age is unknown, but is around 80 years. At the beginning of the evaluation some questions were asked about their current condition and living situation, but also about their condition and living situation before they moved to the retirement home.

### 10.2.2. Service in general

After getting to know the participant a bit, the service was explained. This was done using a poster which presents a visual representation of the service, and descriptions of its six main aspects: sending out a request for help; sending messages; organizing activities; using it with the device of your own choice; setting your own privacy; monitoring activity. See Figure 10-1.

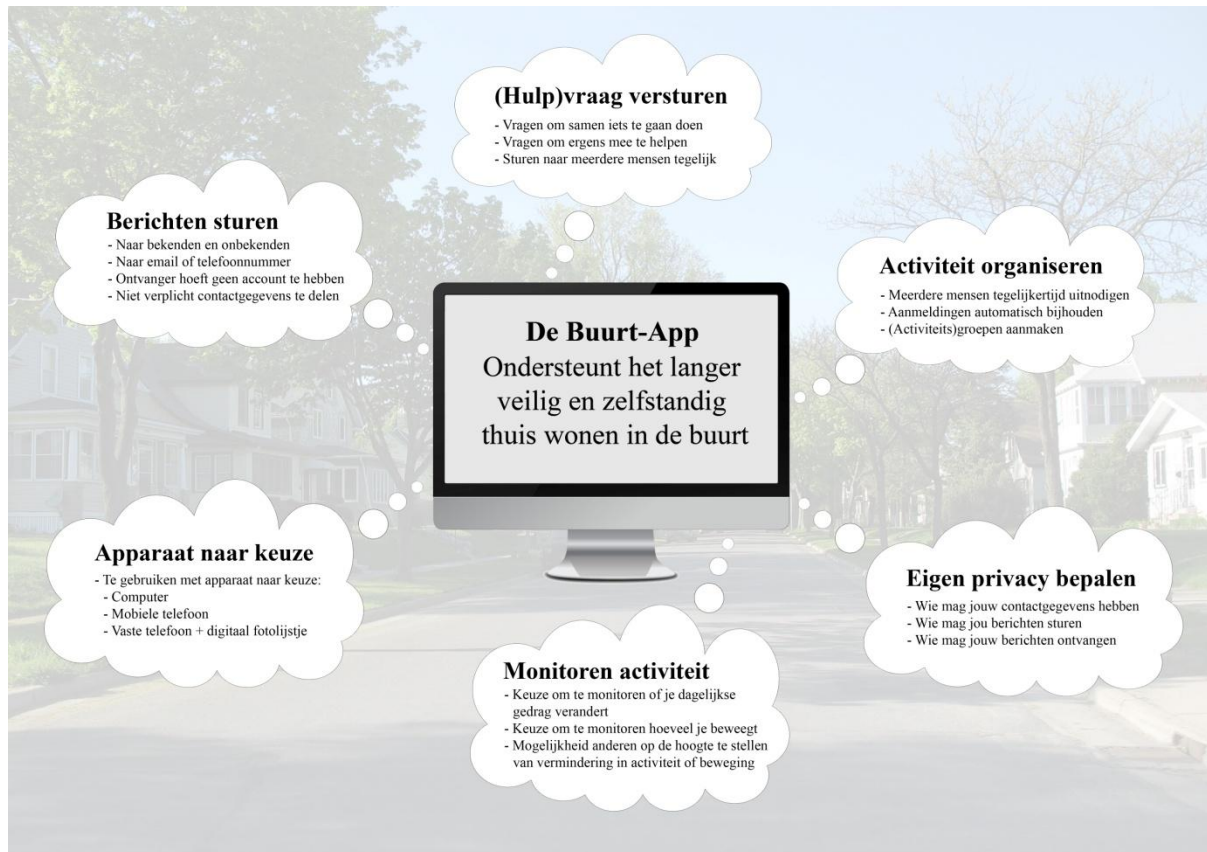


Figure 10-1: Poster to describe the service

After the explanation, the participant was asked what they thought of the service in general, and what they thought of each different aspect. Each participant was also asked what they thought was the most interesting and the most useless aspect. Furthermore, the participants were asked if they thought the service was useful in general, and with what communication device they would have wanted to use the service.

### 10.2.3. Using the service

To see if the participants understand how to interact with the service, four scenarios were visually presented. These scenarios were taken from four of the flow charts mentioned in section 9.2.2. These scenarios simply represented functions of the service: creating a profile, adding contacts, sending a request for help, and organizing an activity. The other two flowcharts mentioned in section 9.2.2 – creating a group and adding a new user to a group – seemed to be the least relevant. Taken into account the limited amount of time, there were no scenarios made of these flowcharts to use in the evaluation. The scenarios can be found in Appendix L.

Participants were asked what they thought of the functions, if they would use them, and if they thought they will be easy to use. There was also one specific focus point, namely the different social groups that they should add their contacts into.

Then, the participants were explained that the service would motivate each user to behave in a particular way, according to the user types described in section 9.2.1. Together with the participant, a decision tree of the user types was used. This tree can be found in Figure 10-2. Then was explained what kind of persuasion should be used to get reciprocity in the neighborhood. The participants were asked what they thought of this type of persuasion, and if they would mind if the service would try to persuade them.

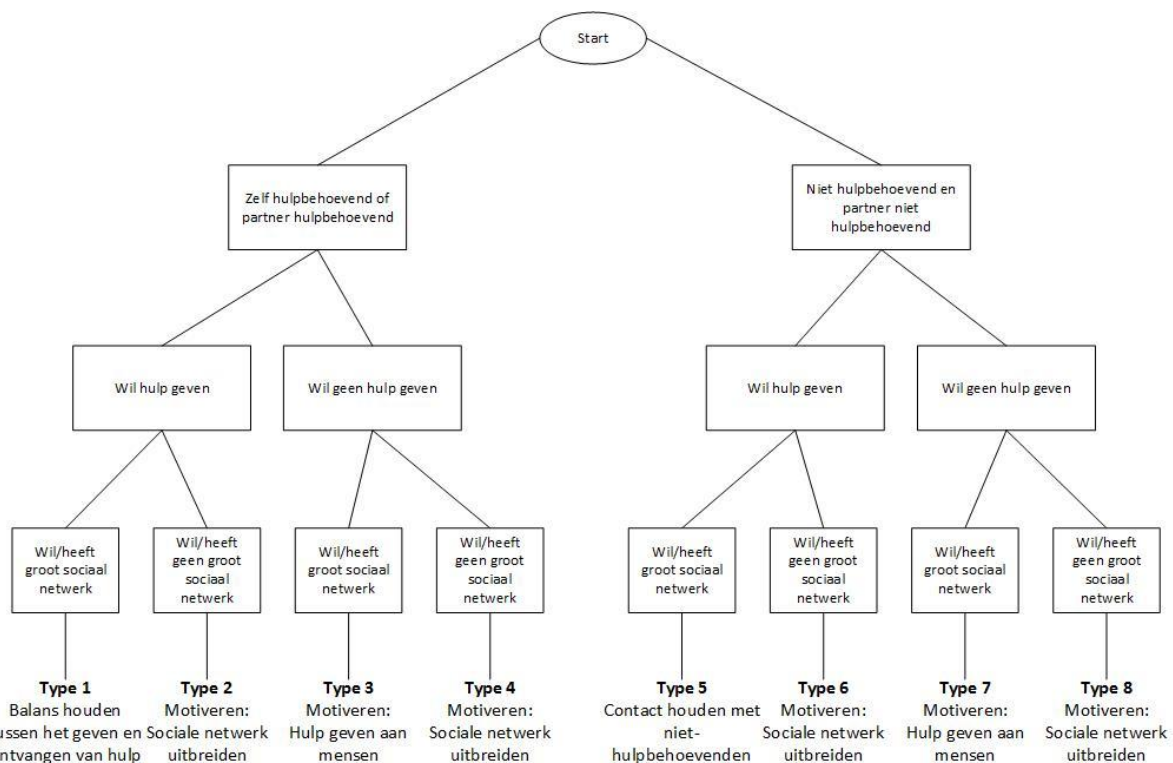


Figure 10-2: Decision tree of the user types

## 10.3. Results

### 10.3.1. In what situations should frail seniors use the service?

First of all, the living conditions of the participants before and after they moved to the Ariënsstaete are described, including the reason why they moved. This has much to do with why and when they should use the service; if the service could have prevented them from moving to the retirement home, it would have fulfilled its goal.

#### Before the retirement home

Before the participants moved to the Ariënsstaete, they all were very independent. Two of them got domestic help once a week and every other week, and a third got homecare, as her husband was very ill. Besides the help from homecare, she herself was taking care of her ill husband. Another

participant also had a husband who was needy. Neighbors would help in case of an emergency, but both participants did not want to bother them otherwise.

Three of the participants also mentioned that their neighbors were old and needy themselves, as they lived in a neighborhood with senior homes. The fourth participant mentioned that living in an area with people from different ages, was one of the advantages of living at home. One participant got help from her children with gardening.

### **Reasons for moving**

Two of the four participants had as a main reason to move to the Ariënsstaete because their children worried. One of them had lost her husband and became needy herself in the last year before she moved to the Ariënsstaete. A third participant moved to the Ariënsstaete because there she could get the quiet she needed. The last participant was on a waiting list for many years and got offered a place just three days after she got a back surgery. One of the participants also mentioned the activities that the Ariënsstaete organizes, to be an important factor in her deciding to move there.

### **In the retirement home**

They all live very independently in the Ariënsstaete, and they have lived there for a period ranging between one and six years. Only one of the participants gets care from the Ariënsstaete twice a day, the others do not get care. They do all get domestic help, ranging between once a week and once every other week. Besides that, they all have very active lives; they visit many activities the Ariënsstaete organizes.

The main advantages of living at the Ariënsstaete that were mentioned, were the quiet and feeling of safety they got there, and the fact that they are never alone and could always talk to someone.

### **Conclusion**

Three of the four participants do not get care in the Ariënsstaete, which means that they should also be able to live completely independent without care. If the service would have provided a safe and secure environment for these seniors, that would make it unnecessary for their children to worry, maybe this would have prevented them from moving. So seniors should use the service to prevent them and their children to feel like there is an environment that would be more safe and secure to spend the rest of their lives.

#### **10.3.2. Why and when would frail seniors want to use the service?**

The overall idea of the service and each of its functions, were discussed with the participants, to see the reasons they have to use this service.

### **Overall opinion service**

The general idea of the product was received positively, but the participants were a bit doubtful if it would work. In the areas in which they had lived before they moved to the Ariënsstaete, the social cohesion in the neighborhood was already present. Their neighbors asked them if they could get something from the store for them, and the other way around. For other chores they actually would not want to ask their neighbors, except when it is an emergency. That their neighbors were also seniors played a big part in this. It also became clear that when one took care of their spouse, they also did not ask for help from their neighbors to do this.

The participants also mentioned that the people that lived in the Ariënsstaete were very different from their previous neighbors. The people in the Ariënsstaete were more self-oriented and gossiped all the time. This kind of people they do not want to ask for help and the service would probably also not work for them.

One participant mentioned that she was afraid the service would get too large-scaled, because she wanted only to keep close to the people she already knew.

Overall, the scenarios that were presented were considered easy and clear. Due to time, one participant was only shown the scenario of adding contacts. Another participant thought filling in a profile was very difficult and that she would certainly need help in filling it in.

### **Sending out a request for help**

Only one of the participants explicitly mentioned that sending out a request for help was important, and she did not even think this was the most important function that the service has. Another participant thought that sending out a request for help was the most useless function of the service, because she is against the idea of neighborhood help.

Two of the participants explicitly said that they would only send out a request for help in case of an emergency. One of them mentioned that she might send out a request for help in a less serious situation, when she knows that someone specific wants to and can help her. The participants that would send out a request for help said that they would try it, but that they know that nobody wants to help them. One of them also said that there were maybe two or three people that she wants to send such a request to, and that she wants to personally select the receivers with every new request.

One of the participants mentioned a neighborhood service that already exists, where you can get help with small chores for a very low price. The barrier to use this service is lower, because you would know they certainly want to and can help you. Another participant mentioned that there are certain chores you do not want neighbors to help with, like washing oneself.

### **Organizing activities**

One of the participants said she would organize activities if she lived independently, and she even thought this was the most important function of the service. The other three do not want to organize activities, but do want to join them if it is something they like. One of them said organizing activities is something for younger seniors.

### **Sending messages**

Two of the participants thought that sending messages was the most useless function of the service. The reasons for this that were mentioned are because sending messages is already possible with the telephone, and because it might give the receiver a scare if they receive a message.

### **Defining own privacy**

Defining your own privacy was very important for two participants, with one of them thinking it was the most important function of the service. They want to only have contact with the people of their own choice. However, one of them did mention that in case of an emergency it does not matter who comes to help her. Another participant thought that privacy was the most useless characteristic,

because she compared it to someone's ego, and thinks that most people think too much of themselves.

#### **Monitoring activity**

Monitoring activity was only received positively by the participants, with two of them thinking it is the most important characteristic of the service. In the Ariënsstaete they already have an emergency button in their home, so they can notify someone if something is wrong. They think it is a good thing to automatically measure if an emergency happens, wherever they are, especially if they live alone. One of the participant questioned the fact that when someone's activity changes, they would indeed see the message about this, because they might forget to check it.

#### **Using device of your own choice**

This aspect also was received positively by everyone. One of them thought it was the most important characteristic. Three of the participant wanted to use the service with a landline phone and a digital photo frame, as they did not know how to use the computer. The other participant wanted to use a laptop.

#### **Conclusion**

Frail seniors want to use the service to get a safe and secure feeling by being monitored and getting help immediately if something bad happens. Furthermore they want to use the service to get in contact with people that have the same interests and hobbies as they have, and to participate in activities that meet their interests. Sending out a request for help is not something they thought was very important, as there are few situations in which they would ask for help. In situations that they wish to ask for help, they would only ask two or three people in their social network.

#### **10.3.3. Is there enough tailoring to the user?**

During the discussion of the characteristics, a few aspects were notable. A few additions or adjustments to the service can be made to make these aspects work optimally to the user's needs.

#### **Hobbies and interests**

Although there were no specific questions about hobbies and interests, two of the participants indicated they liked the idea of adding them. One of them said this could be used to exchange craft ideas online, and she also thought it would be nice to meet other people and go crafting together. The other participant said she would like it if she got invitations to activities relevant to her interests and hobbies.

#### **Social groups**

The idea of the social groups was overall considered to be okay, although there were a few additions. One participant wanted to create her own groups and another participant said that there should be a group 'close acquaintances', as seniors have more of those than friends or acquaintances. Another participant also said she did not want to add acquaintances or vague acquaintances to her contact list, as she does not want to share her problems with them.

#### **Contact list**

At some points the participants were confused and got the idea they had to only add contacts that they wanted to send requests for help to. One of them mentioned that she would not add seniors, because they are too busy with themselves. Another participant mentioned that it would probably

be difficult for seniors to add people, because all the contacts she has are already in her contact list. Yet another participant thought it was a good function, because she can control her contacts.

### User types

Due to time, not all different types of users were explained to the participant, but only the type of user that they belong to. Two of the participants were considered a socializing help-giver, another participant a socializing help-giver and help-taker and the last participant a non-socializing help-giver. They all understood what the service will do for them and why. One participant did state that it is probably unrealistic that the reciprocity would indeed occur. Another participant said that meeting new people always goes without any conscious effort.

### Conclusion

Overall, the service seems already be tailored a lot to the needs of different users. However, a few additions can still be made. The frail seniors thought that more should be done with their hobbies and interests to connect them to people or activities. Also, frail seniors do not seem to have a lot of contacts, and therefore their contact list and social groups do not seem that important as they do to vital seniors. Last but not least the frail seniors thought the service would meet the needs of their specific user type, but they also thought that this kind of motivation might be too ambitious.

## 10.4. Conclusion

As was already discovered in the previous work (section 1.1), asking for help is difficult for (frail) seniors. The participants indicated that they would not want to ask neighbors for help, especially not their senior neighbors as they all have their own problems. As was already found in the evaluation with vital seniors (chapter 7), it is a good thing if a suggestion can be given of someone who could and would help. In most situations the seniors would only want to ask people very close to them, but if they know for sure that someone wants to help they might consider asking him/her. Asking formal institutions is no problem for them.

In contrast to statements from the vital seniors in chapter 7, the frail participants did seem to be able to build a social network in their new home in the Ariënsstaete, by participating in activities. Exercising or participating in activities indeed seems to be important to meet people, just like the conclusion from the previous work (section 1.1). One of the things they like most about the Ariënsstaete are those activities, together with the fact that there is always someone to talk to. Just like with the Building Bridges device (section 3.3), having a common interest also seemed to be important to them; they thought that entering their hobbies and interests would lead to invitations to activities they like. Like predicted in section 3.1, seniors would like the service to support functions such as organizing events.

An important conclusion from this evaluation is, that although social cohesion (in the Ariënsstaete) seems to be very important for their feeling of safety, this is not enough. They indicated that social cohesion was also present in their previous neighborhoods, but still they decided to move to the Ariënsstaete. The fact that they have an emergency button in their home -which they can use to call for immediate help - gives them and their closest relatives the comfort they need. Two of the intervention methods mentioned in section 3.1, seem to be very important for the participant when

moving to the Ariënsstaete: increasing social support and increasing opportunities for social interaction.

The participants agreed with the vital seniors (chapter 7) on the fact that in an acute situation it is the most important to automatically let someone know that there is something wrong. In situations in which the participants themselves would still be able to ask for help, they would ask for help themselves. However, in contrast to the privacy concerns of the vital seniors, the participants did not really care who would help them in case of an emergency. This is in agreement with the conclusions in section 5.2.1: the frailer someone gets, the less privacy concerns they will have and they would want to use technology if it is useful for them, even if it invades their privacy.

However, they still would want to have control over their social network, as was also predicted in early evaluations of the Co-living project (section 3.3). As was also concluded from previous work (section 1.1), the social network of frail seniors is small; the participants indicated that they would not want to add too many people to their contact list, also because most people they do not want to bother with their problems.

Using the device of your own choice was received very positively by the participants, as it will be more accessible to them if they would be able to use a landline phone in combination with a digital photo frame, just like was predicted in section 5.1. Creating their profile on the computer is also something they thought would be very difficult, however if a general practitioner or some other formal caregiver would help it would be okay.

## 11. Final design

The results from the evaluation with the more frail seniors are used to make the final additions to the concept. The flow charts from chapter 9 are still relevant, and because there are not a lot of adjustments only the scenario of David is rewritten (Appendix M).

### 11.1. Adjustments and additions

After the second evaluation there are again a few adjustment and additions to the functionality of the service.

The privacy of the users, especially in case of an emergency, seemed to be less important to the frail participants than to the vital seniors in the first evaluation. However, every user of the service should still be able to indicate how much privacy they want. Otherwise, the people that are protective of their own privacy do not want to use the service.

Another aspect of the design of the service that should be changed is the reciprocity between neighbors. Ideally, every neighbor helps and every neighbor receives help. However, the vital seniors already indicated that there are many frail seniors that need help and there are not enough people that could and would want to help them. Now, the frail seniors indicated that they would not dare to ask other seniors to help them, because they are also old. In addition, they indicated that they actually would not even want to ask others, except for maybe their closest contacts. However, they do not hesitate to ask formal help or services that offer help with small chores. As long as they know for certain that they want to help. But they indicated that though they (think they) give a lot of help to others they do not expect that others would return the favor.

So actually, again a distinction can be made between two types of users: the users that need help and the users that give help. The users that need help need to be provided with a platform of volunteers that can be trusted and want to help them. The users that give help need to be motivated to actually become a user in the first place. Of course a user should also be able to be both types of user at the same time. However, to be sure that the users that give help are trustworthy the service should somehow be monitored. If this is not the case, users do not want to ask those volunteers. In addition to the platform of volunteers, it should still be possible to send a request for help to people in someone's own social network, or for someone to indicate they need help through the service.

Again, the same five aspects will be used to elaborate the changes: The functionality of the service can be divided into five aspects: settings of the user; send messages; receive text messages; monitoring of the user; supporting the user in certain actions. An overview can be found in Table 11.1.

	The first concept	Improved concept	Final design
Settings of the user			
Creating a profile	Personal information; hobbies; chores they can perform; preferences.	Same as before + living situation; social groups.	Same as before + social groups defined differently and users

			can sign up to volunteer database.
Changes in behavior/life	Service adjusts behavior according to behavior of user and by asking questions.	Same as before + information about whereabouts; illness.	Same as before.
<b>Send messages</b>			
Send requests for help	Reciprocity of small chores of certain types. Will be sent to people that can help with this type of chore.	Reciprocity more naturally. No general terms, but personal message. Users select who they want to send request to.	Same as before + can be send to volunteer database.
Organize an activity	You can organize an activity with someone in your social network.	Same as before + activities can be organized for groups.	Same as before + activities can be organized for people that meet a certain profile
Send personal messages	-	A simple personal message can be send to contacts.	Same as before.
<b>Receive text messages</b>			
Receive motivational messages	User gets motivated to be (socially) active.	Same as before + user gets motivated to help others once helped.	Same as before.
Receive messages from others	User receives requests for help and invitations to activities.	Same as before + user receives personal messages.	Same as before.
Receive messages on message board	-	All messages that are addressed to someone will also be send to his/her own message board	Same as before.
<b>Monitor the senior (optional)</b>			
Monitoring social contacts	Monitored to automatically maintain contact list.	-	-
Monitoring if and when the senior leaves the house	Monitored to check everything is okay.	Same as before.	Same as before.
Monitoring the location of the senior	Monitored to support certain requests for help and in case of emergency.	Same as before + user can choose which locations he/she wants to share.	Same as before.
Monitoring the movement of the senior	Monitored to make sure senior exercises enough	Only for personal use.	Same as before + monitored if senior falls down.
<b>Supporting the senior in certain</b>			

actions			
Maintaining contact list	Contacts can be added both manually and automatically.	Contacts can only be added manually, but people can be added by selecting them from a list.	Same as before + users can meet new people through activities or helping, service will promote interaction.
Preventing diluted friendships	The service sends reminders to users about friends.	-	-
Groups of people	The service offers the function to create groups of people.	Same as before + privacy settings for each group separately.	Same as before.

**Table 11.1: Functionality of the final design**

#### **11.1.1. Personal settings**

There are only three additional adjustments in the profile of the user.

The first adjustment is that users should get the opportunity to define their own social groups. The frail seniors seemed to have not that many contacts, and they indicated that when they would send a request for help, this would only be to their very closest contacts. One frail senior was enthusiastic about the groups, but she would rather define those groups herself. The standard social groups should be adjusted to friends, family and close acquaintances. In addition, users should be able to adjust (the names of) these groups or add new ones. Frail seniors only have a few contacts that they want to add and these will fit in the standard social groups; vital seniors may have a somewhat more extensive social network, but they will probably also be able to create new groups if they want to.

To make the use of the service easier for these seniors, the service should not bother them by asking if they want to change someone's social group. However, when the senior does use the social groups, the service may still send out questions to the user to see if the information is still up to date.

Another adjustment is that users get to decide if they want to be invited by people they do not know, to activities that meet their hobbies and interests.

The last adjustment is that it should be possible for people that are willing to help to sign up to be a volunteer in the service. These people should be trustworthy, so there should be some kind of authority that monitors them. The service itself can of course also track who is helping whom, so they can be traced if something happens.

#### **11.1.2. Send messages**

Sending out personal messages is something that the frail seniors did not see the benefit of. However, the vital seniors were very positive about this functionality, and therefore it should certainly be included in the service. But the function should be added in such a way that it is clear that it is definitely not the main functionality of the product, and that it should only be used for important messages.

Having contact with different people and always being able to talk to someone is something that the frail participants seemed to enjoy a lot. Two of them already saw this happening when they saw that they had to share their hobbies and interests with the service. Frail seniors would like to get invited

to activities that meet their interests. To accomplish this, it should be possible to send an invite to (unknown) people that meet a certain profile. To avoid that users send an invitation to a lot of people, they should also be able to choose the amount of people the invitation should be sent to.

In addition to the function of sending a request for help to people within a social network, it should also be possible to send one to people that are a volunteer in the service; people that have indicated that they are willing to help.

#### **11.1.3. Receive text messages**

There are no specific additions or adjustments to text messages that can be received.

#### **11.1.4. Monitor the senior**

Monitoring of the user seems to be more important to the frail seniors, and therefore more emphasis should be put on this sensor. Not only should users be able to measure their normal activity, it should also be possible to connect the service to sensors that measure when the user falls down. Participants in the second evaluation indicated that in such a situation, they might not be able to do anything anymore and therefore it is important that this will be monitored and help will come automatically.

#### **11.1.5. Supporting the senior in certain actions**

Though the vital seniors were very enthusiastic about the distinction between friends and acquaintances, this did not seem to be a very useful function to the frail seniors. It has been found that frail seniors would only ask specific people for help, and they would want to select every person individually when sending out a request for help. In these cases, it is not very important that their social contacts are all assigned to the right social groups (as these seniors do not use the social groups).

In addition, when a user connects to someone else through their hobbies and interests, the service might use this information to strengthen their social relationship by suggesting meetings between the two people. Furthermore, users should be connected to the same volunteer every time they ask for help, so they could bond with them and possibly they could later add them to their social network and ask for help in an informal way.

### **11.2. Conclusion**

There are no real adjustments to the five main aspects of the service, but there are a few additions. When creating a profile, users can indicate if they want to be part of the group of volunteers that help people, and/or if they are people that need help themselves. People can therefore also choose to send a request for help to this volunteer group or to people inside their own social network. In addition to this, the hobbies and interests of users are used to let them meet with people with the same interests through activities that they can organize. The service will try to link a help-taker each time to the same help-giver. Also the service will promote meetings between people that got to know each other through activities based on their interests.

## 12. Conclusion

To conclude this research, a conclusion, discussion and reflection are given.

### 12.1. Conclusion

The main question of this project is *"How can a personal service be used to improve the self-efficacy, social engagement and security awareness of independently living seniors?"*. The final design of the functionality of the service described in chapter 11 should be the answer to this question. Using the service, the seniors would be motivated to participate in society. The service will send them motivational messages to go out and meet people and will support them in sending out a request for help or organize an activity. The service will therefore support them in connecting with people in the neighborhood. They would feel safe because they would get the help they need whenever they want it using the service to send out a request for help, and because they could use sensors to monitor themselves or let others monitor them if they want to. Furthermore they would feel independent because they are the ones that organize it all and take the initiative over their own life.

One sub question is *"How can a personal service help to initiate and maintain the network of a (frail) senior?"*. Initiating contact between a senior and someone else can be done in two ways: by sending out a general request for help and meeting someone new, and by organizing or participating in activities. Maintaining this network can be done by motivating the senior to be social, and by monitoring the social activity of the senior through the service.

*"How can a personal service help to notify neighbors/friends about possible needs a senior might have?"* is the second sub question. If seniors use sensors to monitor their activity, this can be done by sending out an alert if the activity level of a senior drops significantly. If seniors do not use sensors this is somewhat more difficult, but by sensing how often someone uses the service to make contact with others it might be possible to notice a significant behavior change. In addition, the service gives the opportunity to needy seniors to send out a request for help whenever they want, to their contacts or to a database with volunteers (that live nearby).

The third sub question is *"How can a personal service help motivating the senior to be active?"*. If seniors use sensors to monitor how physically active they are, the service could provide feedback to them, so they can change their behavior according to their own wishes. However, if they do not use any sensors, motivating them to be physically active is difficult, as their amount of exercise is unknown. Motivating seniors to be socially active can be done by sending motivational messages, sending invitations to activities, or sending suggestions to make contact with someone. The content of these message should be based on the guidelines mentioned in section 5.2.2.

The last sub question is *"Which technology should be used in order for every senior person to (be able to) use the personal service?"*. Letting seniors choose whichever communication device they want to use makes it possible for every senior person to use the service.

## 12.2. Discussion

The final design is a service in which it is needed to create a volunteer base to which a request for help can be asked. The volunteers should be trustworthy, and to realize this, they should be monitored by someone. However, the initial idea of the service was that it improved the social cohesion in the neighborhood. If a formal aspect is added, the wanted reciprocity might not turn out the way it should. In an ideal situation the needy seniors would first ask help within the database of volunteers, then add this volunteer to their social network, and later asking this volunteer personally if he/she would want to help. However, it cannot be predicted if this will indeed be the case. If there are indeed more requests for help than there are people that want to help, it might become difficult for the senior to get help from the same volunteer each time.

That is another issue that might occur when using the service, that there might not be enough volunteers to create a solid base within the service. If someone does not get the help they need, they would quickly stop using the service. As for becoming a volunteer, as was mentioned in section 5.2.2: when someone begins, the rest will follow. However, it is unclear if someone will indeed will begin. The same goes for the organization of activities. Within activity groups this will probably occur, as known people are invited. However, inviting people solely based on their hobbies and interests, is probably not something that a lot of people do. From the four frail seniors that were interviewed, only one of them indicated that she would want to organize activities. The vital seniors said that it was unlikely to meet new people at their age, so they probably are also not interested in organizing activities.

A big difference between the vital seniors and the frail seniors might therefore be that frail seniors have a smaller social network and are open to meet new people. To help them expand their social network, vital seniors should also be willing to get to know them. Vital seniors also mentioned that they thought the social network of frail seniors was small, but in addition to this they mentioned that there are some people they do not want to have contact with. Maybe the real issue is that instead of help with chores, some frail seniors are especially socially frail and just need someone to talk to. If the motivational messages the service provides indeed motivate people to have contact with each other, this might help these seniors to get less socially frail.

Furthermore, in chapter 7 and chapter 8 it became clear that the younger seniors should be the ones that can make a difference. They should be the ones that should expand their social network and prepare themselves to the future. It could be questioned if the service would become useless once every younger senior prepares themselves for the future. However, a lot can happen to people when they are aging as became clear from the interviews with the frail seniors. Someone might have been independent his/her whole life and suddenly become needy, which makes it hard to suddenly ask for help. Or maybe someone was taken care of by his/her partner, and then his/her partner suddenly is unable to help anymore. Furthermore, as people keep aging, their social network keeps decreasing, as more and more people they know pass away. Though this does not rule out that it might be a good thing to build a social network when younger, seniors probably could benefit from a service that makes it easier for them to contact others.

In this research it became clear that seniors have their own view about the neighborhood help. In the evaluations with vital as well as with frail seniors, different comments were made about why the ideal situation cannot be realized. The vital seniors indicated that there were not enough people that

were able and willing to help frail seniors, and therefore the ones who did want to help did not have enough time to help everyone. In addition, even one of the frail participants indicated that she thought there was probably nobody that wanted to help her, even though she helped a lot. Furthermore, the frail participants indicated that before they moved to the retirement home, they lived in a street with only senior people, and they did not want to bother them with their problems as they have problems of their own. They probably did not even want to bother them if they were not as old as they were, as they prefer asking for help to people they know are willing to help (like volunteers). The conclusions from this research regarding the thoughts of seniors about neighborhood help can be used in other research as well, together with their ideas of having a social network. People cannot be forced to create a social network, they should be motivated in some way to connect with others and they should have the feeling that they are the ones who take the initiative to create this social network. In addition to this, everybody has different needs regarding the size of this network.

## **12.3. Reflection**

### **12.3.1. Limitations of the research**

The biggest limitation of this research is that the only outcome is a list of functionalities of what the service should do in order to fulfill the needs and wishes of vital as well as frail seniors. There is no real prototype, except for the small prototype that represented the very first concept.

So first of all, the usability of the technologies are neither defined nor tested. Only the first concept was tested with vital seniors. At first sight they did not seem to have problems with this, but there are a few additions made to the functionalities after that. Furthermore the seniors were seated behind a computer in the test situation, while in real life they would not be sitting there every time they receive a message. The other technologies that could be used to use the service were not tested at all (smartphone, digital photoframe, etc.).

Secondly, the real effects the service will have on the social cohesion in the neighborhood is unclear. Because this is not tested, the service might have different effects than is expected. In the ideal situation the social cohesion will improve and everybody will have a social network that can help them with their problems. However, other results might also be that the service will only be used by only frail or only vital senior. This can result in frail seniors that are unable to get help through the service, because there are no vital seniors that can help them. Or the result can be that frail seniors would even get more socially frail, as they do not use the service and therefore belong less to society.

Thirdly, it is still a guess if people will actually start and keep using the service. This will depend on the added value that using the service has compared to not using the service. This added value is something that is tuned to the wishes and needs of seniors, though if it will really be an added value in real life remains unclear in this research.

A limitation of this research that makes it even harder to predict if people would use the service, is that motivational messages are also neither defined nor evaluated with seniors, and that there is not researched why people would be willing to help others.

Another limitation of this research is that it only focused on the seniors themselves, but not really on the other stakeholders. The activity groups are included in the research, but family & friends, neighbors, volunteers, and formal help are not. If volunteers were included in the research, they maybe would have gave some insight into why they are willing to help others. Family, friends and neighbors could have given insight into how often and why they would help. Formal help could have given insight into problems that seniors have that could maybe also be resolved by neighborhood help.

Also not all the different frailties were included in the evaluation. Psychological, physical and social frailty all were described in the three personas. However, only one frail senior in the evaluation showed real physical frailty, and she did not have this before she moved to the retirement home. Also only one of them described herself as being socially frail. Nobody of the frail seniors had psychological frailty.

Related to this is the fact that the evaluations with the frail and vital seniors were at different moments in the design process, and that the final design is evaluated with neither.

### **12.3.2. Future work**

The most important research that still should be done is how to actually get people to use the service, and how to actually develop the service.

On the one hand there should be some research about how to motivate people to become volunteers and help seniors. What are the motives that current volunteers have to help people? In what conditions are people willing to change their status from no volunteer to volunteer? Maybe people could be persuaded to become a volunteer by giving them some kind of reward, either a financial reward or a promise that they would get the help they need in the future.

On the other hand seniors should also be motivated to use the side of the service in which they can ask for help, and how they could be motivated to maintain or extend their social network. This should not be limited to frail seniors. As seniors do not like to be considered frail the service should not look as if it could only be used by frail seniors. Vital seniors should see the benefit of using the service. Of course the service can also be used for activity groups and for other kinds of activities. In what conditions are (vital) seniors willing to sign themselves up for the service? By whom should the service be promoted? To promote the service to frail seniors, maybe a general practitioner can be asked. A first questionnaire to this target group is already set up and can be found in Appendix N, but due to time issues this was not used in this particular research.

Furthermore some research should be done regarding the usability of the different technological (communication) devices that can be used, regarding the wishes and needs of seniors. The devices seem to meet the requirements of seniors, but the actual implementation of the service should still be designed. In this process, all different frailties should be taken into account and evaluations should also be held with people that have different frailties.

After all this is researched, the service should be tested in a real life situation for a longer period of time. In this testing period it should become clear if people want to use the service and indeed keep

using the service. After this test period some adjustments to the service could be made to optimize the design.

For now, the results from this research are ready for use by TNO within the COMMIT project UIALL. What exactly will be the next step is still unclear.

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## Appendix A – Personas

**Name:** David

**Gender:** Male

**Birth date:** 12-03-1933

**Marital status:** Divorced



David is an 80-year old male that has lived in the same neighborhood for 35 years now, ever since he divorced his wife. In 1965 he bought a house of a reasonable size, a two story house, because in that time his son Paul used to visit him every weekend. However, as it takes a lot of effort for David to climb the stairs he only uses the rooms on the ground floor.

David's physical condition has strongly deteriorated the last few years. It started when he fell off his bike in 2005. He broke his leg and after a hospital visit he actually never got back the strength in his legs. In addition to this, his hands start losing their strength as well. Nowadays he uses his mobility scooter if he has to go shopping, but tries to avoid leaving the house whenever possible.

David never remarried and got used to living alone. However, in addition to the decreasing strength in his legs, the strength in his hands and his eye sight also decreases. That makes the daily chores a lot more difficult for him. His son Paul used to help him every week or so, but since Paul died of a heart attack a year ago, David has to fend for himself. Fortunately Paul helped him setting up connections with Meals on Wheels before his death so David gets food delivered every day. But as he does not have a housekeeper, David's house gets messier every day.

David spends most of his day doing small chores, which take him a lot of effort. Apart from this he does not do much else. He has a television that keeps him company for the rest of the day. He used to own a computer as well, but he sold it, as his physical decline kept him from enjoying to use it.

David is content with his life and has no intention of involving anyone else in it, certainly not after his son has died suddenly. The only problem that David experiences is the amount of money he pays for his meals and for the housekeeping. As David lives on a small pension this is a bit much for him. In addition to this he also is reluctant to go to a care home, as he has managed to live on its own for half his life.

**Name:** Els  
**Gender:** Female  
**Birth date:** 28-08-1943  
**Marital status:** Widowed

Els is a 70-year old female that just moved to a new neighborhood. The house she lived in was too big for her alone and she wanted to live more closely to her two daughters Kelly and Anouk.



Since her husband died two years ago, Els her mental health has strongly deteriorated. She does not feel happy and she feels lonely. Furthermore her memory is starting to decline, which makes her afraid to perform any activities or to make contact with others.

As Els is new to the neighborhood she does not really know anyone. She was hoping that her daughters would support her in her social life, but they do not visit her a lot as they are both working fulltime. She did hear of a choir that is active in the neighborhood, but she is afraid to take a look at it, because she does not want to be a burden to them.

To get to know her grandchildren a bit better, Els joined the social network Facebook. She is still physically completely healthy and after some help from her husband she also learned how to work with computers. However, seeing all those people sharing stories of the interesting things they are doing makes Els just feel more lonely.

In addition to using the computer, Els also owns a smartphone. Her daughter Anouk gave it to her as a birthday present. Els does not use it a lot, but she does have some applications installed that for example help her remembering to take her medication or that help her creating her grocery list.

**Name:** Arnold

**Gender:** Male

**Birth date:** 05-02-1941

**Marital status:** Married

Arnold is a 72-year old man who is happily married and lives with his wife Sarah in a pleasant neighborhood. Both he and his wife are very beloved by their neighbors, some of them belong to their best friends.

Arnold has been a very active person all his life and is very active since he retired 4 years ago: he joined the marching band and he became a member of the volleyball club. In addition to this, he plays bridge with his wife and their neighbors every week and sometimes he goes to the Bingo with all of them.

Because of all these different activities Arnold has a very large social network. He recently created an account on Facebook to maintain this network, but unfortunately not everyone he knows is as active on Facebook. In addition to this he also owns a smartphone with which he can easily get in contact with everyone he knows.



## **Appendix B – Scenarios before service was designed**

### **Scenarios David**

#### **Scenario – David – creating a profile**

The strength in the hands of David gets worse and he is afraid he will not be able to do his daily chores. To see if he can do anything about it he visits the general practitioner, Michael. Unfortunately Michael does not have good news for him: the strength in his hands will probably not get any better. Michael recommends that David asks someone to help him once in a while, because otherwise David probably would have to move to a care home soon. Then Michael signs David up for a technology that will get him in contact with potential helpers.

#### **Scenario – David – being motivated (for the first time)**

The next day David starts with his daily chores. When he has been busy for a while, his attention is drawn to the technology that tries to motivate him to make contact with somebody. David just knocked a glass on the floor by accident and therefore he realizes he really needs someone to help him and decides to use the technology.

#### **Scenario – David – Maintaining his social network**

Although David did not really want any social contact in the first place, he is really grateful he found someone, Peter, who has helped him doing his daily chores for the last few weeks. When he was invited to Peter's barbecue last Saturday he even met another nice man, Ronald. However, now he reached a point where he does not want any contact. He lies in bed for a few days without bothering to do anything. He knows that Peter is on holidays so he does not have to explain himself to anyone. However, then Ronald visits him to check if everything is okay, because the technology gave him the information that David has not been active lately.

## **Scenarios Els**

### **Scenario – Els – creating a profile**

When Els is in the supermarket she sees an advertisement for a technology that focuses on the social network of neighbors. Els decides to visit the website to see what it is all about and signs herself up.

### **Scenario – Els – being motivated (for the first time)**

When Els is watching television later that week, she gets motivated by the service to join the weekly choir repetition that starts in an hour. Els feels a bit excited, but still is afraid to join the choir without knowing anyone, because she thinks she will be a burden to the choir. She decides to do nothing with the information.

A few days later, again her attention is drawn to the technology, but this time it is a message that is actually sent by the director of the choir, Lisa. It says that Lisa had heard from the service that there is someone interested in singing and she wants to introduce the choir to her if she would like that. Els still is a bit scared, but as she is being the one approached by someone to talk about the choir she decides to let Lisa make contact with her. Lisa contacts Els and they talk enthusiastically about the choir. Lisa invites Els to come and try it. Els decides to go the next time and she really enjoys herself.

### **Scenario – Els – Maintaining her social network**

As Els is very new to the choir, she decides to study very hard before the next week. She decides to ask for help using the technology, but she will only ask those that are probably willing to help her.

## **Scenarios Arnold**

### **Scenario – Arnold – creating a profile**

Since Arnold has joined the marching band he became very active within the marching club. He organized several social nights and helped finding a new director. One of his friends, Alex, always was a contact point for new members but since he moved away to another city he asked Arnold if he wants to take over. Arnold accepts and Alex explains to him the technology that he used to maintain the contact with (possible new) members. It seems very simple to Arnold so sign himself up and become the contact person for the marching band.

### **Scenario – Arnold – being motivated (for the first time)**

A few days after Arnold had signed up he actually forgot all about the fact that he subscribed to the technology. But then he was notified that Michelle has not been to rehearsal the last two weeks. He was informed that the reason she was not present is unknown and he was asked if he wanted to contact her for more information.

As Arnold did not really know Michelle that well he was not sure what to do with this information. Missing two rehearsals also is not that problematic. He decides to keep an eye on it for now. As he does not see her the next rehearsal he asks his friend Frank if he knows where she is, because he knows that he spends a lot of time talking to her during rehearsals. Frank tells him that he does also not know what is wrong with Michelle. Sarah overhears them talking and says she lives close by Michelle and maybe can visit her and ask what is wrong. They all think this is a good idea.

### **Scenario – Arnold – Maintaining his social network**

Arnold is very busy with the marching band, and as he also gets older he does not have enough energy to also be active within the volleyball club. He decides to quit. After a few weeks his attention gets drawn to the technology, that motivates him to get in contact with someone he knew from the volleyball club, as they did not see each other for a while.

## Appendix C – Requirements

### Functional requirements

The technology should help the users maintain (and increase) their social network in the neighborhood.

- The technology should use the activities of two people to bring them together.
- The technology should remind the users of friends they have not seen in a while.
- The technology should not be a replacement for face-to-face contact.
- The technology should provide an easy way to contact someone outside of your social network.
  - o The technology should make use of the common interests of people when connecting them.
- The technology should motivate the user to be more socially active if their social activity level is low.
- The technology should focus on making contacts with elder neighbors.

The technology should be tailored to the wishes of the user.

- The user should have the freedom to decide which personal information he/she wants to share with the technology, or with people.
  - o The user should always be given the opportunity to decide if he/she wants an automatically generated message to be send to someone in their social network.
  - o The user should be given the opportunity to decide which contact information he/she wants to share with any of his/her contacts.
- The user should have the freedom of choosing how much messages he/she wants to receive from the technology, or from people.
- The user should have the freedom of choosing what kind of messages he/she wants to receive from the technology, or from people.
- The user should have the freedom to decide how active he/she wants to be.
- The technology should make a distinction between close friends, vague acquaintances and everything in between.
  - o The technology should keep track of who the users spends time with.

The technology should make sure users stay active.

- The technology should be able to track if the user is active.
- The technology should motivate the user to be more active if he/she has a drastic shift in activity.
- The technology should warn friends of the user when he/she has a drastic shift in activity.
- The technology should be able to track the physical activity of the user.

- The technology should motivate the user to exercise more if their physical activity level is low.

The technology should offer services through which help is easily obtained.

- The technology should be able to find that one person that is able to help the user (in- or outside of his/her social network).
- The technology should give the opportunity to easily contact formal help.

The technology should motivate the user at the right time and place.

- The technology should be able to draw the attention of the user.
- The technology should use the location of the user to optimize their social life.
- The technology should use the activities of the user to optimize their social life.

The technology should provide locally-relevant information.

- The technology should provide information about activities that take place in the neighborhood.
  - o The technology should provide information about activities in the neighborhood that match the person's interests.
  - o The technology should provide alternatives to hobbies that people are unable to perform anymore.
  - o The technology should provide information about activities that people in the social network of someone perform.

The technology should support groups that organizes an activity at a regular basis.

- A group that organizes activities should be able to assign a contact person.
- The technology should provide easy ways to keep in contact with other members of the group.
- The technology should provide easy ways to recruit members.
  - o If someone is interested in an activity, the technology should suggest this person to the contact person of the group.

## **Non-functional requirements**

Using the technology should be possible for:

- People with mobility problems.
- People with less strength in their hands.
- People with hearing problems.
- People with visual problems.
- People with memory problems.

Using the technology should be beneficial for:

- Vital elderly.
- People that do not want social contact.
- People with a small social network.
- People with a large social network.
- People that are happy with their social network as it is.

Using the technology should be cheap.

To use the technology:

- The user should not be obligated to own a computer or tablet.
- The user should not be obligated to own a smartphone.
- The user should not be obligated to give input on a mobile device.

It should be possible to sign yourself up for the technology:

- From home.
- By someone else.
- Without being obligated to anything.

## Appendix D – Product ideas

### Product 1 - sending & receiving broadcasts

This product focuses on three things. The first is letting the elderly maintain their social network by letting them propose activities to one or more people inside their social network. The second is letting the elderly make new contacts by letting them propose activities to people outside their social network. Nobody is obligated to meet anyone if he or she does not want to, and messages can simply be ignored. Someone can only make real life contact with someone else if they have exchanged contact information. The third focus of the product is to motivate the elderly to actually use the product, send broadcasts, respond to received broadcasts and then go outside and meet people.

#### Building social network

Social network is built by letting the elderly send broadcasts to the whole neighborhood and by giving them the opportunity to select someone from the responses and by motivating them to go and meet people.

- Broadcasts are sent by using either a computer/tablet/smartphone or by using an NFC-tag stand.
- Broadcasts and motivational messages are received by either a computer/tablet/smartphone or by a digital photo frame that is also connected to the internet.

#### Maintaining social network

Social network is maintained by letting the elderly add neighbors to their social network, by giving elderly motivational messages to see someone in their social network and by giving the elderly the opportunity to send a broadcast only to their own social network.

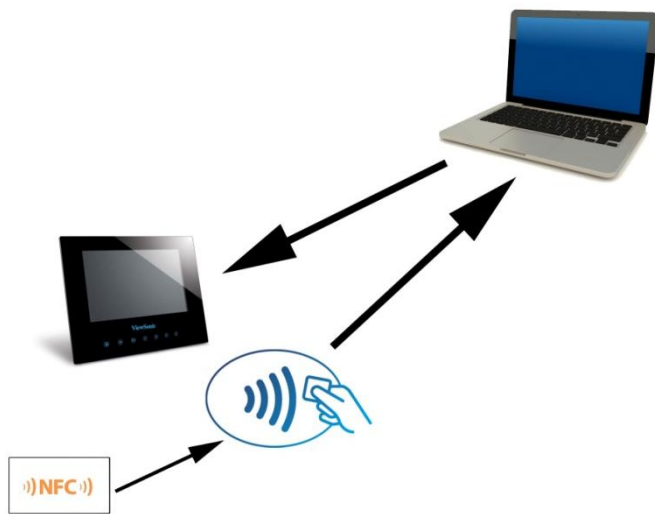
- Motivational messages shall change if the elderly did not sent (or responded to) a broadcast for a longer time.

#### Critical situation

There is no additional service that lets the elderly call for help in a critical situation. It depends on the fact that the elderly will have telephone numbers of the neighbors in their social network after making contact.

#### Technology

- Digital photo frame connected to the internet (its own emailadres).
- NFC tag-stand connected to the internet.
- NFC-tag identification card

**Advantages:**

- People that already use their computer/tablet/smartphone with internet access can easily join the service without having to buy an additional product.
- No messages will be send to other persons on behalf of someone if that someone does not want it to be send.

**Disadvantages:**

- The support network shall not receive information if something is wrong with the elderly.
- There is no additional support for the 'request for help'.

**Challenges:**

- Getting the elderly motivated to send out a broadcast instead of waiting for someone else to send one.
- Creating an NFC tag-stand.
- Getting the motivational messages and broadcasts to display on the digital photo frame.

## **Product 2 - Tracking the behavior of the elderly**

This product focuses on tracking the elderly when he or she leaves the house. The elderly can indicate what kind of activity he or she is going to perform. If two people that use the product come together for a longer time period it will automatically register that they have a meeting with each other. If it seems that the elderly does not go outside that often or there is a drastic change in his/her leaving the house the service recognizes this and will first try to motivate the elderly and if this does not work it will try to contact people in his/her social network. The service automatically adds neighbors to the social network of elderly if they meet each other a lot. In addition to this, the elderly can also add people they want. The contact information is used in critical situations.

### **Building social network**

Social network is built by getting motivational messages which should help you get motivated to go outside to meet new neighbors.

- Motivational messages are received by either a computer/tablet/smartphone/normal phone or by a digital photo frame that is connected to the internet.

### **Maintaining social network**

Social network is maintained by tracking to which people the elderly pays a visit and giving them a warning if the behavior of the elderly changes.

- If the elderly seems to leave the house less, the service will contact the elderly and motivate them to make contact with others. If no contact is made, the service will contact the neighbors to go visit the elderly.

### **Critical situation**

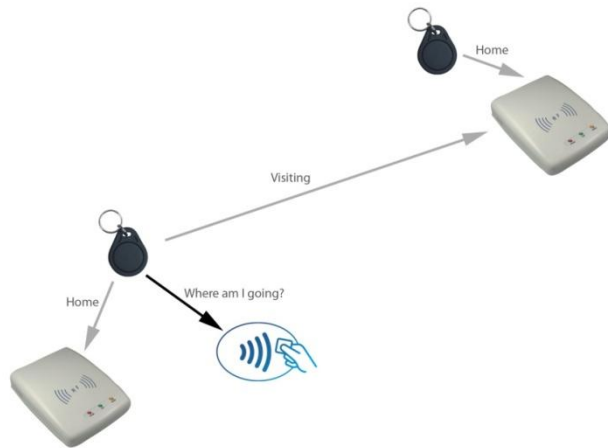
When the elderly find themselves in a critical situation outside the house they can ask for help. The service will contact neighbors physically and emotionally close to them.

- There will be a special button to send the request for help.

### **Technology**

- NFC

- RFID (or bluetooth)



### Advantages

- The service creates the social network automatically.
- The service recognizes it as the daily behavior of someone changes.
- The service is able to update the social network of someone if the behavior does not get better.

### Disadvantages

- There is no easy way to meet new people; elderly really have to get motivated to go outside and meet random people.
- It is impossible for people that do not own the device to become a 'close friend' to the elderly.
- The device has to be reloaded and elderly have to think about doing this.
- There is not much privacy.
- Nearby RFID-signals may interfere with each other.

### Challenges

- Making sure each identification-device connects correctly.
- Motivating the elderly to go outside and meet people.
- Making sure the service knows people are near each other.
- Connecting the RFID-reader to the internet.
- Difficult to read two RFID-signals that are close to each other.

### **Product 3 - connecting people with the same interests**

This product focuses on connecting people with each other that have the same interests. In order to make a connection both sides first have to give the message that they are willing to meet someone new or to participate in a specific request/support activity. If a connection is made both sides will get a message from the service that proposes a get-together. They have to both accept this proposal before the service makes it definite. After the get-together the service will ask them both, separately, if they liked the other person and if they want to continue this connection in the future. Based on the input of the person their social network is automatically build, but the elderly can also add other people if they want. After a connection is made the service will propose get-togethers between people at a specific interval.

#### **Building social network**

Social network is built by giving a request or an offer to the service that in its turn connects you to someone that is also willing to commit to the request/offer and that has (some of) the same interests as you.

- Request or offer can be given through computer/tablet/smartphone/normal phone.
- Proposition can be received through computer/tablet/smartphone/normal phone.

#### **Maintaining social network**

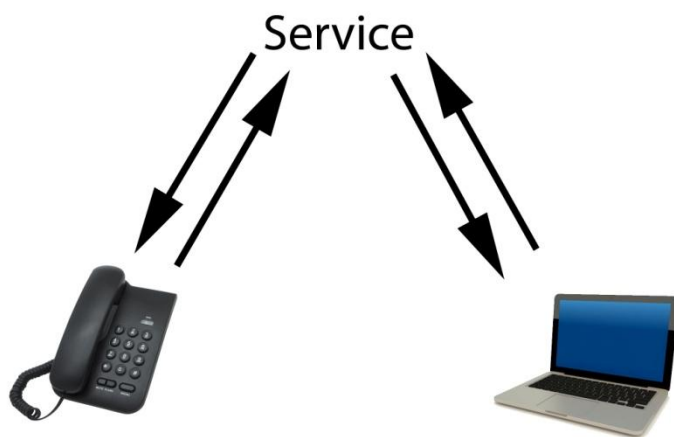
Social network is maintained by asking the elderly if he or she likes the person, by giving the opportunity to add other persons to the network and by proposing meetings with one of them.

- If the elderly seems to reply to meetings more often with a decline, the service will propose meetings more often and if there seems to be no change the service will contact neighbors to go visit the elderly.

#### **Critical situation**

When the elderly find themselves in a critical situation outside the house they can ask for help. The service will contact neighbors physically and emotionally close to them.

- Request can be given through tablet/smartphone/normal phone.

**Advantages:**

- People that already use a computer/tablet/smartphone/phone can easily join the service without having to buy an additional product.
- People are provided with a conversation starter: the shared interests.
- People will be sure that the other person also wants to get together with them.

**Disadvantages:**

- There is no alternative for sending messages for people that have difficulty with using one of the standard devices.
- People are dependent on the system for the get-together time and place.
- The service has to be up-to-date on the places where people can meet.
- People will not know with whom they will meet so they may be afraid that they do not know whom to start a conversation with.
- If people start to organize meetings without using the service, the service might think that the elderly is not social while they certainly are.

**Challenges:**

- Make sure the service can propose a correct get-together. (Time, place.)

## Appendix E – Scenarios with the first concept

### Scenarios David

#### Scenario – David – creating a profile

The strength in the hands of David gets worse and he is afraid he will not be able to do his daily chores. To see if he can do anything about it he visits the general practitioner, Michael. Unfortunately Michael does not have good news for him: the strength in his hands will probably not get any better. Michael recommends that David should ask someone to help him once in a while, because otherwise he probably would have to move to a care home soon. Then Michael signs David up for a service that will get him in contact with potential helpers. He inserts David's contact information, his hobbies, his interests, and his preferences regarding social contact into a web form. Michael tells David that if he has not been active for a few days, the service will ask someone to make sure that he is alright. Then he gives David a package with a key chain with an RFID tag, and an RFID reader. These are used to track when he leaves the house and with whom he has contact. In addition, the package includes a digital photo frame on which he can receive messages from the service through email.

#### Scenario – David – being motivated (for the first time)

The next day David starts with his daily chores. When he has been busy for a while, his attention is drawn to the digital photo frame on which there is a motivational message to make contact with somebody. David just knocked a glass on the floor by accident and therefore he realizes he really needs someone to help him and decides to use the service. He calls the special number of the service and chooses the option that he wants to make contact with someone that can and wants to help him with his daily chores. Not much later he sees another message on the digital photo frame. It says that the service found someone, Peter, that is willing to help him with his daily chores and if it is okay for him to come over the next day at 14:00. David calls the special number again and says that it is okay.

#### Scenario – David – Maintaining his social network

Although David did not really want any social contact in the first place, he is really grateful he found someone, Peter, that has helped him doing his daily chores for the last few weeks. When he was invited to Peter's barbecue last Saturday he even met another nice man, Ronald. However, he has reached a point where he does not want any contact. He lies in bed for a few days without bothering to do anything. He knows that Peter is on holidays so he does not have to explain himself to anyone. After a few days he hears his phone ring. Because he almost never gets a call he thought it might be important and decides to pick up. It is a message from the service. It says that David has not been active for a while and asks if he wants to contact anyone and go outside. David replies with a negative answer. The next day the phone rings again, with the same message. The third and fourth day David decides not to pick up. Then, at the fifth day suddenly his doorbell rings. It is Ronald, checking if he is alright, because the service gave him the information that David has not been active lately.

## **Scenarios Els**

### **Scenario – Els – creating a profile**

When Els is in the supermarket she sees an advertisement for a service that focuses on the social network of neighbors. It says that you can join this network by visiting their site or downloading their application. If you are unable to do this yourself you can also ask the general practitioner to help you with it. Els does not feel the need to go the general practitioner, but when she gets home she visits the website to see what it was all about and signs up.

The website states that if she wants to let the service automatically monitor if she is still active, she should get a cheap keychain together with an RFID reader via the general practitioner. This could help the service check if she still leaves the house once in a while. She could also let her phone check her activity if it is provided with GPS. She decides to first try to see if this service is actually what she wants before buying the keychain or try to use GPS on her phone.

### **Scenario – Els – being motivated (for the first time)**

When Els is watching television later that week, suddenly her phone rings. She thinks this is strange, because it is around dinner time and her daughters never call during dinner, they always call her in the morning. She checks her phone and sees that she has received a text message from the service she subscribed to, motivating her to join the weekly choir repetition that starts in an hour. Els feels a bit excited because she loves to sing, but still is afraid to join the choir without knowing anyone, because she thinks she will be a burden to the choir. She decides to do nothing with the information.

A few days later she gets another text message from the service, but this time it is a message that is actually sent by the director of the choir, Lisa. It says that Lisa had heard there is someone interested in singing and she wants to introduce the choir to her if she would like that. Els still is a bit scared, but as she is being the one approached by someone to talk about the choir she decides to let Lisa make contact with her and gives this information to the service. Not too long after that Lisa contacts Els (through phone). They talk enthusiastically about the choir and Lisa invites Els to come and try it.

Els decides to visit the repetition and she really enjoys herself. The next day she gets another text message; she got an invitation from Lisa to join the choir group in the service. She accepts this.

### **Scenario – Els – Maintaining her social network**

As Els is very new to the choir, she decides to study very hard before the next week. She decides to ask for help using the service, but she will only ask those that are probably willing to help her. She logs into her account and sends out a request that she wants to sing with somebody that afternoon to Lisa, asking if she can forward it to the choir members. Soon she receives feedback from the service that Emma is willing to sing with her and if she agrees with this. Els is excited, because she already thought that Emma is a nice woman. She sends a positive message back and that afternoon they get together to sing.

## **Scenarios Arnold**

### **Scenario – Arnold – creating a profile**

Since Arnold has joined the marching band he became very active within the marching club. He organized several social nights and helped finding a new director. One of his friends, Alex, always was a contact point for new members but since he moved away to another city he asked Arnold if he wants to take over. Arnold accepts and Alex explains to him the service that he used to maintain the contact with (possible new) members. It seems very simple to Arnold so he decides to create a profile online and adds himself as the contact point for the marching band. He decides not to buy a keychain, because people can contact him without it and he keeps track of his own social network.

### **Scenario – Arnold – being motivated (for the first time)**

A few days after Arnold had signed up he actually forgot all about the fact that he subscribed to the service, but then he received an email notifying him that Michelle has not been to rehearsal the last two weeks. It told him that the reason she was not present is unknown and asked him if he wanted to contact her for more information. There was a link in the email that led to a place where he could directly contact her.

As Arnold did not really know Michelle that well he was not sure what to do with this information. Missing two rehearsals also is not that problematic. He decides to keep an eye on it for now. As he does not see her the next rehearsal he asks his friend Frank if he knows where she is, because he knows that he spends a lot of time talking to her during rehearsals. Frank tells him that he does also not know what is wrong with Michelle. Sarah overhears them talking and says she lives close by Michelle and maybe can visit her and ask what is wrong. They all think this is a good idea.

### **Scenario – Arnold – Maintaining his social network**

Arnold is very busy with the marching band, and as he also gets older he does not have enough energy to also be active within the volleyball club. He decides to quit. After a few weeks his attention gets drawn to the technology, that motivates him to get in contact with someone he knew from the volleyball club. The amount of social contact that he has had through the service has dropped, and this is mostly because he did not send messages to members of the volleyball club or replied to invitations of volleyball club activities.

## Appendix F – Text used in the prototype

### Pagina 1 – Welkom!

Welkom bij de Buurt-app!

De Buurt-app is een applicatie die de sociale cohesie in de buurt kan vergroten door mensen in contact met elkaar te brengen. Mocht er (in de toekomst) een moment komen dat hulp vereist is dan kan er met behulp van de Buurt-app eenvoudig een oproep verstuurd worden naar een bekende in de buurt.

Om gebruik te kunnen maken van deze applicatie, is het nodig dat u een profiel aanmaakt. Wat wij van u vragen is om in ieder geval uw naam door te geven. Het invullen van alle andere informatie is niet verplicht. Echter hoe meer informatie u invult, hoe beter de applicatie voor u zal werken. Dit, omdat de applicatie zich dan kan aanpassen aan uw wensen.

➔ Maak een nieuw profiel aan

### Pagina 2 – Persoonlijke gegevens

Contactgegevens

- Naam
- Adres
- Huisnummer+toevoeging
- Postcode
- Woonplaats
- Emailadres
- Telefoonnummer
- Mobiel nummer (+heb ik niet)
- Geboortedatum
- Burgerlijkestaat

Wilt u een profielfoto toevoegen?

- Ja
- Nee
- Weet ik nog niet

➔ Verder

### **Pagina 3 – hobby's en interesses**

#### **Wat doet u graag in uw vrije tijd?**

Meerdere antwoorden mogelijk.

Naar de bioscoop

Naar het theater

Culturele evenementen bezoeken

Musea bezoeken

Op vakantie

In de natuur zijn

Uit eten

Naar een café

Winkelen

Actief zijn in de politiek

Actief zijn in verenigingen of stichtingen

Werken

Vrijwilligerswerk, namelijk ...

Wandelen

Fietsen

Erop uit met de auto

Erop uit met de motorfiets

Sporten, namelijk ...

Computeren

Televisie kijken

Iets verzamelen

Krant(en) lezen, namelijk ...

Weekblad(en) lezen, namelijk ...

Boek lezen, genre(s): ...

Creatief bezig zijn, namelijk:

Muziek luisteren, genre(s): ...

Aandacht besteden aan gezin

Sociaal bezig zijn

Nieuwe mensen leren kennen

Nieuwe dingen ondernemen

Klussen in en om het huis

Tuinieren

Schoonmaken

Koken

Bakken

Handwerk,

namelijk:

Ik doe liever niets bijzonders

Overige interesses/hobby's, namelijk ...

## **Pagina 4 - voorkeuren**

### **Hoe sociaal bent u?**

- Ik ben liever alleen.
- Aan één of twee contacten heb ik wel genoeg.
- Ik vind contact leuk, maar soms vind ik het ook fijn om alleen te zijn.
- Ik wil elke dag wel met iemand praten.
- Het liefst praat ik elke dag met meerdere mensen.
- Ik wil zoveel mogelijk contact, met zoveel mogelijk mensen.
- Wil ik liever niet zeggen.

### **In hoeverre staat u open om de volgende mensen te helpen?** Kennissen – buren – clubleden – vrienden - familie

- Ik wil nooit helpen.
- Ik wil alleen helpen in noodsituaties.
- Ik wil alleen helpen als ze het écht niet zelf kunnen.
- Ik wil alleen helpen als zij ook iets voor mij doen.
- Ik wil alleen helpen als zij ook iets voor mij doen, tenzij het een noodsituatie is.
- Ik wil alleen helpen als zij ook iets voor mij doen, tenzij ze het echt niet zelf kunnen.
- Ik wil altijd wel helpen, als ik er tijd voor heb.
- Ik wil altijd wel helpen.
- Wil ik liever niet zeggen.

### **Wie mag berichten naar u sturen via de Buurt-app?**

- Iedereen die in de buurt woont, ook als ik ze niet ken.
- Iedereen die in de buurt woont en die ik tenminste bij naam ken.
- Iedereen die in de buurt woont en die ik tenminste een keer gesproken heb.
- Alleen mensen die ik regelmatig zie of spreek.
- Alleen mensen waarvan ik aangeef dat ze contact met me op kunnen nemen.
- Wil ik liever niet zeggen.

### **Hoeveel beweging wiltu hebben?**

- Ik wil zo weinig mogelijk beweging hebben.
- Ik wil één keer per week wat beweging hebben.
- Ik wil drie keer per week wat beweging hebben.
- Ik wil elke dag wat beweging hebben.
- Ik wil zoveel mogelijk beweging hebben.
- Wil ik liever niet zeggen.

### **Als u een tijd geen contact meer heeft gehad of het huis niet heeft verlaten dan verifiëren wij graag of alles nog in orde is. Na hoeveel tijd moeten we ons zorgen maken?**

Na ... dagen

## **Pagina 5– diensten**

Een ‘voor wat, hoort wat’-principe past goed in een buurtgemeenschap. Wat zou u voor uw buren kunnen en willen doen? U kunt meerdere antwoorden aanvinken.

- Ik kan pakketjes in ontvangst nemen.
- Ik kan een boodschap meenemen.
- Ik kan iets te eten maken.
- Ik kan schoonmaken.
- Ik kan dingen tillen.
- Ik heb kennis van technologie.
- Ik kan overweg met naald en draad.
- Ik kan tuinieren.
- Ik kan klussen.

## **Pagina 6 – Nieuwe gebruiker succesvol aangemaakt**

Gefeliciteerd! U heeft nu een profiel bij de Buurt-app.

→naar de overzichtspagina

## **Pagina 7 – onderdeel 1 afgerond**

### **Onderdeel 1 testen prototype afgerond**

U heeft onderdeel 1 van het prototype afgerond! We gaan nu verder met het volgende onderdeel.

Het volgende onderdeel zal gaan over het dagelijkse gebruik van de Buurt-app. We zullen nu doen alsof u al een tijdje een profiel heeft bij de Buurt-app. Hierbij heeft u ook al een aantal contacten toegevoegd.

→Verder met onderdeel 2

## **Pagina 8 – motivatie om contact te leggen met een vriend**

*Overzichtspagina. Er komt een bericht binnen, inclusief foto:*

- Wist u dat u Piet al 3 weken niet gezien heeft? Wilt u hem een bericht sturen?
  - Stuur bericht
  - Later
  - Stuur geen bericht

## Pagina 9 – bericht sturen naar Piet

*Komt alleen tevoorschijn als de gebruiker voor 'stuur bericht' heeft gekozen.*

### Het profiel van Piet [+foto]

- Ik wil bellen
  - In het echte ontwerp zou hier het telefoonnummer van Piet staan, zodat u hem zou kunnen bellen.
- Ik wil een email sturen
  - In het echte ontwerp zou hier het emailadres van Piet staan, zodat u hem zou kunnen emailen.
- Ik wil afspreken
  - Wat wilt u met Piet gaan doen?
    - Koffie drinken
    - Wandelen
    - Iets anders, namelijk...  
→ Verder of annuleren
  - Wanneer wilt u dit gaan doen?
    - Datum: ...
    - Tijd: ...  
→ Verder of annuleren
  - Waar wilt u dit gaan doen?
    - Bij mij thuis
    - Bij Piet thuis
    - Ergens anders, namelijk ...  
→ Verder of annuleren
  - De uitnodiging is naar Piet verstuurd.  
→ Ok
- Terug naar de overzichtspagina

## Pagina 10 – nieuw contact toevoegen

*Overzichtspagina. Er komt een bericht binnen, inclusief foto:*

- Er is waargenomen dat u recentelijk contact heeft gehad met Jacomien de Jong. Wilt u haar toevoegen aan uw lijst met contactpersonen?
  - Ja
    - *Nog een bericht. Standaard staat alles aangevinkt.*  
Welke gegevens wilt u met haar delen?
      - Telefoonnummer
      - Emailadres
      - Woonadres
        - Annuleren
        - Verder
    - Jacomien de Jong is succesvol toegevoegd aan uw lijst met contactpersonen.
  - Later
  - Nee

## Pagina 11 – Om een gunst vragen

*Overzichtspagina. Er komt een bericht binnen, inclusief foto:*

- U heeft aangegeven dat u nog een pakje thee nodig heeft. Uw buurman Klaas is zojuist in de Albert Heijn gearriveerd. Wilt u hem een verzoek sturen om een pakje thee voor u mee te nemen?
  - Stuur verzoek
    - Het verzoek is naar Klaas verstuurd.
      - Ok.
  - Nee

## Pagina 10

### Onderdeel 2 testen prototype afgerond

- U heeft deel 2 van het prototype afgerond!  
Het testen is nu voorbij

## Appendix G – Statements evaluation vital seniors

### Situatie 1 – onderhouden netwerk

Stel je voor:

Je wandelt elke maandagochtend door het bos in je eentje. Je vriend Piet wandelt elke dinsdagochtend door het bos, ook in zijn eentje. Jullie weten dit niet van elkaar, maar doordat jullie allebei gebruik maken van de Buurt-app wordt dit wel geregistreerd. Jullie krijgen beiden een bericht binnen dat de ander dezelfde wandeling maakt, maar op een andere dag. Daarna krijgen jullie de suggestie om samen de wandeling te gaan maken op één van deze twee dagen.

Wat zou je in deze situatie graag willen van de Buurt-app?

Het lijkt mij prettig...

...suggesties te krijgen van welke activiteiten ik met iemand kan gaan ondernemen.

...af en toe gemotiveerd te worden om sociaal te gaan doen.

...om een activiteit die ik normaal alleen uitvoer samen te gaan uitvoeren met iemand die ik ken.

...om altijd te kunnen weten wat mijn vrienden aan het doen zijn.

+    +/-    -

2	3	
3	2	
5		
1	1	3

Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

...altijd traceerbaar te zijn.

...mijn locatie automatisch te laten doorgeven aan mijn vrienden.

...automatisch te laten doorgeven aan mijn vrienden wat ik aan het doen ben.

+    +/-    -

	2	3
2	1	2
	1.5	3.5

## Situatie 2– onderhouden netwerk

Stel je voor:

Vivianen jij zijn bevriend, en jullie zien elkaar elke week op de club. Nu heb je haar echter een tijdje niet gezien op de club. De Buurt-app suggereert dat je contact met haar zou kunnen opnemen om te kijken wat de reden van haar afwezigheid is. Met behulp van de Buurt-app stuur je haar een bericht.

Wat zou je in deze situatie graag willen van de Buurt-app?

Het lijkt mij prettig...

+    +/-    -

...een bericht te krijgen om bij een vriend van me te gaan verifiëren of alles nog wel goed gaat, wanneer deze een tijdje niet actief geweest is.

4		1
1.5	1.5	2

...dat anderen een bericht krijgen of alles nog wel goed met mij gaat, wanneer ik een tijdje niet actief ben geweest.

Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

+    +/-    -

...mijn vrienden het automatisch te laten weten als ik een tijdje niet actief ben geweest.

3		2
---	--	---

### Situatie 3– actief bewegen

#### Stel je voor:

Je ontvangt een bericht van de Buurt-app dat je te weinig beweegt. Je wilt ook graag gaan sporten, maar niet alleen. Via de Buurt-app vraag je informatie op over verschillende sporten die je samen met anderen kan beoefenen. De Buurt-app presenteert een overzicht van mogelijkheden. Zo zie je bijvoorbeeld dat je buuren Ans en Piet elke maandagochtend een stuk wandelen, dat je vriend Karel elke donderdagavond naar de volleybalclub gaat en dat er ook een badmintonvereniging is, maar dat je nog niemand kent die dat beoefent. Je besluit contact op te nemen met Karel om hem meer te vragen over de volleybalclub.

#### Wat zou je in deze situatie graag willen van de Buurt-app?

Het lijkt mij prettig...

+    +/-    -

...suggesties te krijgen van welke sporten ik kan gaan beoefenen.

...een overzicht te kunnen zien van wat mijn vrienden voor sport beoefenen.

...af en toe gemotiveerd te worden om actief te gaan doen.

2	1.5	1.5
2	2	1
0.5	4.5	

#### Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

+    +/-    -

...de Buurt-app constant te laten meten hoeveel ik beweeg.

...mijn hobby's en interesses door te geven.

1	2	2
3	1	1

## Situatie 4–Elkaar helpen

### Stel je voor:

Je hebt net een nieuwe televisie gekocht, maar je snapt niet hoe deze aangesloten moet worden. Je geeft deze informatie door aan de Buurt-app en er wordt gesuggereerd dat je je buurman Peter of je buurjongen Bob vraagt. Bob ken je niet. Peter groet je altijd wel vriendelijk, maar verder ken je hem ook niet. Omdat je Peter toch beter kent dan Bob besluit je om hem te vragen, en je stuurt hem een berichtje via de Buurt-app. Je ziet dat Peter houdt van zelfgemaakte koekjes, iets wat jij goed kunt bakken. Terwijl hij de volgende dag jouw televisie instelt, bak jij lekkere koekjes voor hem.

### Wat zou je in deze situatie graag willen van de Buurt-app?

Het lijkt mij prettig...

...om gemakkelijk om hulp te kunnen vragen aan meerdere mensen tegelijkertijd.

...suggesties te krijgen van wie mij kan helpen met een probleem wat ik heb.

+    +/-    -

3	2	
5		

### Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

...mijn contactgegevens door te geven.

...in mijn profiel te zetten welke diensten ik kan aanbieden. (Bijvoorbeeld koekjes bakken of technische problemen oplossen)

...mijn dienstenaan te bieden in ruil voor de diensten van iemand anders.

...altijd iets terug te doen als ik iemand om een gunst vraag.

+    +/-    -

4		1
3.5	0.5	1
0.5	2.5	2
4	1	

## Situatie 5–Hulp vragen

Stel je voor:

Je brood is op. De supermarkt is een stukje verderop en je hebt je been gebroken, waardoor het erg lastig voor je is om zelf een nieuw brood te halen. Gelukkig weet je met behulp van de Buurt-app dat je buurman Theo op dit moment naar de winkel is. Theo ontvangt een berichtje dat jij nog een brood nodig hebt en neemt dit voor je mee.

Wat zou u in deze situatie graag willen van de Buurt-app?

Het lijkt mij prettig...

+    +/-    -

...om altijd te kunnen weten wat mijn vrienden aan het doen zijn.

0.5	3.5	1
-----	-----	---

Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

+    +/-    -

...om aan te geven dat ik zelf op het huidige moment niet in staat ben een kleine actie uit te voeren.

5		
---	--	--

## Situatie 6 –Hulp geven

Stel je voor:

Je gaat naar de supermarkt en omdat de Buurt-app dit weet, ontvang jij een berichtje dat je buurvrouw Thea, die met koorts in bed ligt, nog een doosje thee nodig heeft. Jij koopt dit doosje, zodat je deze bij haar kan afleveren.

Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

+    +/-    -

...mijn contactgegevens door te geven.

...altijd traceerbaar te zijn.

...mijn locatie automatisch te laten doorgeven aan mijn vrienden.

...mijn diensten aan te bieden wanneer dit mij nauwelijks extra tijd of werk kost.

4		1
1	0.5	3.5
0.5	2.5	2
5		

## Situatie 7– nieuwe contacten

### Stel je voor:

Jullie club heeft een nieuw vrouwelijk clublid en zij kent nog niemand anders in de club. Omdat ze een beetje schuchter is, heeft ze via de Buurt-app aangegeven dat ze graag een iemand van de club wil leren kennen. Jij ontvangt een bericht waarin je gevraagd wordt of je met Mathilde, 72 jaar, wil afspreken. Daarnaast staat erbij dat jullie koken en lezen als gemeenschappelijke interesses hebben. Jij reageert hier positief op.

### Wat zou je in deze situatie graag willen van de Buurt-app?

Het lijkt mij prettig...

+    +/-    -

...contact met nieuwe clubleden of buren te kunnen vergemakkelijken, doordat er berichten gestuurd kunnen worden via de Buurt-app.

2.5	2.5	
2	3	

...een gespreksonderwerp te hebben bij de eerste ontmoeting.

### Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

+    +/-    -

...mijn hobby's en interesses door te geven.

3.5	1.5	
2	2.5	0.5
3	2	

...mijn contactgegevens door te geven.

...tijd te besteden aan het leren kennen van nieuwe buren of clubleden.

## Situatie 8– contacten toevoegen

Stel je voor:

Je hebt gezellig met het nieuwe clublid Mathilde een kopje koffie gedronken. Nu zit je weer thuis op de bank en ontvang je een bericht van de Buurt-app. Er wordt gevraagd of je vaker contact met Mathilde zou willen hebben, waarbij je antwoord kunt geven zonder dat zij dit te weten komt.

Wat zou je in deze situatie graag willen van de Buurt-app?

Het lijkt mij prettig...

...de mogelijkheid te hebben zelf te kiezen of ik nogmaals contact wil hebben met iemand of niet.

...alsde Buurt-app automatisch bijhoudt wie mijn contacten zijn.

+    +/-    -

5		
0.5	0.5	4

Wat ben je bereid bij te dragen om dit te bereiken?

Ik ben bereid...

...de Buurt-app constant te laten meten of ik contact met iemand heb.

...de Buurt-app te laten meten hoeveel tijd ik met iemand spendeer.

...de Buurt-app te laten meten wanneer ik het huis uit ga.

+    +/-    -

	1.5	3.5
	1	4
	2.5	2.5

## Appendix H – Statements for final discussion vital seniors

### Wat zijn de voordelen?

Welk statement	Groen	Rood
Hulp opbouwen contactpersonenlijst		
Onderscheid vrienden en kennissen	3	
Contacten verwateren niet		
Zoeken naar hulp voor klusje	2	
Bijhouden contact		
Bijhouden beweging		
Overzicht activiteiten contactpersonen		
Sturen bericht naar meerdere mensen	1	
Contact zonder contactgegevens		
Gebruiker beslist alles	2	

### Wat ben je bereid prijs te geven?

Welk statement	Groen	Rood
<u>Aan de Buurt-app:</u>		
...mijn locatie		2
...met wie ik contact heb		4
...hoeveel ik beweeg		1
...mijn contactgegevens		3
...mijn hobby's en interesses		
...mijn diensten	2	
<u>Aan contactpersonen:</u>		
...mijn locatie	4	
...of ik nog actief ben		
...activiteiten die ik uitvoer		3
...mogelijkheid tot vragen gunst		

## Appendix I – Survey for senior activity groups

1. Welke activiteit(en) beoefent jullie vereniging?
2. Uit hoeveel leden bestaat jullie vereniging ongeveer?
3. Bevindt jullie vereniging zich in een grote stad, een kleine stad of een dorp?
  - a. Grote stad
  - b. Kleine stad
  - c. Dorp
4. Welke manieren worden er momenteel toegepast om nieuwe leden te werven? (Meerdere antwoorden mogelijk.)
  - a. Krant
  - b. Tijdschrift
  - c. Facebook
  - d. Twitter
  - e. Andere online social media
  - f. Mond-tot-mond reclame
  - g. Flyers
  - h. Alle bovenstaande
  - i. Anders, namelijk ...
5. Hoeveel tijd wordt er per week besteed om nieuwe leden te werven?
6. Wordt er momenteel specifiek aandacht geschonken aan het werven van leden ouder dan 65 jaar?
  - a. Ja
  - b. Nee
  - c. Soms
7. Zo ja, hoe?
8. Via welk(e) communicatiemiddel(en) wordt er momenteel contact gehouden met de leden? (Meerdere antwoorden mogelijk.)
  - a. Telefoon
  - b. Sms
  - c. WhatsApp
  - d. Email
  - e. Facebook
  - f. Twitter
  - g. Skype
  - h. Anders, namelijk ...
9. Welk van onderstaande communicatiemiddelen gebruiken de leden om in contact te blijven met elkaar? (Meerdere antwoorden mogelijk.)
  - a. Telefoon
  - b. Sms
  - c. WhatsApp
  - d. Email
  - e. Facebook
  - f. Twitter

- g. Skype
  - h. Anders, namelijk ...
  - i. Ik weet het niet
10. Worden er naast de hoofdactiviteit van de vereniging nog andere activiteiten georganiseerd om de banden tussen verschillende leden te versterken?
- a. Ja
  - b. Soms
  - c. Nee
11. Zo ja, wat voor activiteiten?
12. Hoeveel procent van de leden is ouder dan 65 jaar?
- a. Minder dan 5%
  - b. 5% - 25%
  - c. 25% - 50%
  - d. 50% - 75%
  - e. 75% - 100%
13. Hoeveel procent van de leden zijn fysiek kwetsbaar? (Bijvoorbeeld: problemen met lopen; weinig kracht in hun handen; slechtziend.)
- a. Minder dan 5%
  - b. 5% - 25%
  - c. 25% - 50%
  - d. 50% - 75%
  - e. 75% - 100%
14. Hoeveel procent van de leden zijn cognitief kwetsbaar? (Bijvoorbeeld: eenzaam; erg onzeker; vergeetachtig)
- a. Minder dan 5%
  - b. 5% - 25%
  - c. 25% - 50%
  - d. 50% - 75%
  - e. 75% - 100%
15. Zijn er (veel) leden geweest die tijdens het lidmaatschap fysiek of cognitief kwetsbaar zijn geworden en om die reden niet langer in staat waren om actief deel te nemen aan de activiteiten?
- a. Ja. Toelichting: ...
  - b. Nee
16. Is dat lid vanaf dat moment nog in contact gebleven met overige leden van de vereniging?
- a. Ja
  - b. Nee
  - c. Gedeeltelijk
  - d. Weet ik niet
  - e. N.v.t.
17. Is de vereniging bereid om extra tijd te besteden aan het werven van oudere leden?
- a. Ja
  - b. Nee
  - c. Weet ik niet
18. Zo ja, hoeveel tijd per week?

19. Is de vereniging bereid om voor een klein bedrag een extra apparaat aan te schaffen om het werven van leden – met in het specifiek ouderen leden – te bevorderen?
- a. Ja
  - b. Nee
  - c. Weet ik niet
20. Zo ja, hoeveel mag dit apparaat maximaal kosten?
21. Overige opmerkingen:

## Appendix J – Scenarios with the improved concept

### Scenarios David

#### Scenario – David – creating a profile

The strength in David his hands gets worse and he is afraid he will not be able to do his daily chores. To see if he can do anything about it he visits the general practitioner, Michael. Unfortunately Michael does not have good news for him: the strength in his hands will probably not get any better. Michael recommends that David should ask someone to help him once in a while, because otherwise he probably would have to move to a care home soon. Then Michael signs David up for a service that will help David to get in contact with potential helpers. He inserts David's contact information, his hobbies, his interests, and his preferences regarding social contact into a web form. Then Michael gives David a package with a key chain with an RFID tag, and an RFID reader. These are used to track when he leaves the house. In addition, the package includes a digital photo frame on which he can receive messages from the service through email. He advises David to add contacts to his contact list.

#### Scenario – David – being motivated (for the first time)

The next day David starts with his daily chores. When he has been busy for a while, his attention is drawn to the digital photo frame on which there is a motivational message to make contact with somebody. David just knocked a glass on the floor by accident and therefore he realizes he really needs someone to help him and decides to use the service. He calls the special number of the service and chooses the option that he wants to ask someone to help him. He is informed that there is a greater chance of finding help when he has contacts. He remembered that the practitioner also told him that, and decides to first try and add some contacts.

In the selection menu, he chooses the option to add contacts. He got two options: add contacts manually or find contacts. He chooses to find contacts. The service reads aloud a few names of people that live close to him. David does not really know his neighbors, but recognizes one name: Peter Gold. He decides to add him as a contact. The service asks him in which social group he wants to put Peter: family, friend, acquaintance or vague acquaintance. He puts Peter in the vague acquaintances group.

David does not feel like adding more contacts and again chooses the option that he wants to ask someone to help him. He decides to send this request to all his contacts and to the friends of all his contacts, as he does not mind if it is Peter that comes to help him or someone that knows Peter.

Not much later he sees another message on the digital photo frame. It says that Peter is willing to help him with his daily chores and if it is okay for him to come over the next day at 14:00. David calls the special number again and says that it is okay.

#### Scenario – David – Maintaining his social network

Although David did not really want any social contact in the first place, he is really grateful he found someone, Peter, that has helped him doing his daily chores for the last few weeks. He also received a

message on his digital photo frame that asked him if Peter still was a vague acquaintance, because they have had much contact lately. David called the special number and put Peter in the acquaintances group.

When he was invited to Peter's barbecue last Saturday he also met another nice man, Ronald. David received a message that Ronald added him as a contact. The message also stated that if David wanted to add Ronald as a contact himself, he needed only to call the telephone number of the service and press an 8. This made it easy for David to add Ronald as a contact as well. He put Ronald in the vague acquaintances group.

Now, David reached a point where he does not want any contact. He lies in bed for a few days without bothering to do anything. He knows that Peter is on holidays so he does not have to explain himself to anyone. After a few days he hears his phone ring. Because he almost never gets a call he thought it might be important and decides to pick up. It is a message from the service. It says that David has not been active for a while and asks if he wants to contact anyone and go outside. David replies with a negative answer. The next day the phone rings again, with the same message. The third and fourth day David decides not to pick up. Then, at the fifth day his doorbell rings. It is Ronald, checking if he is alright, because the service gave him the information that David has not been active lately.

## **Scenarios Els**

### **Scenario – Els – creating a profile**

When Els is in the supermarket she sees an advertisement for a service that focuses on the social network of neighbors. It says that you can join this network by visiting their site or downloading their application. If you are unable to do this yourself you can also ask the general practitioner to help you with it. Els does not feel the need to go the general practitioner, but when she gets home she visits the website to see what it was all about.

The website stated that if she wants to let the service automatically monitor if she is still active, she should buy a cheap keychain together with an RFID reader. This could help the service check if she still leaves the house once in a while. She could also let her phone check her activity if it is provided with GPS. She decides to first try to see if this service is actually what she wants before buying the keychain or try to use GPS on her phone.

She decides to sign up. The first steps of filling in her profile were easy: filling in her contact information; her preferences regarding social activity; services she can offer; and her hobbies and interests. Then she was asked to add contacts. She filled in the contact information of her daughters, but other than that she does not know anyone.

### **Scenario – Els – being motivated (for the first time)**

When Els is watching television later that week, suddenly her phone rings. She thinks this is strange, because it is around dinner time and her daughters never call during dinner, they always call her in the morning. She checks her phone and sees that she has received a text message from the service she subscribed to, motivating her to join the weekly choir repetition that starts in an hour. Els feels a bit excited because she loves to sing, but still is afraid to join the choir without knowing anyone, because she thinks she will be a burden to the choir. She decides to do nothing with the information.

A few days later she gets another text message from the service, but this time it is a message that is actually sent by the director of the choir, Lisa. It says that Lisa had heard there is someone interested in singing and she wants to introduce the choir to her if she would like that. Els still is a bit scared, but as she is being the one approached by someone to talk about the choir she decides to let Lisa make contact with her and gives this information to the service. Not too long after that Lisa contacts Els (through phone). They talk enthusiastically about the choir and Lisa invites Els to come and try it.

Els decides to visit the repetition and she really enjoys herself. The next day she gets another text message; she got an invitation from Lisa to join the choir group in the service. She accepts this.

### **Scenario – Els – Maintaining her social network**

As Els is very new to the choir, she decides to study very good before the next week. She decides to ask for help using the service, but she will only ask those that are probably willing to help her. She logs into her account and sends out a request to the choir group, that she wants to sing with somebody that afternoon. Soon she receives feedback from the service that Emma is willing to sing with her and if she agrees with this. Els is excited, because she already thought that Emma is a nice woman. She sends a positive message and that afternoon they join together to sing.

## **Scenarios Arnold**

### **Scenario – Arnold – creating a profile**

Since Arnold has joined the marching band he became very active within the marching club. He organized several social nights and helped finding a new director. One of his friends, Alex, always was a contact person for new members but since he moved away to another city he asked Arnold if he wants to take over. Arnold accepts and Alex explains to him the service that he used to maintain the contact with (possible new) members. It seems very simple to Arnold so he decides to create a profile online. Alex then invites him to be the contact person for the marching band and Arnold accepts.

### **Scenario – Arnold – being motivated (for the first time)**

A few days after Arnold had signed up he actually forgot all about the fact that he subscribed to the service. Then he received an email notifying him that Michelle had sent a message to the marching club group. As he was doing nothing at that moment he decided to read it. It said that she was unable to join that evening. Arnold did not spend much time thinking about it, but the next week the same thing happened.

As Arnold did not really know Michelle that well he was not sure what to do with this information. Missing two rehearsals also is not that problematic. He decides to keep an eye on it for now. When she skips the next repetition as well, he asks his friend Frank if he knows where she is, because he knows that he spends a lot of time talking to her during rehearsals. Frank tells him that he does also not know what is wrong with Michelle. Lisa overhears them talking and says she lives close by Michelle and maybe can visit her and ask what is wrong. They all think this is a good idea.

### **Scenario – Arnold – Maintaining his social network**

Arnold is very busy with the marching band, and as he also gets older he does not have enough energy to also be active within the volleyball club. He decides to quit. After a few weeks his attention gets drawn to the technology, that motivates him to get in contact with someone he knew from the volleyball club. The amount of social contact that he has had through the service has dropped, and this is mostly because he did not send messages to members of the volleyball club or replied to invitations of volleyball club activities.

## Appendix K – Flowcharts interaction between service and user

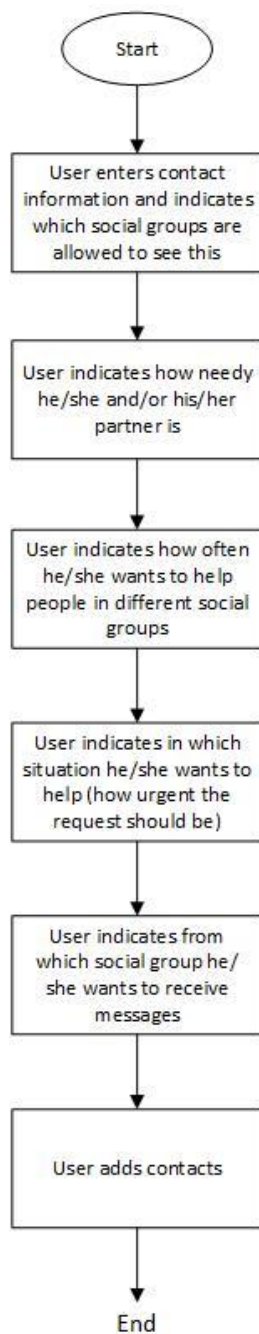


Figure 3: Flowchart creating a profile

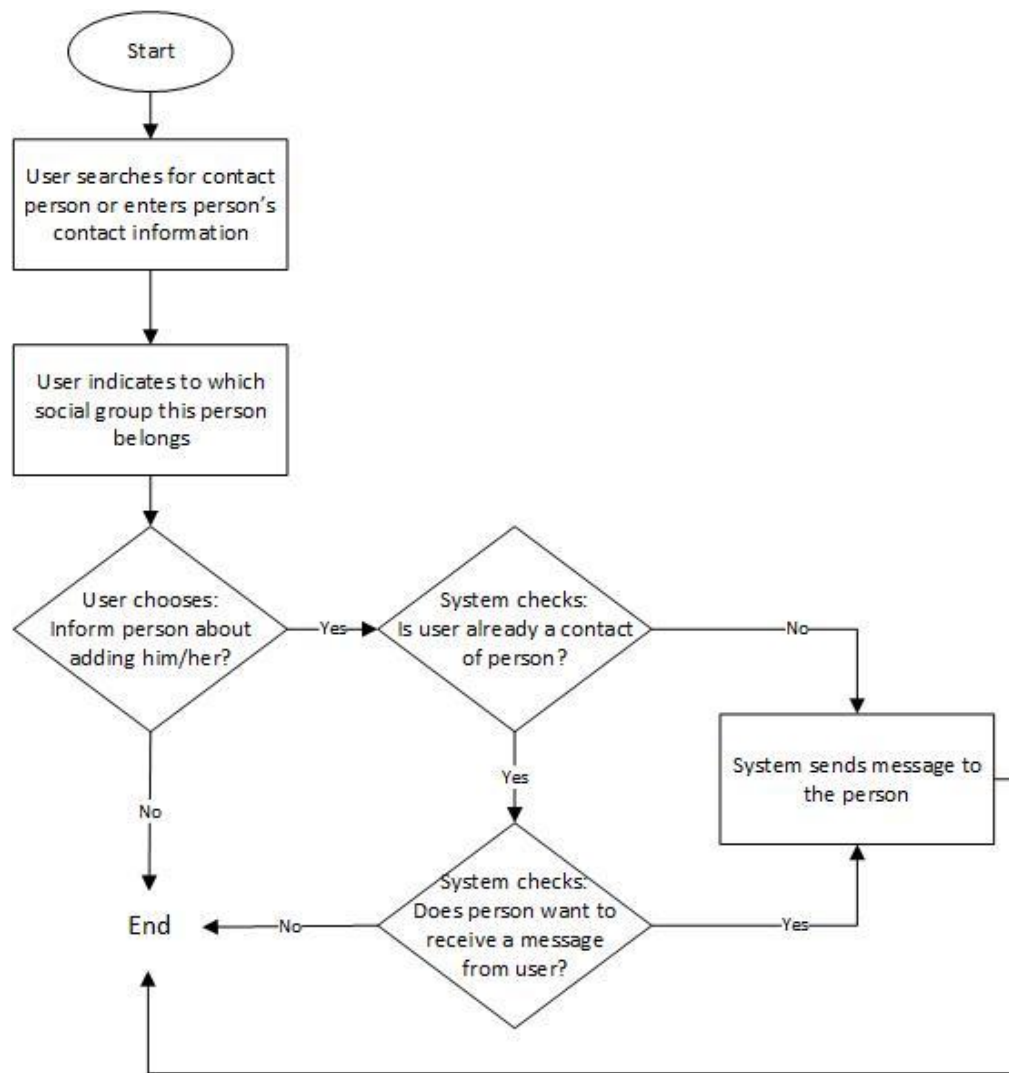


Figure 4: Flowchart adding contacts

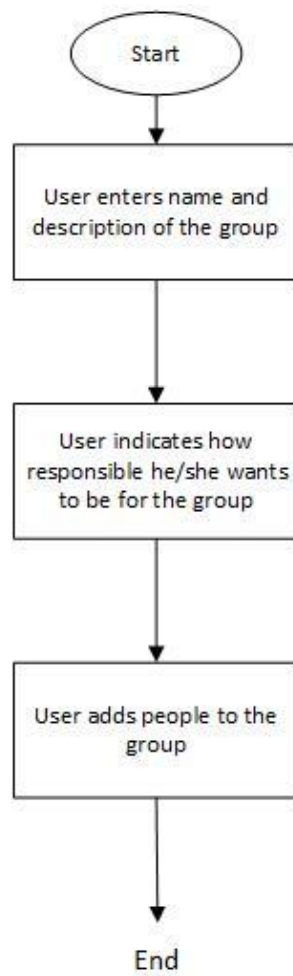


Figure 5: Flowchart creating a group

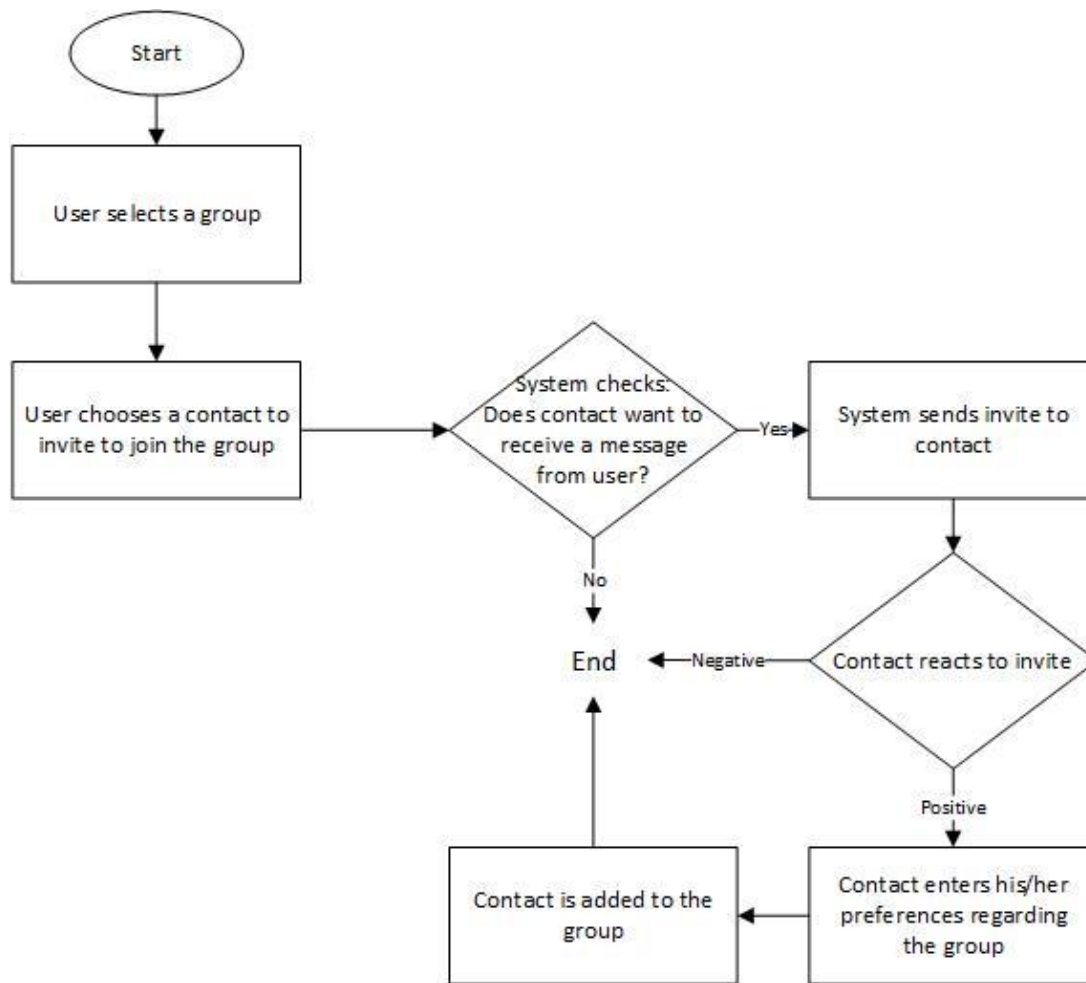


Figure 6: Flowchart adding new user to a group (1)

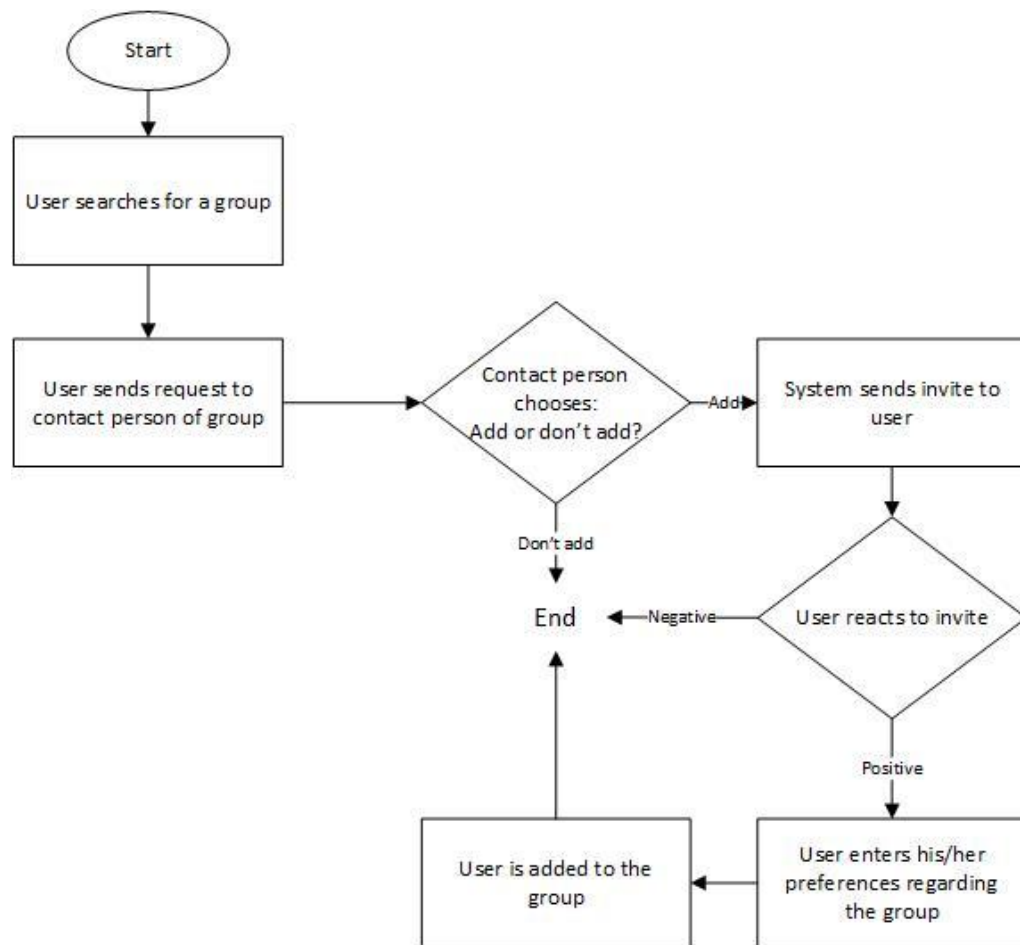


Figure 7: Flowchart adding new user to a group (2)



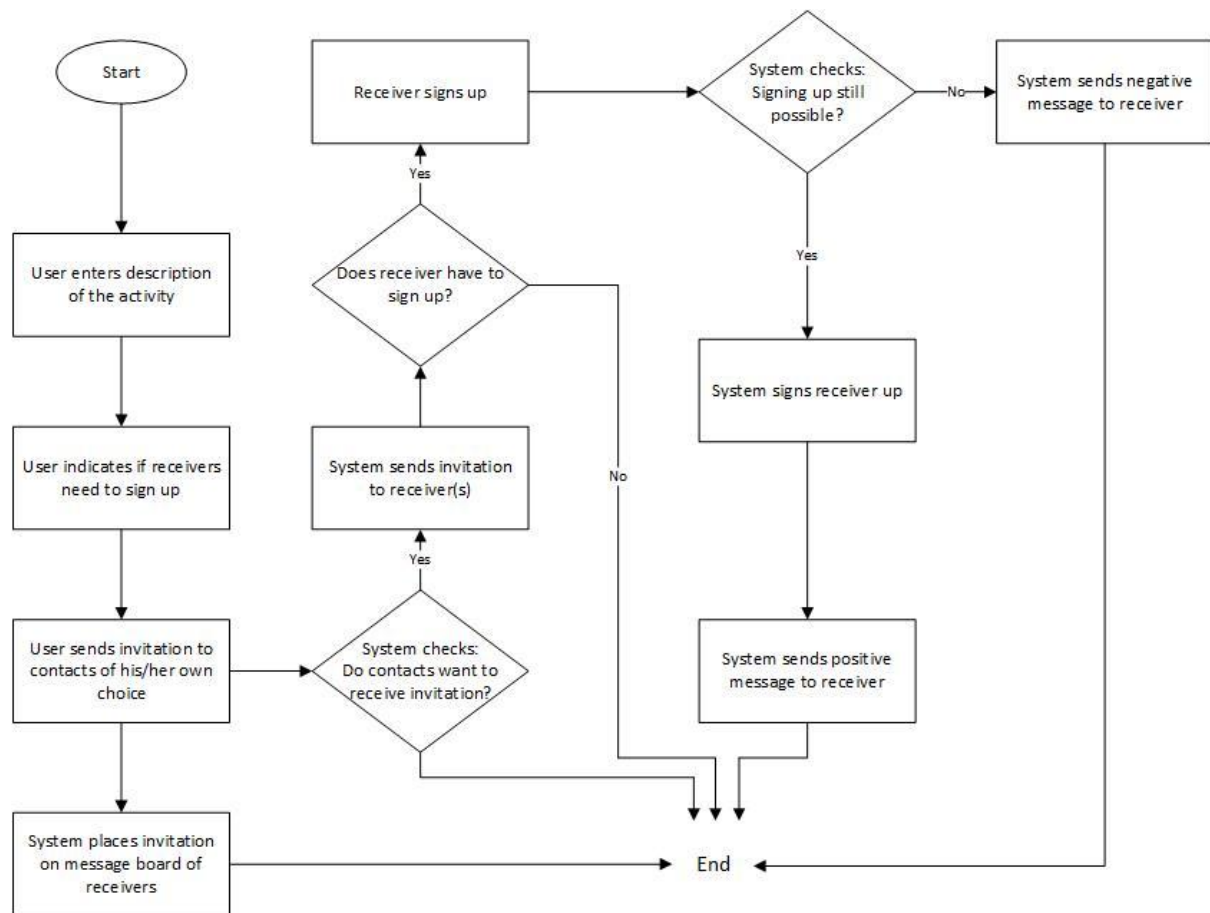


Figure 9: Flowchart organizing an activity

## Appendix L – Scenarios used in evaluation frail seniors

### Profiel invullen

The figure shows six computer monitors arranged in a 2x3 grid, each displaying a step in the profile creation process:

- Contactgegevens**  
Wie mag het zien?  
Vrienden?  
Familie?  
Kennissen?
- Hulpbehoevend**  
Hoe hulpbehoevend ben jij of je partner?
- Helpen**  
Wanneer wil je helpen?  
Hoe vaak wil je helpen?  
Wie wil je helpen?
- Berichten**  
Hoe vaak wil je berichten?  
Hoeveel berichten wil je?
- Hobbies & interesses**  
Wat zijn je hobbies & interesses?
- Profiel aangemaakt!**

Figure 10 - Scenario for creating a profile

### Contactpersonen toevoegen

The figure shows five computer monitors arranged in a 2x3 grid (with the last cell empty), each displaying a step in the process of adding contacts:

- Voeg contact toe**
- Selecteer**
- Selecteer sociale groep**
- Marie is toegevoegd!**  
Wil je haar een bericht sturen dat je haar hebt toegevoegd?
- Wil je meer contacten toevoegen?**

Figure 11: Scenario for adding contacts

## Hulpvraag versturen

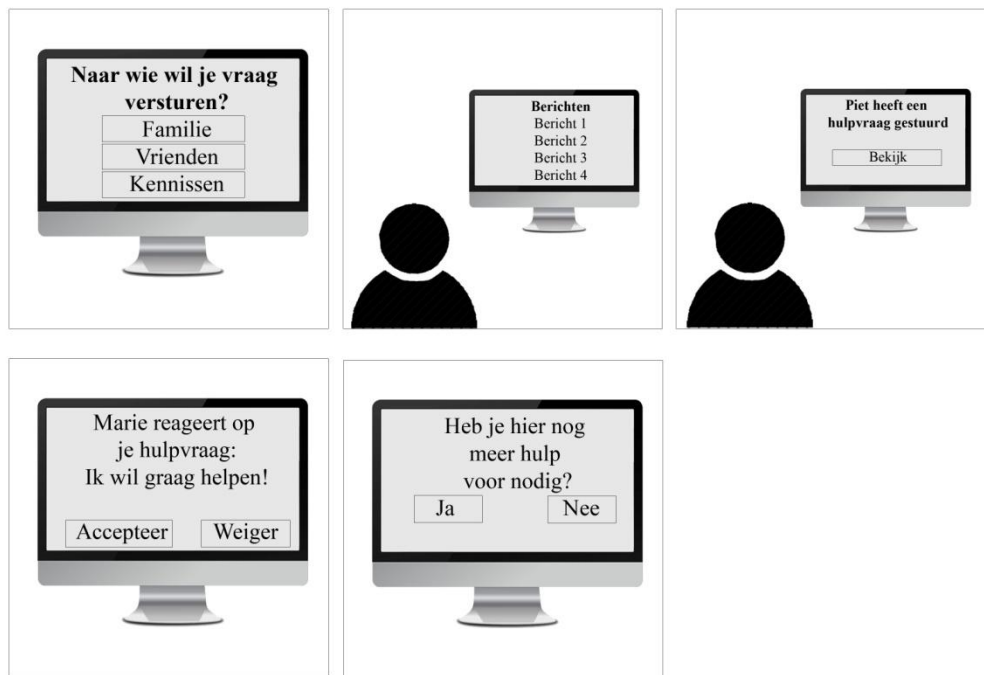


Figure 12: Scenario for sending a request for help

## Activiteit organiseren



Figure 13: Scenario for organizing an activity

## Appendix M - Scenarios with the final design

### Scenarios David

#### Scenario – David – creating a profile

The strength in David his hands gets worse and he is afraid he will not be able to do his daily chores. To see if he can do anything about it he visits the general practitioner, Michael. Unfortunately Michael does not have good news for him: the strength in his hands will probably not get any better. Michael recommends that David should ask someone to help him once in a while, because otherwise David probably would have to move to a care home soon. Then Michael signs David up for a service that will help him to get in contact with potential helpers. He inserts David's contact information, his hobbies, his interests, and his preferences regarding social contact into a web form. Then Michael gives David a package with a key chain with an RFID tag, and an RFID reader. These are used to track when he leaves the house. In addition, the package includes a digital photo frame on which he can receive messages from the service through email.

#### Scenario – David – being motivated (for the first time)

The next day David starts with his daily chores. When he has been busy for a while, his attention is drawn to the digital photo frame on which there is a motivational message to make contact with somebody. David just knocked a glass on the floor by accident and therefore he realizes he really needs someone to help him and decides to use the service. He calls the special number of the service and chooses the option that he wants to ask someone from the volunteer group to help him.

Not much later he sees another message on the digital photo frame. It says that Peter is willing to help him with his daily chores and if it is okay for him to come over the next day at 14:00. David calls the special number again and says that it is okay.

#### Scenario – David – Maintaining his social network

Although David did not really want any social contact in the first place, he is really grateful he found someone, Peter, that has helped him doing his daily chores for the last few weeks. He has added Peter as a contact, so that he can ask him directly instead of through the volunteer database.

When he was invited to Peter's barbecue last Saturday he also met another nice man, Ronald. David received a message that Ronald added him as a contact. It included a special menu item within the telephone number that made it easy for David to add Ronald as a contact as well. He put Ronald in the vague acquaintances group.

Now, David reached a point where he does not want any contact. He lies in bed for a few days without bothering to do anything. He knows that Peter is on holidays so he does not have to explain himself to anyone. After a few days he hears his phone ring. Because he almost never gets a call he thought it might be important and decides to pick up. It is a message from the service. It says that David has not been active for a while and asks if he wants to contact anyone and go outside. David replies with a negative answer. The next day the phone rings again, with the same message. The third and fourth day David decides not to pick up. Then, at the fifth day his doorbell rings. It is Ronald, checking if he is alright, because the service gave him the information that David has not been active lately.

## Appendix N - Questionnaire for general practitioner (future work)

Binnen het COMMIT-project van TNO zijn wij momenteel bezig met het ontwerpen van een technologie die senioren helpt om het meeste uit hun netwerk te halen. Wanneer er optimaal gebruik gemaakt wordt van hun netwerk, zullen zij zich veiliger voelen in de wijk. En met behulp van sociale ondersteuning zullen ze een grotere kans hebben langer zelfstandig thuis te blijven wonen.

De technologie is een service wat de sociale cohesie in de buurt vergroot, door iedereen contact te laten maken met anderen met behulp van het communicatie-apparaat van zijn of haar keuze. Dit kan bijvoorbeeld een computer zijn, of een smartphone. Senioren die beide apparaten niet bezitten, kunnen gebruik maken van een combinatie van een vaste telefoon en een digitaal fotolijstje (waarop emails ontvangen kunnen worden). De technologie kan aangevuld worden met een apparaatje waarmee de locatie en activiteit van de senior gemeten kan worden, bijvoorbeeld een smartphone of sleutelhanger.

De service geeft gebruikers de mogelijkheid om een simpel bericht of hulpvraag naar meerdere mensen tegelijkertijd te sturen. De hulpvraag kan variëren van het halen van een kleine boodschap, tot dagelijkse hulp in het huishouden. De senior kan kiezen of hij of zij de hulpvraag enkel wil sturen naar mensen binnen het netwerk, of ook naar vrienden van vrienden. In het geval van nood kan de senior binnen een bepaalde kring van mensen ook een noodoproep versturen. De ontvanger van de berichten is vrij om te beslissen van wie en wat voor soort berichten hij/zij wil ontvangen.

Daarnaast kunnen er ook nog groepen gecreëerd worden binnen de service, waardoor bijvoorbeeld gemakkelijk uitnodigingen van activiteiten verstuurd kunnen worden. Naast dit alles zal de senior af en toe berichten ontvangen die hem of haar motiveert om sociaal te gaan doen (en eventueel om meer te gaan bewegen).

Er is al een evaluatie geweest met de eindgebruikers, de senioren. Zij waren erg positief over het concept en zagen het wel gebeuren. Wat nog onderzocht moet worden, is hoe de senioren in aanraking komen met deze service. Daarom zou ik graag een paar vragen willen stellen die te maken hebben met het advies wat wordt gegeven aan senioren die hulpbehoevend (beginnen te) worden.

- Komt het op dit moment weleens voor dat u senioren aanraadt om hulp te vragen binnen hun sociale netwerk?
- Zo nee: Waarom niet?
- Zo ja: Geeft u dan ook tips die hen kunnen helpen met het vragen om hulp bij hun vrienden, kennissen, en burens? Ja: Welke tips?
  
- Wat vindt u van het idee van de technologie?
- Zou u het senioren aanbevelen om gebruik te maken van deze technologie?
- Bent u bereid om senioren te helpen met het aanmaken van een profiel voor deze technologie? (kost ongeveer 10 minuten)
- Zo nee: Waar denkt u dat ze de hulp moeten zoeken voor het aanmaken van een profiel voor deze technologie?
  
- Heeft u nog overige opmerkingen?