Deliverable 5.3	
Results of the pilots	
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AAL
AMBIENT ASSISTED LIVING

Project Acronym: HELICOPTER
Project full title: HEalthy LIfe support through COmPrehensive Tracking of individual and Environmental Behaviors
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TABLE OF CONTENT

1) Introduction

Owing to the ageing population, there is an increasing need of smart and connected support systems. In the HELICOPTER project we focus this on integrated sensor networks to learn about common patterns in an elderly's lifestyle, and to use this data to give timely feedback and signal caregivers of elderly people.

As society grows more complex, its challenges become more complex as well. Such challenges we call 'wicked problem', and they need a multi-perspective approach to be addressed (Martin, 2009). The challenge of an ageing society is such a 'wicked problem'. There are various stakeholders, with each their own challenges and, often contradicting, needs.

The Living Lab is an approach to address such complex challenges. It allows for different methods to be applied in collaboration with various stakeholders to find innovative solutions. For the Living Lab it is important that the methods are applied in a realistic context (Brankaert, 2016) as the validity of the results increases by this. Additionally, Living Labs are able to propose stakeholder-based, market ready solutions, or as Leminen et al. (2012) describes it: " *Living Labs have been successful in providing networks that can help to create innovations that match with users' needs and have the ability to be brought to market level."*. One of the key fundamentals of Living Labs are described by Bergvall-Kareborn and Stahlbrost (2009). They propose five principles to which a Living Lab should comply: Continuity, Openness, Realism, Empowerment of users, and Spontaneity. This means the Living Lab involves the end-users to construct meaningful innovation with and for them. Thereby, the involvement of stakeholders with a market interest in such Living Lab activities fosters successful innovation and market impact (Schuurman, Marez, & Ballon, 2016). As such the Living Lab bring multiple stakeholders together to perform innovation methods to address complex societal challenges from different perspectives.

To evaluate the Helicopter system we applied an in context Living Lab evaluation. The method, protocol and results are covered in this report.

This deliverable integrates results from both Dutch and Swedish pilot locations. This focuses mainly on the participants experience related to the project adoption, emergence of new behaviours and routines and social participation, as well as to the lessons learned from both users and pilot teams.

2) The Dutch Pilot

Based on the literature, we propose an in-context evaluation protocol (Figure 1) to be used in design-driven Living Labs for impaired users (Brankaert, 2016). This protocol is based on three home visits, each with a specific goal: introduction (Home Visit 1), intervention (Home Visit 2) and reflection (Home Visit 3). Thereby, we propose additional steps for a safe involvement of users, and the engagement of users through a community structure. These are covered in Figure 8.5.

In addition to the protocol phases we suggest a strong involvement of all relevant stakeholders throughout the process (User, Care, Industry and Research). In this way the different stakeholders feel involved and responsible in each of these stages.

For designers this protocol enables a holistic, safe and efficient way to engage with elderly users in their context. By this we can evaluate their design proposals in a real-life context and gain insights for adjustment or redesign through this. Therefore such an evaluation should be seen as part of an iterative process, which will most likely be preceded or will be succeeded by additional iterations.

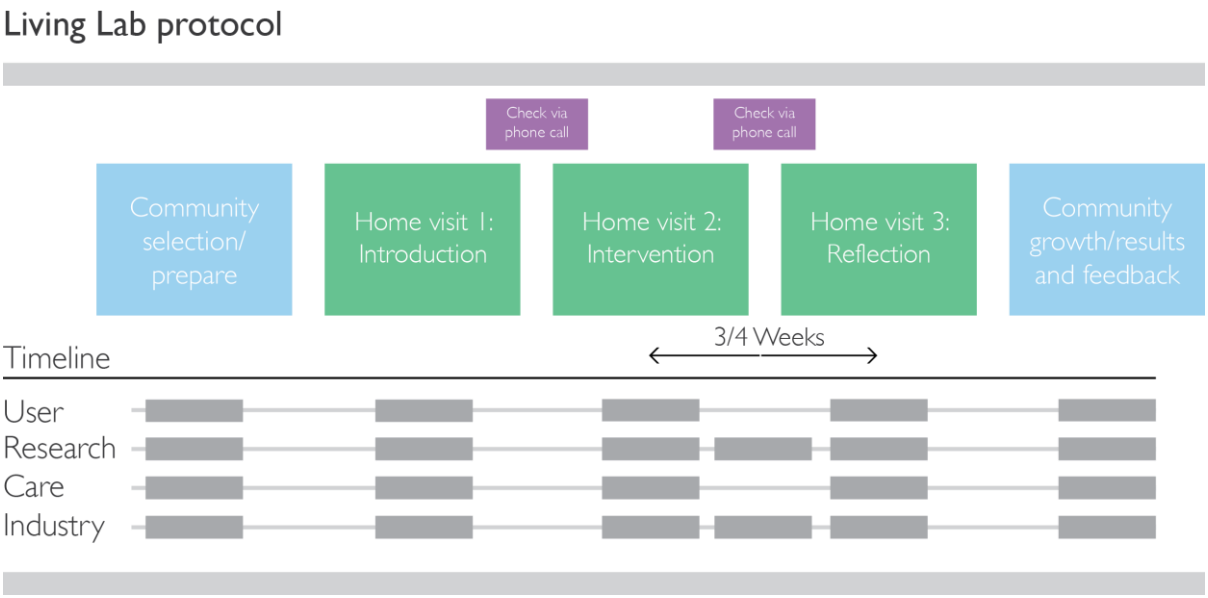


Figure 1 Protocol proposal for future involvement of impaired users.

Community selection/preparation

In this phase the study is set-up and prepared. We recommend that all relevant stakeholders are already included from this phase onward. In this way they might feel more ownership in selecting an intervention, the evaluation method and the context. Finally, when a community is built, it could support a selection of users who match a certain intervention. In this way, needs are better matched with interventions, and the results for stakeholders might improve.

Home visit 1: introduction

During this phase the users are visited with the main purpose of introducing the project and the rationale behind it. Depending on the abilities of the users, the intervention could also already be

explained. Key in this phase is to allow users to get acquainted with the project and the process step by step.

Home visit 2: intervention

During this visit the intervention is brought and (re-) introduced; the users should already be familiar with the project. We advise that at least one familiar person (from Home visit 1) joins this visit. In this step the research method is explained as well, and from this moment the users can use the product or system for a limited period of time as they wish. Thereby, it has to be made clear that users cannot keep the intervention after the test period if this is not possible in the specific case.

Home visit 3: reflection

During the final home visit the researchers (and potentially the care or business stakeholder) collect the prototype used for the intervention and the data from the research method (again we recommend that one familiar person is present). They also reserve sufficient time (~ 1 hour) to reflect with the users on their experiences and address queries related to the research method and the project in general. The agenda for this meeting has to be set together with the relevant care and business stakeholders, so that these partners gain reflective insights that are of particular interest to them.

In-between checks

To streamline communication, we added additional checks in between the home visits. One of these checks is set before the second home visit to improve protocol efficiency and communication. The second check, which should be scheduled during the intervention study, is designed to address issues that might have come up so far. However, we can also anticipate other purposes, or a higher quantity, for the checks depending on the specific user (and their impairment), the complexity of the research method, and the length of the study.

Collaboration with Summa College

The ambition of Cooperative Slimmer Leven 2020 is to develop a sustainable regional living lab where new innovations and services can be co-created, developed and tested together with end-users. The pilot Slimmer Leven is responsible for in the Helicopter project required to be organised in an innovative way. This because there were a number of working sessions about the business case. From this could be concluded that if we want to truly scale up an innovations like the one developed in the Helicopter project (where a part of the businesses relies on financing from formal institutions/insures) we need hard figures. For this reason we are trying to organise the pilot in such a way that this is actually feasible. To do this first a small pre-pilot (n=10) was organised in order to make sure that the large pilot runs more smoothly.

For this reason SL2020 has established a collaboration relationship with a senior secondary vocational education (Summa College Zorg) who are teaching level 2 nursing and care students. Because jobs of these type of students are disappearing they need to be re-schooled in order to stay valuable within the work field. Therefor they would like to explore if these students could educate and guide elderly people in the introduction to the use of new health innovations and technologies. We tested a model

where these students will recruit elderly persons and guide them through the HELICOPTER pilot, from introducing the project and technology, to providing support during, to evaluate the pilot according to of course the HELICOPTER requirements. First a pre-pilot was organised to including 10 participants to try out the procedure of recruiting, testing, supporting, evaluating etc. before the real Helicopter pilot started. The students were the first contact point for the participants and were guided by the pilot coordinator of Slimmer Leven who visited the students regularly for instructions, questions and sharing of experiences.

Besides the pilot coordinator and the student guides a technician was hired for the house visits (e.g. installation, technical assistance).

2.1) A general overview of the pilot phase

For the Helicopter pilot a total of 28 end users are involved in the NL. The first 21 end users (16 households) were included in September 2015, the additional 7 end users (6 households) in December 2015. This resulted in a total of 35 participants (22 households) from the Dutch perspective.

After a technical training with the tech partners the Helicopter system was already installed in the 16 households in order for the data collection to begin. However, the pilot installation could not be done at once, due to technical issues with the posters[1]and bluetooth connections, which were then solved in February. The second wave of end users was installed in February 2016 as well, with posters eventually delivered in March. Upon first usage of such device, some of the end users were not comfortable with it: interpreting lighting pattern was not perceived as immediate, and, to someone, luminosity was excessive. Some of the posters were therefore dismissed, waiting for tuning and possible design rework. The Bluetooth connection, needed for clinical device communication, was available in April 2016. With such components needing late adjustments, the partnership decided to postpone the end of the pilot to the end of June in order to gather as much data as possible. In May an interactive workshop with participants was organised in Eindhoven in order to collect some more qualitative data about the Helicopter service and prospects. The pilot wrapping up and de-installation took place the last week of June, just as the evaluation (survey and planning of interviews).

2.2) Participants experience with the HELICOPTER services

2.2.1) The project adoption

Participant recruitment was carried out as part of an education course at Summa College. The students often knew the participants in person, as they were often family members or neighbours. This allowed for a more convenient researcher – participant relationship that improved the adoption and integration of the HELICOPTER system in the homes of the users.

[1] See *D2.3: Scenarios of Design Concepts Storyboarded Interaction and Product Service Descriptions* for the set up of the pilot, which explains the functionality of the poster.

As described in section 1, the system was introduced in steps. First the Tablet was introduced, then the software on the tablet, then the sensor package and finally the integrated feedback poster. For these last two installations a technician was required to perform the installation.

For the first two steps the adoption process went smooth. The users had time to get used to the tablet system, and they had a personal assistant in the student who they were in touch with for the project. In this phase we found that some users were reluctant to use the tablet on a regular basis, which has to be taken into account further on. On the other hand, there were also people who started using the tablet for contacting family and friend or to play games where they didn't do this before.

Nevertheless, some issues occurred with the system software start-up, in part due to internet connection troubles, in part due to perceived difficulties in interacting with the app (e.g., users forgot access credentials). Also, field deployment of the app allowed to discover some bugs and unexpected behaviors, this yielding some redesign work. Besides this, app features were added throughout the pilot duration: the overall picture resulted, for some users, somehow confusing and possibly threatened their confidence. Of course, a longer pilot time would have made this less critical, and lesson learnt will be exploited in the project follow-up.

The final two phases of the adoption process were also inherently demanding, with installation process taking about 2 hours/home. This can be regarded as a good result in general (in particular by considering the personalization needs and the complete home coverage): nevertheless, such an amount of time was still perceived as excessive from some elderly user, again possibly diminishing their trust. It is however to be mentioned, to this respect, that the system was not meant to be installed by elderly users themselves and that installation procedures were designed to be suitable for installation by non-specialist (i.e., caregivers). Nevertheless, interacting with elderly home environment is still a delicate task, so that some small adjustment can be thought of, based on such pilot outcome, to reduce the perceived intrusiveness of the installation procedures.

More generally speaking, it is to be remarked that continuing technical development during the pilot execution, although allowing to introduce and test newer components and functionalities, may lead (and in some cases led) to question user perception and interest. This is a risk which is inherently connected to living lab approaches: nevertheless, some unforeseen technical accidents made this more sensible in this case.

2.2.2) The emergence of new behaviours and routines

Unfortunately, the pilot experience was not sufficient to fully assess and evaluate changes in users' behaviors and actual impact on their wellbeing. Apart from the limited the "stable" pilot observation time, it is to be mentioned that fully evaluating the main goal of the HELICOPTER approach (consisting of health monitoring features, i.e., the "automatic triage"), inherently would have required to involve caregivers and the health systems at a much larger extent than actually allowed by the project and partners constraints. The partnership was actually aware of this, and countermeasures were thought to keep the user engaged anyway, with suitably designed interaction strategies, based on the apps and the snowflake. Their impact, however, was less effective than expected, also due to aforementioned technical issues.

Nevertheless, from discussions with the participants we know that some of them became more aware of their own behaviour. Participants also mentioned that they understand the objective and aim and are enthusiastic about it.

2.2.3) Social participation

Impact on social participation was expected from improving relationship with caregivers: a caregiver app was thus designed and implemented. However, involvement of actual formal caregivers into the pilot was limited, due to constraints emerged when analysing the end-user support networks: i.e., real formal caregivers, due to either privacy concerns or to work overload, was not available to be deeply involved in the project, so that the caregiver role was played by pilot team members themselves. Involvement of informal caregivers was limited as well, again mostly resulting in relationships with pilot team members, which were the first point of contact. A lot of social interaction took place with them, which was highly appreciated by both parties. So this was a beautiful side effect.

2.3) Lessons learned

In this chapter we would like to list the remarks and learning points from both the users' perspective as well as the pilot team perspective concerning the HELICOPTER project and pilot deployment.

2.3.1) From the users

	Remark	**Learning point/improvement**
Use of the app	Different problems with app installation and operation were discovered and needed fixes, mostly due to debugging of early versions andnetworking issues (coming from different security policies implemented by the diverse Internet Service Providers).	ISP policies are relevant to service continuity and operation: better specification of the actual communication features is needed to select a reliable/compatible provider. More extensive testing before releasing the app to end-users is needed. Possibly, introducing a subgroup of beta-testers would help.
	Due to networking issues, syncing of the app with sensor data was sometimes delayed or unreliable.	See above.
	No feedback from medical sensors was included in the application.	Treatment of clinical data was subject to different design considerations, related to different countries regulations and

		sensitivities, this resulting in making such data not included in the app user interface (all medical sensors included their own UI, though). Data was nevertheless acquired and included in the Diagnostic Suspicions decision process. This, however, resulted in a less transparent and trusted procedure, with respect to end-user perception. Display clinical data on the end-user APP will therefore be considered as an improvement.
Installation	Different kinds of Wi-Fi. Too many routers necessary.	3G dongles couldn't be accessed remotely by the technical partners, so not recommended to use. Wifi coverage very bad in some households. System easier to install in small apartments/one floor houses instead of multiple floor houses.
	Delays in the release of updates for the system components, which also led to uncertainties in the installation schedule.	Technical challenges and volume of work sometimes resulted in overstepping deadlines, thus possibly not matching end-users' expectations, with adverse impact on their trust. A better, more conservative scheduling for releases should be considered, avoiding too wishful/optimistic planning.
	Toilet sensor was difficult to install (reading range not compatible with smaller rooms, not made to be placed on ceiling instead, or difficult to remove).	The reading-range issue was actually solved after a re-design iteration. Positioning/installation instructions and constraints need to be stated in a clearer fashion.
	Snowflake(poster) installation delayed and with some technical difficulty. Behavior not matching expectations:	The design of such an unconventional, physical interface inherently yields uncertainties and possibly require further re-design

	signalling strategy not immediate/clear.	and tuning steps, based on end-user reactions.
	Clinical device installation much delayed.	Although being due to technical issues independent on partners will (third-party, commercial components exhibiting faulty behaviour, which required design of work-arounds), earlier testing and beta-testing procedure would have been considered.
	Chair sensor should have been delivered in a pillow, bed pad makes noise; not comfortable.	Softer covers for chair sensors could be made available, based on such reaction. Concerning the bed pad, follow-up versions will feature a novel under-mattress pad (not available at the pilot implementation time, already included in newer version), solving the issue.
Usage	Wearable sensor difficult to charge and wear (especially for ladies)	Partly due to the fabric cover, which could be redesigned or eliminated. Charging difficulties may come from the adoption of the EU standard (micro USB plug). Further solution can be thought of during the follow-up engineering phase, based for instance on a docking-station approach.
	For some difficult to charge the wearable on a daily basis.	Increasing battery lifetime could be achieved by design, either by accounting for higher capacity of by reducing power consumption.
	Battery status sometimes unclear, due to difficult interaction with App/poster.	In the pilot experimental implementation, a management dashboard was made available to pilot support teams, allowing for battery checks. In the final version, interaction and display strategies need tuning and re-design.

	Limited battery lifetime of some sensors, sometimes running out faster than expected.	Partly due to "development and debugging" features introduced in the test, power management design is undergoing a full redesign, in the follow-up device engineering.
	The Helicopter vision and aim is clear and people have a positive attitude towards this.	N/A
	People get used to the presence of technology in their home.	N/A
	Privacy aspects remain a point of attention.	Inform participants more clearly about what happens with their data.
	Some misbehaviours with automatic app updates. Difficult to manage. Some usability issues.	Mostly due to communication issues and to inhomogeneous ISP constraints. Hence problems were not predictable by lab-tests. Again, design iteration and the introduction of a beta-testing stage would improve this aspect.
App	The caregiver application (designed for informal caregivers) was released late, and not used to its full potential. Difficulties in managing access credentials and accessing user data. Only Android version available.	Improvement by iterating design are planned in follow up.

2.3.2) From the pilot team

	Remark	**Learning point/improvement**
Recruitment	This was done via the students. Went very well.	Start with a kick off with all participants and students together so that everyone knows each other which enhances engagement and motivation throughout the project.

	Maybe too homogenous. The end-users are all engaged and active persons.	This is almost always the case in a pilot like this. Difficult to engage participants who are not interested intrinsically.
	Motivation can sometimes be questioned (grandparents of students	Good instruction of the students.
	Few drop outs.	System not suitable for people in early stage of dementia (too confusing), system is perceived as intrusive by some participants. The goal was not always clear for participants because of all the technical delays and malfunctioning.
Delivery	Some of the sensors'cases were broken on second delivery, due to rude handling from the carrier.	A more robust case material and better protective packaging could be used.
	Second wave of delivered posters were made of different and more fragile material.	Adopt material exploited in first batch.
Installation	Installation schedule needed frequent adjustments and deadlines were sometimes overstepped, because of technical difficulties, this reflecting in installation and exploitation delays.	More conservative installation plan design, managing backup plans as well.
	Difficult and time-consuming to plan multiple visits, due to different components being deployed in multiple steps.	Introduction of beta-testing steps, before installing everything in user homes. Better synchronization among technical partners workplan.
	Devised installation process not always realistic to implement (e.g. poster set up by users together with technician)	Allow more room to co-create, mainly to iterate steps to further define the pilot set up procedures.

3) The Swedish Pilot

3.1) A general overview of the pilot phase

The pilot started with a first visit in the end-users home in the end of September and beginning of October 2015. At that time the tablet, scale and blood-pressure meter were delivered, although not yet managed by the system. According to the Living Lab protocol the participants should get acquainted to the project in such phase, but it was difficult in this case, due to the system specification still evolving and subject to clarifications.

The pilot leader in the pilot site in Skövde engaged a university student who did the main job installing the equipment when we were ready to do so. In November a postgraduate and member of the project from University of Parma was visiting Skövde Municipality to instruct the installation team in how to install the main part of the Helicopter system. Clinical sensors (although working as stand-alone devices) were not included yet into the system management. In addition to that, Swedish ethical laws regarding research about human and health were considered, and upon consultation among Swedish partners and other consortium members, we considered an ethical application to the ethical board to be necessary, prior to include clinical data in the HELICOPTER data space. Based on this, we eventually agree not to install the clinical sensors in the pilot site in Skövde. I.e., clinical devices were made available to end-users, but related data was not stored by the system.

As of the home installation, technical issues (mostly related to connectivity and to sensor management) resulted harder to be solved than expected. With hindsight, earlier involvement of local technician would have greatly helped in sorting out potential issues and in smoothing the installation procedure.

In spring 2016, the snowflakes were ready to be installed in the end-users homes. The pilot leader and the technician at the pilot site got information about installation routines from CIID. However, actual snowflake service started much later, this endangering motivation of end-users about the snowflake and its function. Similarly, the tablet app experienced many teething problems, which might have resulted in end-user loosing a bit of interest in the project. It was therefore hard to motivate them to use that part of the system, but the ten end-user in Skövde have had an amazing patience, endurance and interest in the system and the project during the pilot. This can be seen in the picture aside, where a creative solution one participant made for the toilet sensor can be seen.

3.2) Participants experience with the HELICOPTER services

3.2.1) The project adoption

Before the pilot were scheduled to start (September 1, 2015) a letter were sent out to associations for senior citizens. In Sweden many senior citizens are engaged in this kind of associations during the years after retirement. It is a nice way to continue social activities and they also work for older adults privileges in the community. After a rather short period of time expressed approximately 20 persons their interest in participating in the pilot. Due to holiday, time passed by before the first contact were taken. Some of them had changed their minds in participating but the main part of them were still interested. Ten persons were engaged, six single household and two couple. The quantity of participants in Skövde were stipulated from the beginning in the AAL Joint Programme for this project and the amount of devices and sensors, sent from the technical members in the project to the pilot site.

A first visit in the end-users home were set up and they got the tablet and some clinical sensors. All ten participants were more or less accustomed to tablets and all got Wi-Fi. It was meant that, during the first visit all of the participants should download the application on the tablet and choose colour for the different sensors boxes and coverages. In some cases, the app didn't work as expected, due to download difficulties. The pilot leader sorted such an issue out manually, so that the making of coverages and boxes didn´t get delayed. Such a positive attitude of the pilot team was a key to preserve the trust of the users, even though technical problems were frequent.

New versions of the application were sent out several times and to make it as easy as possible for the end-user to download the new version the pilot leader made an instruction but it was sometimes difficult for users to download the application. Establishing a continuous teamwork with the app developers was not easy as well.

Although the pilot team provided all text translation is Swedish, language localization of the app was initially limited, with some word and sentences being still stated in English language. Some of the participants had learned in English but not all of them, so they felt a little bit excluded. This was fixed in later versions.

Despite such problems, all of the end-users have kept their faith and trust high during the time of the pilot. Only one participant ended the pilot before time, not because of lack of trust but because of change of homes, he moved to his summerhouse in a different municipality in the beginning of the summer 2016. The proof of their dedication to the project were shown in a workshop, postgraduate Bertil Lindenfalk at Jibs held in the beginning of June 2016. Nine out of ten were showing interest and participated during several exercises.

3.2.2) The emergence of new behaviours and routines

Hopefully the end-user didn´t change behaviours because of the pilot. During the installation phase we encouraged all of them to live the same active life as they were used to do. If they were inactive or

had a poor social life, we had wanted them to get more active. Now they could live their life in the same way they were used to.

Despite this, one sensor, the Musa, demanded a change in behaviour. They had to make a new routine to remember to wear it and to charge it every night. Several of the participants expressed worries about forgetting it and if so, what was happening with the registration of data. Some of them has expressed the awareness of the sensors and the outcome of using the device each sensor is connected to, "how often have I been to the toilet today" or "how long have I sit in my chair this evening". But after a while this awareness faded away and they didn´t notice the sensors anymore. This is of course a good sign, they didn´t feel like they were monitored. Nevertheless, better feedback from the tablet app would have been appreciated.

3.2.3) Social participation

During the visit at the end-users home no one has articulated any negative impact on the social participation. They have only mention it as a positive topic to talk to their children, grandchildren and friends about, because they were curious about the project and the outcome of it. Due to interviews in the newspaper and national television, this two participants received questions and remarks from neighbours and acquaintance but still in a positive way.

3.3) Lessons learned

3.3.1) From the users

All of the end-users has enunciate the concern about the technology and the amount of time it took to install the Helicopter system and then maintain it. The problem for the pilot leader has been to keep users informed about the system goal and visions, as they evolved throughout the project: communication with the partnership was somehow limited by very different partner backgrounds, and the technical view was not always easy to grasp and share.

Despite the awareness about inherent limitations of an experimental approach, end users do believe that the Helicopter system has much room for improvement, with several respects. Some of the end-users have had thoughts about the financial aspects of the project and also what will happen financially in the future. Altogether, they have expressed the need for the Helicopter system to have a much straightforward and friendly technology and a better feedback to the user in the future. One example for technical gain is to improve the sensors power management, now requiring frequent maintenance. Still they believe in the Helicopter system. They believe that the system can help elderly to feel more secure. Several of them asks, in the future, for a person who works behind the system and check what is happening to the end-user due to data coming from the sensors.

3.3.2) From the pilot team

The way of searching for end-users could have been done in a different way. Now we got a rather homogenous group, they are fit and active and very positive to encounter new things in their lives. If we got a more heterogeneous group of end-users we may have got more feedback both negative and positive.

The most crucial feedback to bring back to the project or future projects is the need of improving communication, among partners and with users. This is likely necessary due to different culture or interest in communicating. Of course, we all have different personalities and identities, which may make it difficult to interpret communication and interaction, resulting in a source of misunderstanding (Nilsson & Waldemarsson, 2013) and mistrust. In this project, no one has English as the first language, but in some way the feeling is that sharing information would have been improved, to avoid time and frustration of pilot team in dealing with technical issues. Without the help and cooperation from UNIPR technicians, visiting Skövde a few times, we hadn´t made it.

Another lesson the pilot leader has learned is that it is a huge benefit to have an own set of the whole system to test, before meeting the participants in their homes and there try to figure out what to do.

During the last 1½ year, every fortnight the two pilot leader has had a meeting over the internet, together with Bertil Lindenfalk at Jibs. The purpose has been to share required information, support each other and ask common questions and share information to the rest of the project group. Nilsson and Waldemarsson (2013) calls attention to the importance of sharing information between group members to make the process working. Replies to our requests were not always as prompt as needed, and how we perceived it both as a personal and cultural issue (Nilsson & Waldemarsson, 2013). We have noticed that when we actually met, face to face, we got more and better answers to our questions.

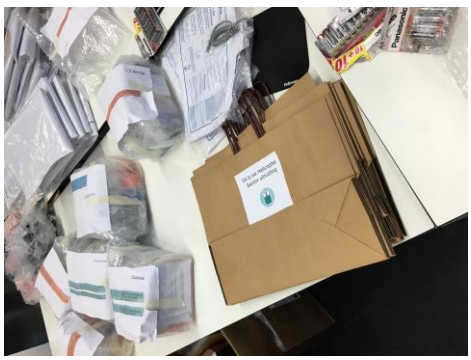
Another lesson learned is that the overall service quality can be greatly improved through better cooperation between technology and service designers, cooperating on a wider range. In this pilot, also due to limited execution time, issues between the technology and the service views were not always discussed in depth, with technology constraints often prevailing. Planning more time and room for co-creation would have made things smoother.

4) Annex I: Pilot impression

The first installation.

The students with the tablets.

Delivery of the pilot sensors at pilot premises.



Packing the pilot kits for each particpant.

Inside a pilot kit.

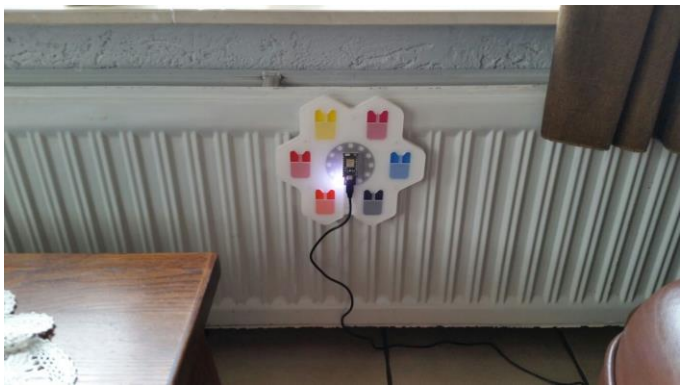
Ready to go!

Handing them over to the students and their participants.

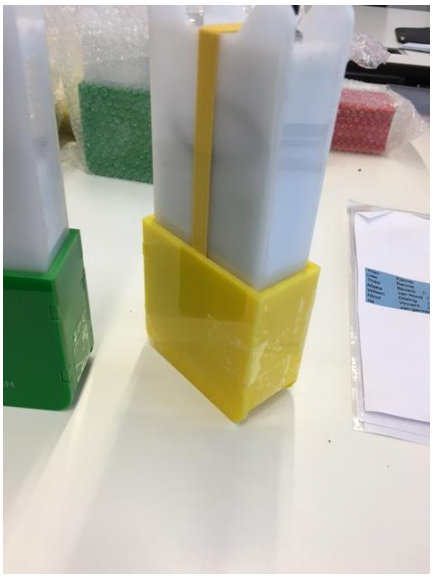
Re-installation due to some errors.

Some participants created pillow cases for the chair sensor pads.

Fragile material! Cases didn't survive the trip.

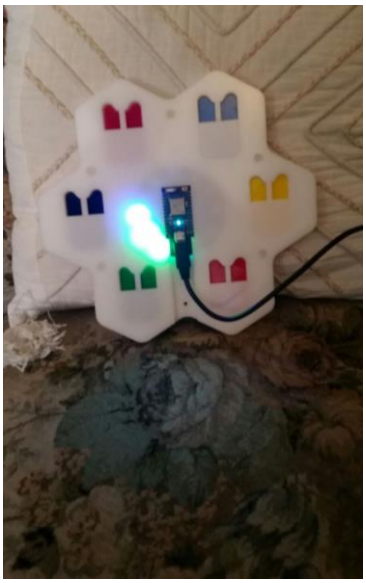


Poster at participant premises.



Tried to fix the cases.

Poster at participant's premises.



Poster at participant's premises.

Sensor delivey.

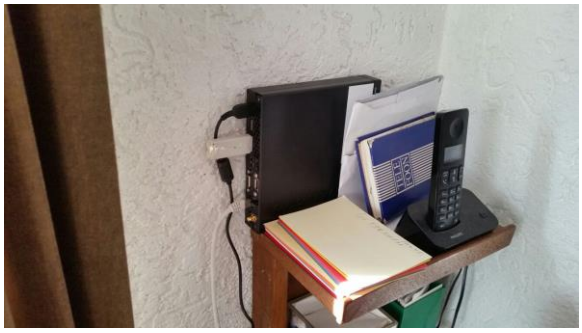
Creation of the posters.

Creation of the posters.

Additional routers due to bad connection.

Sensors at participant's premises.

Sensors at participant's premises.



Sensors at participant's premises.

Sensors at participant's premises.

Sensors at participant's premises.