I Need Your Help! How to Establish a Support System for an AAL Pilot Region

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Abstract: The complexity and the specific user group of AAL systems make it difficult to provide adequate support. In particular, in AAL projects where business cases should be simulated in order to guarantee a smooth transition of the products and services to the market. Usually, the project consortium distributes or channelizes the responsibilities for system components. On the contrary, the pilot region fit4AAL relies on a professional support team. This paper describes how the workflows and support strategies were established and enhanced due to ticket analysis of a first phase of the field trial. Within this phase of testing the developed training program ILSE, an initial support system was launched consisting of three pillars: local centres, first and second level support. The findings of analysing the support tickets demonstrated a high potential to reduce support effort regarding technical issues. We visualised the support workflow and developed standardised solving strategies to decrease the effort of the tickets and increase the satisfaction of the AAL users.

1 INTRODUCTION

According to the European Commission (2014) the demographics of the European Union are projected to change in the coming decades. The overall population will be much older than it is now. A large portion of the population will retire and the labour supply will decline overall (European Commission, 2014). For the growing user group of older people, technologies and services have been developed in recent years (Hallewell Haslwanter & Fitzpatrick, 2017). Development and research conducted within this field is summarised under the term Active and Assistive Living (AAL). The overall aim of AAL is to increase the quality of life for older people by introducing tailored services and products (Hayn & Schreier, 2017). For example, these solutions target to support the autonomy, self-confidence and mobility of older adults. AAL wants to promote a better and healthier lifestyle for individuals at risk while maintaining the health and functional capability of elderly people (Nguyen, Colin, Lemoult, Sigwald, Thiollier, & Krivitzky, 2015). Therefore, AAL solutions support ageing well at home, in the community and at work. The range of developed products and services is wide: AAL uses communication technologies (e.g. smart watches), smart homes, assistive robots, mobile and wearable devices as well as various sensors such as sphygmomanometers (Jaschinski & Allouch, 2015). Although a lot of development and research has been conducted so far, there are not many scientifically evaluated systems on the market nor currently used in reality at this point (Hallewell Haslwanter & Fitzpatrick, 2017). A possible reason is that services are often provided in isolation and in a technocentric way (Bertel, Teles, Strohmeier, Vieira-Marques, Schmitter, Ruscher & Kofler, 2018) such as living labs with highly controlled settings. Further, technologies often fail to embed in the daily routines of older people and their common surroundings (Hornung, Müller, Shklovski, Jakobi & Wulf, 2017). Often already the design does not take into account the real needs and capabilities of users (Colomer, Salvi, Fernanda, Cabrera-Umpierrez, Arredondo, Abril, Jimenez-Mixco & Medrano, 2014). This requires not only a focus on development of AAL solutions together with the target group but also on testing the setup in real life of the seniors. Such settings are so-called pilot regions in Austria, which

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the BMVIT[1] initiated in 2012. Compared to other AAL projects, volunteers of the target group take part in the development and testing of the solutions by integrating them in their homes and daily lives for a certain amount of time, e.g. for half a year or even longer. How often, when and what they use is left up to them with the aim to investigate the effects of the usage. Hayn & Schreier (2017) emphasises that the pilot studies include important tasks such as recruitment of participants, clarification of ethical aspects, the deployment of the system to the households of users, the maintenance of the installations and, last but not least, the ongoing support of the users (Hayn & Schreier, 2017). The importance of the support in pilot regions is additionally visible when observing the common solutions to overcome the different challenges, which emerge when introducing AAL systems to real homes (Förster, Werner, Hämmerle, Kofler, Ates, Piazolo & Fuxreiter, 2017). On the one hand they are related to the environment itself and on the other hand to the users. Most homes are not designed to integrate specific technologies. As a result, technical issues such as cabling, power sources, already existing technologies, internet connectivity or ordinary space have to be considered before deploying technology (Doyle, Bailey, Scanaill & van den Berg, 2014). Beside this, acceptance and adoption of the technology can be problematic (Heart & Kalderdon, 2013). Learning the usage of ICT-based solutions represents a barrier for older users (Doyle, Bailey, Scanaill & van den Berg, 2014). Nevertheless, elderly people are open-minded about technology, when it is appropriately introduced and when support is accessible (Heart & Kalderon, 2013 & Doyle, Bailey, Scanaill & van den Berg, 2014). 'Older people need space to be curious about new technology, to feel comfortable to ask what they may think are 'stupid' questions and have these answered […]' (Doyle, Bailey, Scanaill & van den Berg, 2014). Jaschinski & Allouch (2015) proposed special training programs, which teach the elderly people how to use technology. Further, technical support in form of a helpline or a written manual is recommended to avoid technology anxiety and promote a successful usage of AAL systems (Jaschinski & Allouch, 2015). Doyle, Bailey, Scanaill & van den Berg (2014) stated that a hotline should be provided, which users can call 24 hours in order that technicians can immediately fix problems remotely. Usually, a monitoring system helps to observe the support process. For research projects, Förster, Werner, Hämmerle, Kofler, Ates, Piazolo & Fuxreiter (2017) recommended a ticketing system, which facilitates clear communication and regulation of responsibilities within the project partners. The effort of supporting users is often underestimated and can be especially time consuming directly after installation of the systems. Experts advise to budget enough resources for unexpected incidents and challenges (Förster, Werner, Hämmerle, Kofler, Ates, Piazolo & Fuxreiter , 2017) such as temporary server failure, news-related inquiries (e.g. General Data Protection Regulation) or similar.

The pilot region fit4AAL intended to cope with these challenges by including a professional support team from a project partner. This paper presents how their support system has been adapted to and established for the AAL pilot region. The remainder of this paper is organised as follows. The first section introduces the problem statement, fit4AAL and ILSE. Section two explains how the support system was developed and improved. In section three the results of this process are presented. Section four discusses the outcomes. Finally, section five concludes our findings.

1.1 Fit4AAL and ILSE

Fit4AAL is an Austrian pilot region including Salzburg and Vienna. The AAL project focuses on promoting an active lifestyle and sport in retirement by new technologies. Therefore, the technology-supported functional fitness program ILSE has been developed. The primary target group of ILSE are people aged 55 and older. The program offers fitness exercises tailored to the determined fitness levels of the users. The so-called ILSE-app is not only available on the tablet, but a reduced version is additionally installed on a 3D camera system (Orbbec Persee) that can be connected to the users' TVs. Furthermore, ILSE includes an activity tracker to support outdoor activities. The entire system is tested within two field trials in Vienna and Salzburg. Over 200 independent people, aged between 59 and 75 years, use ILSE in their homes over a six-month period. One of the main outcomes arising from these field trials was to avoid usage barriers related to insufficient support. The fit4AAL project members aimed at supporting the participants adequately without expanding resources boundlessly by introducing the ILSE support.

[1] Austrian Ministry for Transport, Innovation and Technology

2 PROCESS OF ESTABLISHMENT

In this section the process used to establish and improve the ILSE support system is described. First, a basic support system has been installed. In the second step, the previous support process and accrued support issues were analysed. Based on the results, process flows were standardized, support templates developed and the manual refined.

2.1 Initial Support System

The basic ILSE support system comprises three parts: the local centres, the first and the second level support.

Two local centres were implemented, one in Salzburg and one in Vienna, to act as physical contact points. Each centre featured a so-called demo apartment, where the ILSE system was installed for demonstration. The field trial users were asked to come to the centres for meeting their coaches. These fitness trainers determined the fitness level of the users and adapted the training programs for ILSE accordingly. Subsequently, the users received the system and initial instructions. At the end of the trial, participants were able to return the ILSE system at one of the centres. In addition, the centre was open for users and other interested persons to demonstrate ILSE.

The first level support was a professional call centre providing a phone and an e-mail service, and thus, being the first contact point for the ILSE users during the trial.

A call centre is an indispensable part of a satisfying support system (Doyle, Bailey, Scanaill & van den Berg, 2014). Feinberg, Kim, Hokama, De Ruyter & Keen (2000) even stressed the importance of call centres for customer satisfaction. Many interactions take place at a call centre. Tasks vary from usual information to complex troubleshooting. Regarding ICT, a call centre agent ideally interacts with the caller and simulates the question on the computer system meanwhile (Steel, 2003). Therefore, call centre agents must have technical expertise as well as communicative skills. A beneficial conversation must be competent, efficient, professionally friendly, flexible, and, finally, satisfying for the caller (Maaß, Theißig & Zallmann, 2001). The main purpose is to listen and care because ‘understanding the customer is a key factor in keeping them happy and solving support issues’ (Montgomery & Damian, 2017).

The ILSE call centre was formed by the project partner bit media e-solutions GmbH. The centre was reachable via e-mail twenty-four-seven and the hotline was available from Monday to Thursday from 8 am to 5 pm and Friday from 8 am to 1 pm. The employees of the call centre are usually experts in supporting ICT products for public institutions (schools, public authorities and similar). Besides their daily business, six employees were consigned to support ILSE users during the field trials: One led the support team, two persons dealt with questions in detail and three other persons were mainly responsible for the transfer of problems and solutions between the users and the second level support. Altogether, the team boasted 30 years professional experience. None of them had specific experiences with customers averagely aged 65.

The users were requested to contact the first level support if they needed any help to install ILSE, if devices did not or only partly work, if there were questions according to the fitness program, the technology or the participation itself. The questions were grouped in nine support categories: Participation, installation, technical questions, ethical issues, training, survey, workflow, local support and exchange of devices. All reported issues were documented with the company-internal ticket software. The first level support team was equipped with ILSE tablets and fitness trackers to be able to adequately accompany users through their support case and to reproduce solutions for problems. Further, the team used the ILSE manual to refer to specific descriptions. The manual described how to use the tablet, the 3D camera system and the fitness tracker. A project-intern document clarified the responsibilities of whom and when to forward a problem to the second level support.

The second level support consisted of technicians, who were able to fix bugs, and researchers, who clarified specific problems that could not be solved by the first level support. These persons were usually not in direct contact with the ILSE users. They received issues from the first level support via the ticket software. When an issue could not be solved by the first level support, the corresponding second level support team member received a notification e-mail to log into the ticket software to report the possible solution. The first level support then took over to forward the solution to the users.

A support case was closed when the users were able to continue using the system and when the solution was documented within the ticket software.

2.2 Initial Support Process

By knowing the instances and responsibilities of the first and second level support, the process of support within ILSE can be described. All support cases were documented via the ticket system. Each support process started with an issue, which was submitted through phone or e-mail (step 1). A member of the first level support accepted the issue (step 2). Then the employee started to solve the problem (step 3). The issues varied in category and severity. Some could be answered directly on the phone or with a short e-mail, whilst others needed more input, in particular from the second level support. For tricky technical problems, the support team member referred to the manual to find answers or used the ILSE system to reproduce solutions. Every incident was recorded in a ticket. A ticket contained a combination of structured (ticket ID, title, state, priority, date, user, email, channel, ticket assignee) and unstructured data (problem description). If the problem could be solved, the resolution was documented in the ticket and the ticket was closed. If not, the first level support forwarded the problem to the responsible person of the second level support and assigned the ticket respectively (step 5). The second level support team member tried to resolve the issue and returned a gradual instruction with screenshots and detailed information to the first level support using the ticket system. If a problem could not be resolved or fixed, the second level support asked the first level support to arrange an appointment with the user in a local centre (step 5). The first level support contacted the user to solve the issue and, hence, close the corresponding ticket (step 6).

Every ticket showed the resolution process of an issue. It started with the submission of a problem and the creation of the ticket, proceeded with problem handling, and ended with the solution and closing of the ticket.

2.3 Ticket Analysis

To improve the initial support system and process we analysed the support tickets of the first phase of the field trial from April to August 2019. The broad goals of the ticket analysis were to facilitate the work of the first level support and to reduce the effort of the second level support for the remaining field trial.

The first phase took 18 weeks and included 120 elderly persons who tested ILSE. After six weeks 233 tickets were collected. These tickets were classified according to the support categories (i) technical questions, (ii) participation, (iii) installation, (iv) exchange of devices, (v) training program, (iv) ethical issues, (iiv) questions related to the survey, (iiiv) workflow and (ix) local support. The number of process steps from ticket creation to closure was taken to determine the effort of problem resolution. Little effort means that the problem needed one to five process steps to be solved and it was executed by the first level support. Medium effort means the process took six to ten steps and the second level support was also involved to solve the problem. High effort means the troubleshooting needed more than ten steps. In order to identify typical problems or major problematic areas that contributed to most of the tickets, we had to analyse the categories in detail. Furthermore, we wanted to know if there were common solutions to tickets or whether it was possible to facilitate or even automate resolutions. Therefore, two members of the first level support and three members of the second level support compared and contrasted ticket, problem and process descriptions. The problem descriptions were characterised by problem identifiers. Hence, problem identifiers were again classified. These categories were useful to adjust the problem identifiers with the ILSE manual. Missing descriptions or unclear parts were adapted in the manual according to the findings. In addition, the process descriptions were analysed to model the support workflows. Therefore, activities as well as their order to solve technical problems were identified and visualized in a process diagram. A process diagram shows all steps of the process by graphical elements. The sequence is visualized through arrows and lines between the elements (Berglehner & Wilberts, 2015). The process steps, where the problem solution was given in detail, were extracted. They were collected in a so-called catalogue of standards e.g. process steps to update the ILSE app.

The exchanged e-mails between users and first level support were additionally analysed in detail. We extracted e-mail correspondences that successfully solved support cases and transformed them to standardized templates e.g. detailed description to update the ILSE app including screenshots.

3 RESULTS

In the following, the results of the ticket analysis are presented. Firstly, quantity and quality of tickets are shown. Based on these findings, technical questions were analysed in detail. The ILSE manual was enhanced, the workflow visualized and standardised problem solving strategies developed.

3.1 Ticket Classification and Effort Estimation

Figure 1 shows the classification of the support tickets according to the support category. In most cases (153 of 233), technical questions were asked. One technical question concerned, for example, the starting of the ILSE program; another user reported that the monitoring system crashed several times. The second most frequent requests concerned the category participation (in total 53 of 233). These issues mainly occurred in the beginning of the field trial. Twenty-three of the 53 requests were related to the first appointment arrangement with the coach. For instance, the users asked to postpone the meeting due to unforeseen incidents or similar. Categories with fewer tickets were: ten issues related to the installation, as well ten concerning the exchange of devices, four questions for the training program entered the ticket system and two with respect to ethical issues. One support case was assigned to the questions related to the integrated survey of ILSE. No tickets were created for the categories workflow and local support.

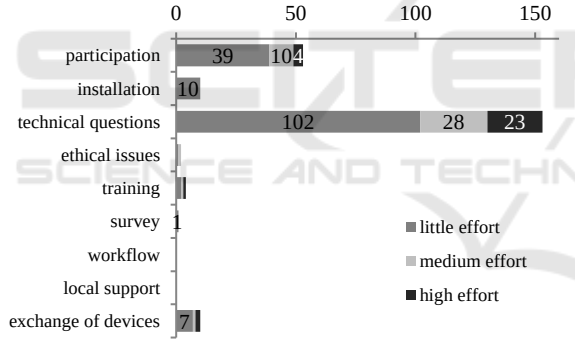

Figure 1: Classified support tickets.

Altogether, 162 tickets required little effort. 41 tickets needed medium effort to be closed and 30 tickets required high effort. The longest process took 32 steps. In this case, the user reported that the update of the 3D camera system failed. Most high effort tickets (23) incurred for technical questions. In comparison to tickets of the category participation, where many questions were related to time shifting, a lot of potential to reduce support effort can be found in technical questions. As a result, the support team focused further on the analysis of the technical questions.

3.2 Technical Questions in Detail

To identify which tickets could have been avoided entirely or where effort could be reduced, we analysed the problem descriptions of technical questions in detail, tagged every ticket with a problem identifier and mapped them to additional categories.

The 22 identifiers, which resulted from the exploration of problem descriptions, were: presentation errors (e.g. screens overlap of training videos), human detection, installation, error icon, update, internet connection, TV adjustment, app start (no launcher), remote control (battery, handling, exchange), gesture control, Installation via Play Store[2], training schedule, app crash, data upload, problem to charge, data transfer, GPS signal, connection of tracker and smartphone, closing app, SHealth app, data volume, and feedback from server.

All raised questions or problems relate to a specific ILSE system component. That is why we mapped the identifiers to the four categories (1) 3D camera system (Orbbec Persee), (2) fitness tracker, (3) tablet and (4) server.

We compared the four categories and problem identifiers with the ILSE manual. Nine sections were identified that had to be revised:

1. General information about the SIM and its available data volume as well as detailed instructions how to connect to the local WIFI were supplemented.
2. References to check the user profile were revised.
3. It was added that the tablet should not be turned off immediately after a training session. Otherwise, the training may not be saved.
4. In addition, general information about the fitness tracker and Bluetooth connection were provided such as that data synchronization can fail due to Bluetooth connection issues.
5. Specific expressions such as ‘update’, ‘gesture control’, ‘profile’, were explained in detail.
6. Furthermore, instructions were given to deactivate the gesture control of the 3D camera system that disturbed some users while performing their training sessions.
7. An overview of the system including components and functionalities was added in the beginning of the manual.
8. Explanations were added on how to check if the app was connected to the server and/or the internet.

[2] https://play.google.com/store

9. Finally, some screenshots were added and complemented with the descriptions of the training summary.

3.3 Support Workflow

A possibility to speed up the support process is to reduce the number of process steps. This means, we had to empower the first level support. Members of the first level support had to know quickly specific problem-solving strategies. So, we decided on providing a standardised process flow. Figure 2 shows the basic support workflow. It starts with a problem which is submitted by an ILSE user. The first level support creates a ticket for the problem and starts to clarify the cause of the question. Some questions e.g. excessive demands can directly be clarified, the ticket can then be closed and the user is satisfied. Other issues require more work. Depending on the problem, the support agent follows the process flow for the 3D camera system, the tablet or the fitness tracker.

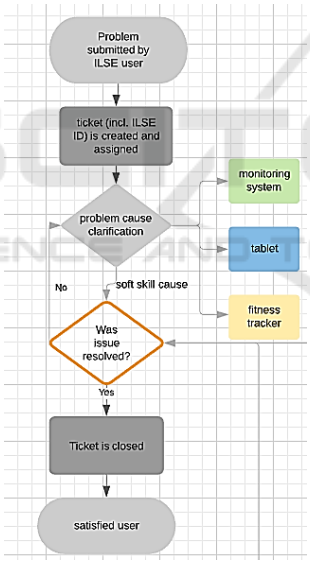

Figure 2: Basic support workflow.

Figure 3 illustrates the support workflow for the 3D camera system. Initially, the agent has to clarify if the question is related to

- The installation,
- The usage of the 3D camera system, or
- The ILSE app on the 3D camera system displayed on the TV.

Then the cause of the specific problem needs to be identified. The most common problem solving strategies such as to start and update the app, how to the gesture control and remote control, and how to use the ILSE app (continue training, training visualization, person recognition, training feedback) are described in the ILSE manual. The agent guides the user through the respective page(s) and supports the user to execute the steps to solve the problem. If a missing internet connection is identified as the reason, the agent supports the user to activate WIFI. If the connection to the local WIFI fails again, the agent supports the user to start a hotspot with the ILSE tablet to connect the 3D camera system. Reported support cases related to the training functionalities of the system require the forwarding of the ticket to the second level support.

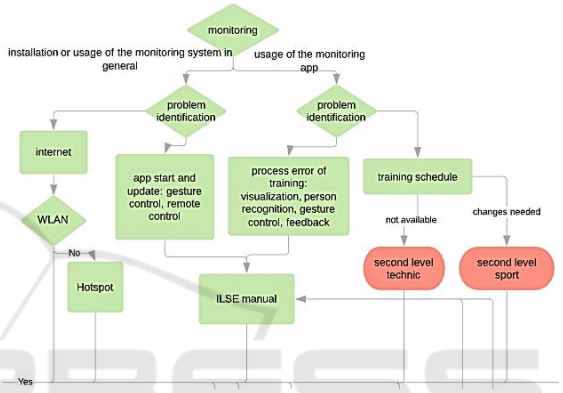

Figure 3: Support workflow for the 3D camera system.

If the tablet is not working as expected, the agent first supports the user to close messages and apps on the tablet and to reopen the ILSE app. Some issues are already solved at this point. Otherwise, the user has to check the data connection. If it is not possible to activate data connection, the second level support has to check the tablet. If the data connection is enabled or can be activated, but the problem still exists, the tablet needs to be rebooted. If the tablet does not work properly after rebooting, the ticket has to be forwarded to the second level support.

If the submitted question is related to the fitness tracker, the agent first clarifies the problem specifically. The ticket is forwarded to the second level support, if data is not transferred to the server even though the tracker is adjusted correctly. Problems with energy supply, GPS tracking, Bluetooth connection, data transfer or training records require rebooting of the tracker. If the problem remains afterwards, the Bluetooth connection of tracker and tablet has to be verified. In the case of handling problems, the agent recommends an appointment at a local centre to clarify the problem.

3.4 Catalogue of Standards and Templates

The catalogue of standards is a file, which presents standardized solutions for most frequent problems. In its first version, the catalogue included 50 standards. Each standard was labelled with the affected component e.g. 'tablet' and the problem identifier such as 'update', followed by a brief description of the problem like 'the ILSE app is outdated'. Finally, the solution is stated such as 'the ILSE app has to be updated', and the solving process is described in steps. For the given example, the steps were:

1. Open Play Store on the tablet
2. Insert "Fit mit ILSE" in the search line
3. Press the button "actualise" if shown and confirm the update
4. Reboot the ILSE app

If the problem solution is even included in the ILSE manual, the respective page is added to the standard. For 16 problems, templates were created additionally. Templates represent predefined answers for users. They are used to evaluate specific data for problem solution or to help users to execute steps to solve a problem by themselves. Templates are step-by-step solutions, which are especially written for the users. The descriptions are very detailed and include screenshots where they are needed.

4 DISCUSSION

In order to support users of ILSE adequately, we built the ILSE support system on a professional call centre. The call centre agents represented the first level support. They had no experience with AAL technologies or elderly users specifically. As part of their usual daily activities, they supported users of software products. ILSE consists of hardware and software components. Members of the first level support reported that the mix of hardware and software components made the support very complex. A reported, very challenging support case was helping to connect the 3D camera system with the TV via the smartphone. Users often demanded subsequent support directly at their homes, which in the end was not necessary. According to the user group, agents determined that the expectations at ILSE and the support were high. Users expected that the installation and usage of ILSE was simple, and the system runs properly. Problems and questions had to be solved quickly. But some questions needed time and many process steps to be solved. With respects to this, the first level was supported in solving problems by the second level support. Members of the second level support were researchers, involved in different areas of the fit4AAL project e.g. sports, technology or evaluation. Due to this mix of different people, the communication between first and second level support was difficult. First level support members complained about reaching the needed persons in time. The third pillar of the basic support system was formed by the two local centres in Vienna and Salzburg, where the ILSE participants received the system components and a first introduction. The introduction comprised the installation and all functionalities of ILSE. Afterwards, the user installed ILSE at home and started to use the system. When problems or questions arose, they notified the first level support via phone or e-mail. Submitted issues, as well as the process of clarification, were documented using a ticket system. To improve the basic support system, tickets were analysed after six weeks in practice. Within the starting trial weeks a lot of tickets were created. Many tickets required a high effort to be solved. Overall, we can say that the support effort was underestimated. First results of the ticket analysis indicated high potential in reducing the load in form of technical problems and questions. Thus, we aimed at decreasing the number of tickets by encouraging the ILSE users to solve questions by themselves. Gaps and unclear parts of the manual were identified and revised. Another possibility to speed up the support process was to reduce the process steps. This meant the first level support had to be empowered. We visualised a standardised support workflow and provided step-by-step solving strategies for specific problems. Additionally, templates were improved that included user-centric, detailed descriptions to solve a problem. In the first weeks of the second phase of the field trial, that started in late of September 2019, we experienced a positive impact of our improvements, in particular on the work of the second level support. Since the first level support team was empowered by the support workflows, the standards and the templates less tickets had to be assigned to the second level support.

5 CONCLUSIONS

In this paper we have demonstrated an approach to create and enhance a support system for an AAL pilot region as well as shared the experiences of running

such a call centre. The resulting support system of ILSE comprises

- A professional first level support, equipped with a visualized workflow and standardised problem-solving strategies,
- A second level support equipped with templates,
- The local centres as physical contact points, and
- A clear, comprehensive manual.

We conclude that analytics of support tickets enables the identification of gaps and the potential to improve the support system. AAL systems are often multi-component solutions, consisting of hardware, software, and, particularly, might additionally include private equipment of the users (e.g. ILSE includes private TVs). Hence, providing adequate support is challenging. It is important to think about this issue as soon as an AAL project is drafted. We recommend a professional call centre as first contact point for the users. Even though the agents had no experience with AAL technologies or elderly users, it was a good starting point to establish a satisfying support system for an AAL project. The experiences in supporting people are valuable and are in addition essential for estimating the potential workload for the business case. The local centres facilitated the preference of the users for personal support and contact.

Nevertheless, the first appointments at the local centres, including the appointment with the coach to assess the fitness level and the initial instructions on how to use the system, were too long and the presented content too much. We think that many tickets regarding installation could be avoided if more comprehensive face-to-face training would be provided in the beginning of a trial phase, perhaps even in groups. A short manual of functions and component descriptions, including a checklist for the equipment, would support the first appointment beneficially. Fit4AAL further demonstrated that it is difficult for an AAL pilot region to measure the expectations of participants. High expectations may raise frustration, and low expectations may reduce the acceptance of the system. We recommend not to conceal the research background, but instead to promote the technical level of the system. In addition, the integration of a support area in the app for quick notifications, such as information about server failures, support availabilities, frequently asked questions, could additionally be beneficial.

Currently the second field trial of ILSE is taking place. First ticket analytics showed that the technical questions decreased. Besides the support system, the ILSE system itself was improved. Further research giving detailed information about ticket development will be conducted after the trial. The next step to professionalise the support, is to outsource the second level from the research team to the product owner.

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